

THE RELATIONSHIP BETWEEN E-JOURNALING AND SOPHOMORE HIGH  
SCHOOL STUDENTS' UNDERSTANDING OF PHYSICAL SCIENCE CONCEPTS

by

Christopher Ryan Reidburn

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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.

Christopher Ryan Reidburn

July 2013

## TABLE OF CONTENTS

|   |    |
|---|----|
| INTRODUCTION AND BACKGROUND .....                     | 1  |
| CONCEPTUAL FRAMEWORK .....                            | 3  |
| METHODOLOGY .....                                     | 10 |
| DATA AND ANALYSIS .....                               | 22 |
| INTERPRETATION AND CONCLUSION .....                   | 44 |
| VALUE .....   | 46 |
| REFERENCES CITED .....                                | 50 |
| APPENDICES .....                                      | 52 |
| APPENDIX A: Student Interview Questions .....         | 53 |
| APPENDIX B: Student Survey Questions .....            | 56 |
| APPENDIX C: E-journaling/Blog Assessment Rubric ..... | 59 |
| APPENDIX D: Unit 2 Forces Test .....                  | 61 |
| APPENDIX E: Unit 3 Work & Simple Machines Test .....  | 67 |
| APPENDIX F: Unit 4 Energy Test .....                  | 74 |

LIST OF TABLES

1. Data Triangulation Matrix ..... 22

## LIST OF FIGURES

|   |    |
|---|----|
| 1. First Practice Blog Prompt.....                              | 12 |
| 2. Second Practice Blog Prompt .....                            | 12 |
| 3. Third Practice Blog Prompt .....                             | 13 |
| 4. Week One Real World Prompt .....                             | 15 |
| 5. First Blog Prompt of Week Two.....                           | 15 |
| 6. Second Blog Prompt of Week Two .....                         | 16 |
| 7. Week Three Real World Prompt.....                            | 16 |
| 8. Week Four Article Prompt.....                                | 17 |
| 9. First Blog Prompt of Week Five.....                          | 18 |
| 10. Second Prompt of Week Five .....                            | 18 |
| 11. Week Six Real World Prompt.....                             | 19 |
| 12. Final Article Prompt .....                                  | 19 |
| 13. Comparison of Treatment's Pretest and Posttest Scores ..... | 24 |
| 14. Improvement between Pretest and Posttest Scores.....        | 24 |
| 15. Treatment vs. Nontreatment Posttest Scores .....            | 25 |
| 16. Weekly Average Blog Evaluation Score .....                  | 25 |
| 17. Weekly Average Blog Analysis Score by Group .....           | 26 |
| 18. Weekly Average Number of Responses per Blog .....           | 27 |
| 19. Weekly Average Number of Responses per Blog per Group.....  | 27 |
| 20. Student Survey Response to Blogging and Understanding ..... | 28 |
| 21. Student Survey Response to Blogging and Unit Tests .....    | 28 |
| 22. Student Survey Response to Blogging and Daily Work.....     | 29 |

## LIST OF FIGURES - CONTINUED

|   |    |
|---|----|
| 23. Student Survey Response to Blogging and Quizzes .....                   | 29 |
| 24. Average Responses per Blog .....  | 30 |
| 25. Average Blog Evaluation Score.....                                      | 31 |
| 26. Average Completed Blog Evaluation Score .....                           | 31 |
| 27. Average Evaluation Score per Blog Prompt Type per Blog.....             | 31 |
| 28. Average Response Left per Blot Prompt Type per Blog .....               | 32 |
| 29. Student Survey Response to Blogging and Class Participation.....        | 32 |
| 30. Student Survey Response to Number of Student Responses.....             | 33 |
| 31. Student Survey Response to Ease of Blogging.....                        | 33 |
| 32. Student Survey Response to Weekly Favorite Prompt Type.....             | 33 |
| 33. Student Survey Response to Weekly Blog Participation and Prompt Type .. | 34 |
| 34. Student Survey Response to Weekly Least Favorite Prompt Type .....      | 34 |
| 35. Student Survey Response to Application of Concepts to Blogging .....    | 39 |
| 36. Student Survey Response to Teacher Input and Understanding.....         | 39 |
| 37. Weekly Average Class Reponses per Blog.....                             | 41 |
| 38. Weekly Average Completed Evaluation Score per Blog.....                 | 41 |
| 39. Student Survey Response to Technical Issues .....                       | 42 |
| 40. Student Survey Response to Blog Quality Over Time .....                 | 43 |
| 41. Student Survey Response to Value of Blogging.....                       | 47 |

## ABSTRACT

High school sophomore Physical Science students were required to create blogs in response to the teacher's prompts relating to the course's topics and post comments to their peers' blogs in this investigation. This research was conducted over a span of six weeks. The three units covered during the course of this study were forces, work and simple machines, and energy. Collection instruments included student interviews, teacher assessments of the students' blogs, comparison of pretest and posttest scores, and student survey responses. Student participation, student blog responses, and blog quality all decreased over the course of this study although the student survey indicated a majority of students felt the quality of their blogs improved over time. Students indicated that they felt blogging did help them better understand Physical Science topics covered during the class. There was an increase between student pretest and posttests for each unit.

## INTRODUCTION

Technology is an integral part of the school community in which I teach and consequently in every lesson because each student has a laptop computer. My Physical Science lesson plans are centered on the effective integration of laptop technology into the subject matter. The students are allowed to take their school-issued laptops home with them at the end of the school day. A majority of students have 24-hour access to the Internet through their modems and routers at home or can go to a location in town that has free wireless internet access. The students' textbooks are no longer printed on paper but are downloaded to their computers. The students' homework assignments are on a self-grading website that reveals the students' scores to them as soon as the student answers the last question. The ever-present existence of technology in our classrooms inspired me to make the effective use of technology in my class a central part of my research project.

Watertown High School is the only high school located in the Watertown School District in northeastern South Dakota. The main industry in the area is agriculture and there are very few white-collar jobs in town. Lake Area Technical Institute is a thriving two-year technical school in Watertown that many Watertown High School graduates attend. The Watertown city limits include a population of over 21,000 people, so our school district has one of the largest enrollments in the state with around 1,200 students attending the high school. 0.2% of the student body is classified as African American, 1.2% as Asian/Pacific Islander, 1.8% of as Hispanic, 2.7% as American Indian/Alaska Native, and the remaining 94% being white/non-Hispanic. The majority of the students are of German and Scandinavian descent. Watertown High School runs on a schedule



consisting of four 90-minute-long blocks. The science courses I teach are semester-long and run for approximately 18 weeks.

One of my teaching goals is to be effective at accessing student understanding of concepts we are covering in each lesson. This goal was the central purpose for my research project. I also wanted to know what kind of metacognition is occurring during this class with the help of the technology students have access to. Another area I was interested in was determining whether students create more connections with concepts when they (the students) are given the opportunity to express their thoughts and reply to what others have to say.

I conducted my action research project in my Physical Science class at Watertown High School during the 2012-2013 academic year. I selected this class for my intervention because I have taught it for eight years and feel very familiar with the content of the course and the nature of the students that take it.

The Physical Science course at Watertown High School is divided into nine units over the 18-week-long semester, with the physics portion being taught the first quarter and the chemistry portion being taught the last half. My project was carried out over an eight week period during the physics portion of the course.

My focus question for this study was: what relationship is there between high school sophomore students' e-journaling and their understanding of Physical Science concepts? The study will also attempt to address the following secondary questions:

- Which question prompt types encourages the most student participation?
- Is there improvement in the quality of student responses over time with the use of student e-journaling?

- Does analysis of the students' entries allow for the teacher and the students to discover any student misconceptions?

### CONCEPTUAL FRAMEWORK

A majority of students today are very technologically literate and have instant information access. Their way of processing information is very different than it was for previous generations of students and because of this the way students are educated a decade ago does not necessarily work well for today's "digital natives" (Prensky, 2001). Students want to use computers and they want to use software that allows access to the world and collaboration with others. A majority of students are on social media websites at least once a day to share their views of the world to the world (Brunsell & Horejsi, 2010b). Expressing your opinions and observations to the world via the internet is an example of e-journaling. This literature review will describe what journaling is, the benefits of journaling, and the challenges of using journals in the classroom. I will then describe e-journaling with both its advantages and drawbacks.

Journaling is when an author writes down their thoughts or ideas on paper as separate entries over a period of time. Journaling has been described as being a form of storytelling and can be reflective in nature (Nesbit, Hargrove, Harrelson, & Maxey, 2004). Journaling may also include the framing of questions, expression of the thoughts of the authors, descriptions of creative endeavors and sometimes the use of drawings into dated entries (Nesbit et al.). It can range from being a personal diary to the instructions of laboratory procedure.

Journaling has been utilized in classrooms for its many benefits. Journal entries can act as a learning indicator for the teacher. Teachers can gain insight to how student learning is progressing when reading student entries (King & LaRocco, 2006).

Journaling in itself is a form of learning. Reflective journaling is a way of processing new experiences into ideas that make sense to the writer. Journal entries allow the author to see how their individual learning is occurring (Boud, 2008). Fritson (2008) states that “regardless of the style of journaling, the primary aim is to have students contemplate and integrate information from courses to real-life experiences, promote critical thinking, and communicate their perceptions/experiences in a written manner” (p. 76). Journaling allows for more involved critical thinking than most questions on a worksheet if the proper journal prompt is given. Student journaling allows the students to share about their experiences and prior knowledge while engaging their higher-order thinking (Sawmiller, 2010). Classroom journaling can lead to students becoming more confident in their own competency. Studies by both Fritson and Dunlap (2006) show that there is an observable increase in student self-efficacy when students are assigned reflective journaling as part of their coursework. Students can recognize their own skills and accomplishments when completing reflective journal entries (Dunlap).

Although journaling has been a part of the literature or English class in academics, journaling has also become popular in science classes. Curriculum developers are including more writing into the science curriculum (Sawmiller, 2010). Writing is an essential part of the process of science (Baker, et al. 2008). Omland and Weisz’s (1996) study addressed the question “Can writing improve learning in traditionally non-writing classes such as math and science?” Omland and Weisz’s research found that with the use of more writing assignments, and the inclusion of prompted (or guided) journaling, there was an increase in student learning, as seen in the difference between pre and post test scores, with the biggest increase seen in the bottom

third of the students. Research by Towndrow, Ling, and Venthan (2008) suggests reflective journaling can lead to an increase in “analysis by thinking about the questions they [the students] wanted to ask in relation to their laboratory experiences” (p. 283). In their study involving reflective journaling, Towndrow, et. al., required a science class of 7th grade girls to record their entries over a five week period. The students were given five minutes after each lesson or laboratory activity and the teacher collected the journals at the end of each week. Their studies showed journaling gives students a forum that is less intimidating than a classroom discussion as journaling makes students more at ease to answer the teacher’s questions without being embarrassed in front of their classmates (Towndrow et al.). Towndrow, et al., also found that journaling gave the teacher an accurate indicator of where their students are at in relation to learning the science concepts.

Integrating journaling into the science classroom poses some challenges. One disadvantage is the student is not journaling when the journal is physically out of the student’s possession while the teacher is reading it (King & LaRocco, 2006; Phipps, 2005). There is also a chance of the journal being lost or misplaced. A drawback is not all student handwriting is decipherable (Phipps). Another shortcoming is the need to have allotted time set aside from the class time to allow students to create entries. This amount of time may need to be increased for students on individualized education plans (IEPs). Another problem is that the writing prompts given by the teacher need to be something that would stimulate a response from the students. The journal entry prompts must have meaning to the student and be seen by the students as relevant to the class and themselves. A challenge could also be that a student might not put forth their best effort

in writing if they know the teacher will be their sole reader. Students will write high quality entries if they have a greater number of people as their audience rather than if they [the student] are just composing a journal entry for the teacher to read (Sawmiller, 2010).

There are necessary components for effective classroom journaling. A medium in which to journal is one primary factor. Interesting and relatable prompts are mandatory. Frequency of journaling is a key element also but needs to be manageable for the both the student and teacher. Requiring entries too often can lead to burnout. To be effective, teacher feedback needs to be direct and specific to the journal entry (Phipps, 2005). The digital version of journaling is called blogging. A weblog, or blog, is a website that allows for publishing of personal entries, displayed in reverse chronological order. Authors of blogs are known as bloggers. Unlike the webpages that were laborious to create in the world of web 1.0 and did not allow for interactivity, today's blogs are now user-friendly and easy to edit (Downes, 2004). Blogging sites can be used by students as online journals, also referred to as e-journaling. The entries created for e-journaling are produced electronically, whether by use of a web camera, uploading files, or typing.

There are benefits to using blogs in education. Readers of most blogging sites are allowed to leave feedback in the form of comments. Posting and commenting on blogs helps students utilize decision-making skills (Ramos, 2010). Sawmiller (2010) points out that weblogs can suit a variety of learning styles. Another benefit of using e-journaling in education is it can help to improve students' writing and literacy skills (Kennedy, 2003; Baker, et al, 2008; Downes, 2004). Students can apply what they read from their peers' blogs and synthesize that information with what they have just learned (Zawilinki, 2009).

Utilizing blogs allows students to draw their own conclusions based on information provided by blogs; students need to be able to determine what is fact or fiction from the internet (Ramos). This access to almost instantaneous feedback for the blogger plays into Pensky's (2001) observation of today's students thriving on instant feedback and rewards.

The use of blogs for e-journaling has allowed for authors to compose for a much bigger audience. Using web 2.0 components (meaning interactive websites) allow individuals to be active participants on the Internet and possibly interact with other people around the world, forming blogging communities that know no geographic boundaries (Efmova & Fiedler, 2003; Witte; 2007). Blogs can function as an outlet for students to express themselves or as an effective portfolio of student's work that can be accessed from any computer throughout the world via a specific URL address (Sawmiller, 2010; Kennedy, 2003). Students can add to the world's knowledge base by commenting through blogs, which can lead to a form of social networking (Brunsell and Horesji, 2010b). The interactivity among students through blogs is advantageous (Brunsell and Horesji, 2010a). Another point of view of a situation or story can add to the student's understanding and it may not be limited to just an author's physical location. The risk of writing for a larger audience, meaning anyone with access to the URL address rather than composing for just the teacher to read and grade, can be a motivation tool for quality writing from a student. (Sawmiller).

There are advantages of online journals over journals kept in paper notebooks. Unlike having a physical notebook to record entries, the e-journal is never out of the author's possession and cannot be lost in the shuffle (King & LaRocco, 2006; Phipps, 2005). Students will always have access to type in entries any time of day (Sawmiller,

2010). There is also an ease in reading typed entries rather than struggling to translate a handwritten notebook entry (Phipps).

There have been some studies in the past few years that have incorporated e-journaling into education. Campbell (2009) found that when 8th grade boys used e-journaling for goal-setting and reflection there was an increase in the students' self-regulation and improvement in their goal-setting abilities over time. Campbell's data collecting included pre- and post-study interviews along with observing the students journal entries.

Bryant's (2011) capstone project was a study involving environmental science students blogging within a class wiki platform. A person who has the URL for a wiki has the ability to edit that wiki. Wikis are usually the product of group collaboration unlike blogs which tend to be more one-authored websites. Bryant focused specifically on the effect of using question prompts to encourage online class discussions. She found that not only did blogging ensure participation from everyone in the class, even the quietest students, but it also served as an additional way for students to synthesize information (as they were reflecting on and discussing each other's comments critically). Another benefit of blogging she observed was that students were continuing conversations about the class outside of school. Student participation and quality in the wiki increased when the students were in control of the wiki topic and format. Her study indicated that a use of a variety of discussion prompts had a high level of participation from her students.

Howell's (2011) capstone study dealt with composing chemistry class lab reports onto a blog. The use of a website instead of paper to record lab reports was advantageous for the fact it cut down on paper use. Another benefit was collaboration occurred when

students posted comments using the Blogger.com website. Howell used student interviews, Likert scale surveys, a formative assessment known as the minute paper, Howell's own journal entries, the students' own self-assessment rubrics, and archiving of the student blogs as data collection tools. Howell found that students liked that they had more interaction with their peers through the use of the blog.

Weekly weblogging in a sophomore high school Biology classroom was the subject of study by Brunsell and Cimino (2009). This study found that the use of the blog increased student participation, increased student comfort and confidence level, motivated students to do more self-directed online research, and resulted in higher quiz scores which increased the students' Biology grades. Students also commented that they liked that other students would help them out online if they were confused when answering questions. This is an example of online collaboration, which is an essential 21st century learning skill.

King and LaRocco (2006) conducted an e-journaling study with graduate level education students and found e-journaling to be a useful classroom tool. The weekly e-journal entries were assigned as part of the students' homework to ensure they would be completed. End of the semester surveys completed by the students overwhelmingly suggested that e-journaling was extremely useful and was of benefit to the students. The student e-journal entries were evidence that the students were synthesizing the ideas learned from both their readings and the lectures from the course.

Despite a wealth of support for e-journaling it is not without some disadvantages. When does the student who does not have internet access at home submit a journal entry?



What happens when an internet ethics problem arises? Sawmiller (2010) recommends that students are told at the beginning what expectations the teacher has of students in their e-journaling along with what the class or school district has in place as internet ethics. A teacher needs to be aware of what is occurring in the class blogging by checking entries and may step into the role as comment mediator. Dunlap (2006) cautions against requiring students to create entries too frequently but also states that teachers need to be timely and prompt to comment on students' posts. Howell (2011) discovered that more class time needed to be devoted so that students could post or leave comments on the blog.

## METHODOLOGY

The purpose of my study was to determine if e-journaling by sophomore high school students will lead to a better understanding of concepts covered in Physical Science. The evidence from the research literature suggests students benefit from expressing their knowledge in the form of journaling because of the processing and critical thinking that occurs. Previous research by others discovered e-journaling allows students to have access to instantaneous comments from others and access to a medium to convey their thoughts around the clock as long as they have internet access. I wanted to see how the sophomore students in my Physical Science class processed the information they gathered during the course. The research from the conceptual framework indicated that students used critical thinking skills when they express concepts in words and when they replied to their peers' comments. My focus question was to determine if student e-journaling increases understanding of Physical Science concepts.

### Participants

This research was implemented during the 2013 spring semester of Physical Science with a single section of sophomores as my treatment group. The treatment class consisted of 17 students with 10 males and 7 females. Sixteen of the students are designated as Caucasian (white) with one Latino student. The nontreatment Physical Science class met during the spring of 2012 and consisted of 9 male and 12 female students. Twenty of the nontreatment group students were classified as sophomores and one student was a junior. The majority of students in the nontreatment class were classified as Caucasian (white) while one student was Native American. 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.

### Intervention

This e-journaling study included three Physical Science units during six weeks running from the end of January through the middle of March during the 2013 school year. The units covered during this time were forces (unit two), work and simple machines (unit three), and energy (unit four). Topics in unit two included Newton's three laws of motion, gravity, friction forces, and inertia. Unit three consisted of the six simple machines, mechanical advantage, power, work, and efficiency. Concepts covered in unit four were forms of energy, forms of thermal energy transfer, and the three laws of thermodynamics.

Weekly quizzes, laboratory activities, daily homework, unit projects, and pretests were graded to determine student comprehension and learning of topics. These graded assignments were identical for both treatment and nontreatment classes. Pretests

(Appendix D - F) were given at the start of each unit and the scores were recorded for comparison with student posttests.

The students' blogs were constructed using the Blackboard™ class website. All members of the class could see all of the e-journaling but it was blocked for anyone who was not a class member or teacher. Students in the treatment group completed three practice blogs and responses prior to the start to this study.

The first blog prompt required a one sentence post and the students were to leave comments on two of their peers' postings (Figure 1). I also left comments in response to every student's blog.

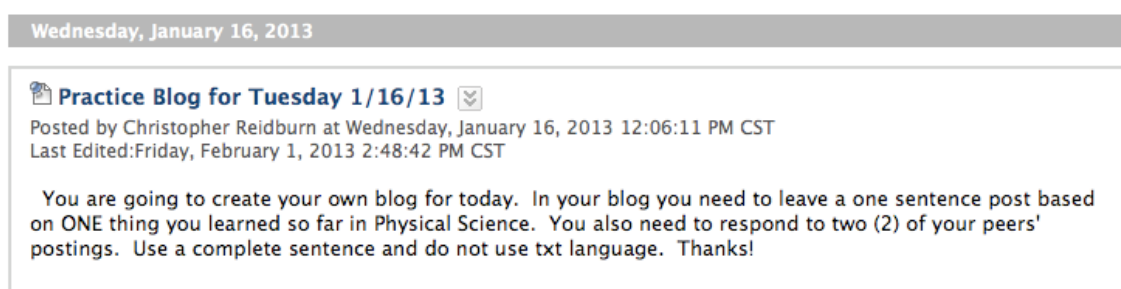


Figure 1. First practice blog prompt.

The second blog prompt (Figure 2) required students to read an online article about life on the moons of planets outside the solar system. It requires a longer minimum blog composition and students were to respond to two blogs.

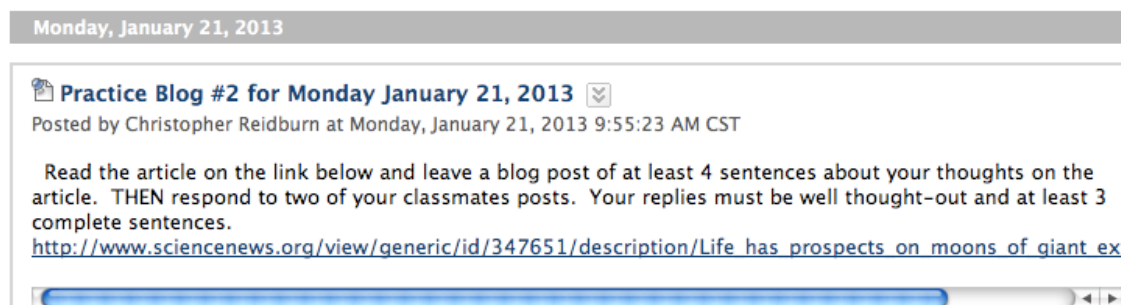
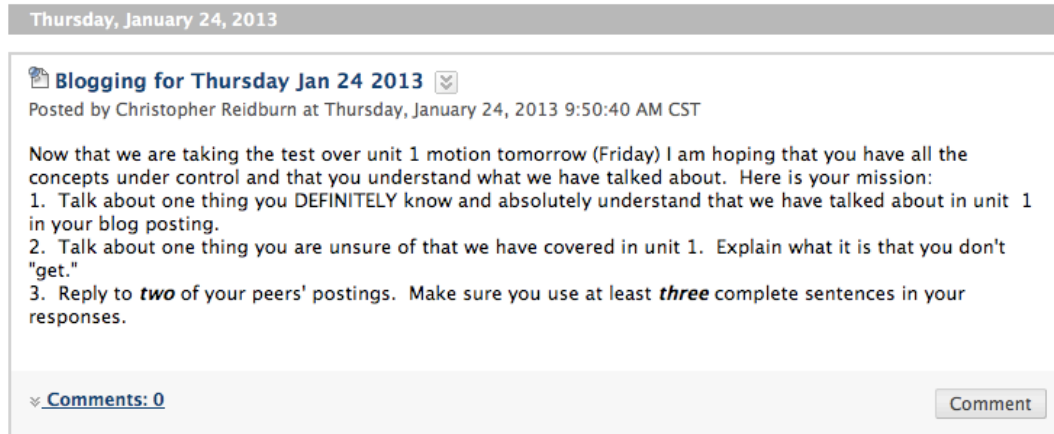


Figure 2. Second practice blog prompt.

The third blog prompt involved students commenting on a topic they understood well from the first unit of motion along with a concept they were unsure of (Figure 3).

Two peer responses were required.



*Figure 3.* Third practice blog prompt.



I compiled the data for the three practice blogs into one evaluation rubric for each student (Appendix C). The evaluation rubric score was based on four criteria: regularity and promptness of leaving posts, reflection of concepts in the students' blogs, the accuracy of information, and overall focus of the blog. The number of responses left by each student was also recorded on each evaluation rubric. The students would then receive their blog evaluation rubric back the following school day. Completing the blogs and leaving the minimum number of responses earned the students the full number of participation points.

I felt after the third blog prompt the students had a grasp of how to construct a sufficient blog and how to leave a proper response. Students knew what expectations the teacher had of the criteria of blog evaluation. I then narrowed the field of blog prompt types to three: real world examples of concepts, article comments, and what you know/what you don't know. I was looking for indicators of correct understanding of

concepts with the real world prompt in addition to a relationship to topics covered in Physical Science. The article comments prompt would have two versions: an online article provided by the teacher and an online article that the student would provide that was related to the topics covered in class. The students understanding of concepts was demonstrated in the article they chose and their explanation of the article's relation to our topics. The "what you know/what you don't know" prompt revealed what concepts students had a firm grasp on and what misconceptions students still had. This prompt was an indicator of what concepts would needed to be discussed again as a class.

Blog posts were to be created by the students on the same day I revealed the blog prompt in the blogging area in the Blackboard™ website. Our 90-minute class blocks allowed for ample time to create a blog. The students were informed that they could also complete the blogs any time during the day and did not need to be at school to add to their e-journaling. Late blog posts were docked in the evaluation rubric. The length of time allowed to leave comments ranged from two to four days and was dependent on the number of blogs required per week. Student responses were to be well thought-out ideas in the form of complete sentences.

The students completed the unit two pretest on the first day of this study. The first type of blog prompt was to relate the class discussion topics with real world examples of forces (Figure 4). The students needed to post two responses.

 **Blog topic for Tues Jan 29 2013** 

Posted by Christopher Reidburn at Tuesday, January 29, 2013 9:41:07 AM CST

**Part 1.** Take one of the topics from the force discussion yesterday (Mon Jan 28) in class (consult your notes if you need to) and construct at least five complete sentences about how it applies to the "real world."  
**Part 2.** Reply to **TWO** of your peers' blogs and leave at least a four sentence response to their blog. Your answers should relate to science.



▼ [Comments: 0](#) Comment

*Figure 4.* Week one real world prompt.

Week two had two blogs prompts. The first (Figure 5) was an article prompt that was provided by the teacher. The students were to create a blog entry based on this prompt on Monday. The article involved black holes and was in reference to gravity and mass. Two responses were required.

Monday, February 4, 2013

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 **Blog entry for Monday Feb 4, 2013** 



Posted by Christopher Reidburn at Monday, February 4, 2013 9:10:56 AM CST  
 Last Edited: Monday, February 4, 2013 1:10:10 PM CST

**1.** Read this article  
<http://www.sciencenewsforkids.org/2012/05/black-holes-big-gulp/>  
**2.** Create a blog post about the article. You must use at LEAST six complete sentences. How does this relate to what we are talking about in Physical Science? What did you find interesting about this article? What did you already know before you read the article? Have you heard anything about this outside of school?  
**3.** Respond to at LEAST two of your peers' blogs with at LEAST three complete and well thought-out sentences.

*Figure 5.* The first blog had an article prompt for week two.

The second blog of week two had a What You Know prompt (Figure 6). Student were required to compose six complete sentences on what topics they felt very confident in the understanding of and what concepts they still had questions on. Three responses were required for each student. This blog prompt was revealed on Wednesday of week two. Students completed the unit two posttest on the Friday of week two.

Wednesday, February 6, 2013

 **Blog Entry for Wednesday Feb 6, 2013** 

Posted by Christopher Reidburn at Wednesday, February 6, 2013 9:14:28 AM CST

1. Use a minimum of **three** complete sentences to explain the one topic you definitely know and feel you have a high degree of understanding of from Unit 2.
2. Use a minimum of **three** complete sentences to express your feelings or questions you have on one topic you feel you don't have a grasp of from Unit 2 or the thing you feel the least confident in you understanding of.
3. Reply to at least **three** of your peers' posts using at least **three** complete sentences. If you can explain something to help them out please do so!



Please do these blog post assignments on the day they are assigned! Thanks!

▼ [Comments: 0](#) Comment

Figure 6. Second blog of week two was a What You Know prompt.

Students began week three by completing the unit three pretest. Week three had one prompt requiring students' ability to relate the topics covered during unit three (simple machines and work) to real world examples (Figure 7). There were three minimum required responses. This prompt was given in the middle of the week.

Wednesday, February 13, 2013

 **Blog post for Wednesday Feb 13, 2013** 

Posted by Christopher Reidburn at Wednesday, February 13, 2013 9:05:00 AM CST

**Part 1:** Take one of the topics from today's notes/lecture (Wed Feb 13) in class (consult your notes if you need to) and construct at least five complete sentences about how it applies to the "real world."

**Part 2:** Reply to THREE of your peers' blogs and leave at least a four sentence response to their blog after reading what they have to say. Your answers should relate to science.



Figure 7. Week three's lone real world prompt.

The students had only one blog prompt for week four of the study. It was an online article prompt provided by the teacher that pertained to current events (Figure 8). The article was in regards to the meteor that disintegrated over Russia. The students were to

summarize the article in their own words and distinguish what scientific data was given in the article. The students were required to leave comments to at least three other blogs.

**Tuesday, February 19, 2013**

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 **Blog for Tuesday February 19, 2013** 

Posted by Christopher Reidburn at Tuesday, February 19, 2013 10:52:02 AM CST

1. Read the article at the link below  
<http://abcnews.go.com/International/russian-meteor-scientists-meteor-pieces-found-frozen-lake/story?id=18525443>
2. Summarize the article in your own words using at least five complete sentences. What scientific data is provided by the article? What other questions can you come up with after reading the article.
3. Respond to at least three other students' blog posts and use at least three complete sentences in you comments.  
 Please do this by the end of Tuesday so others can comment on your blog!



*Figure 8.* Article blog prompt for week four.

There were two article prompts for week five. The first prompt was given on Monday of week five. This article prompt required the students to choose an online article that was related to any topic discussed in the first three units (Figure 9). Three blog responses were required for each student. On Thursday of the week five students completed the unit three posttest and constructed a blog based on a What You Know prompt (Figure 10). Students were to have left three responses on their peers' blogs. The unit four pretest was completed on the Friday of week five.



Monday, February 25, 2013

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 **Blog assignment for Monday February 25, 2013** 

Posted by Christopher Reidburn at Monday, February 25, 2013 9:12:23 AM CST

1. We have covered unit 1 motion, unit 2 force, and unit 3 work. Find an online article that deals with what we have covered in ANY of the 3 units we have covered so far. Put the link into your blog post.
2. Use at minimum 6 sentences to summarize your article and explain WHY and HOW it deals with what we have talked about.
3. Reply to at least 3 of your peers' post using at least 4 complete sentences. Your sentences should reference the blogs (ex. NOT like this, "Your article is great Mr. Reidburn. Good job!" That doesn't cut it!).

*Figure 9.* Students could choose an online article that related to anything that was covered up to that point in Physical Science.

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 **Blog prompt for Thursday February 28, 2013** 

Posted by Christopher Reidburn at Thursday, February 28, 2013 9:16:27 AM CST



Now that you have taken the test...

1. What are 3 topics you are absolutely certain you have down from this unit? Explain a sentence in your own words for each topic.
2. Are there some things that we covered in this unit that you are unsure of? If so, write a complete sentence about it.
3. Respond to 3 other students' postings with a minimum of 3 complete sentences for each.

*Figure 10.* The second blog prompt of week five.

The last week of the study had two blog posts. A real world example blog prompt was given on Monday requiring students to leave comments to three of their peers' blogs (Figure 11). The last blog prompt was revealed on Wednesday of week six. This was an article prompt requiring a minimum of two blog comments (Figure 12). The online article was provided by the teacher and was in reference to particle accelerators and energy. The unit four posttest was then completed the following week.

Monday, March 4, 2013

 **Blog prompt for Monday March 4, 2013** 

Posted by Christopher Reidburn at Monday, March 4, 2013 11:57:03 AM CST

1. Think of an everyday example of where you encounter all 8 forms of energy during your day. Please use a complete sentence for each form of energy.
2. Leave a three sentence response for at least 3 of your classmates on their blog is reference to their posts. Your sentences in your comments should relate to the topic (energy) and not be "Good job, bro." Your response should be coherent and focused on the topic.

*Figure 11.* Week six first blog real world prompt.

Wednesday, March 6, 2013

 **Blog prompt for Wednesday March 6, 2013** 

Posted by Christopher Reidburn at Wednesday, March 6, 2013 9:36:38 AM CST

1. Check out this article:  
<http://www.sciencenewsforkids.org/2012/09/higgs-at-last/>  
 What does this have to do with what we are covering in Physical Science?  
 Respond to at least 2 of your peers' blogs.

*Figure 12.* The last article prompt of the study during week six.

### Data Collection

Data collection tools I used throughout my project are summarized in the triangulation matrix (Table 1). The three data collection tools to answer the primary question of if there is a relationship between student blogging and understanding of what was being taught in the Physical Science class include a comparison of the treatment group's pretest to posttest scores, a comparison of the nontreatment versus the treatment group's posttest scores, and student interviews. The data was gathered initially in the form of a pretest (Appendices D-F) for each of the three units studied during the research. The three units covered during the course of this research were forces, work and simple

machines, and energy. The treatment group's posttest scores were compared to the results of the posttests from my spring 2012 Physical Science class. This nontreatment group data also included additional an additional unit besides the three units included in the study. Both treatment and nontreatment groups had the same pre- and posttests, labs, and assignments. Both groups were comparable in student ability. The student interview questions (Appendix A) provided the students' opinions on whether blogging increased their level of understanding the Physical Science topics covered or if blogging was not a contributor to concept comprehension. Student interviews were conducted at the end of this research study. Seven students were selected as representatives of the class after the class was divided academically into thirds. The students are divided into bottom third (group 3), middle third (group 2), and top third (group 1). Two students were selected from each grouping with the remaining seventh student being from any of the three divisions. I interviewed the willing students from the treatment class and obtained their thoughts on blogging and the relationship to their level of understanding the science topic covered in class at the conclusion of this study.

A blog assessment rubric, student surveys, and student interviews were used as collection tools to analyze the secondary study questions of student participation based on prompt type, discovery of student misconceptions in their blogs, and if improvement occurs in the quality of e-journal responses over the course of the study. The blog assessment rubric (Appendix C) used the criteria of regularity, reflection, accuracy, and an overall summary to rate the students' blogs out of a possible score of 20 points. Each student's blog was evaluated with the rubric. A general participation grade was given to the students to ensure that they would continue blogging during this research study. The

student survey questions (Appendix B) were created online in Google forms and were completed on a weekly basis during the duration of this study. The survey consisted of 13 questions that students rated on a five-point Likert scale that ranged from “strongly agree” to “strongly disagree.” Some of the questions the survey addressed included the students’ perception of their own blogging participation, level of blogging contributing to their understanding, their opinion of the teacher’s comments, and the student’s value in their e-journaling. The survey also contained three write-in questions that required students to fill in their favorite e-journaling prompt, their least favorite prompt, and which prompt they felt caused the most student participation. The students then had to explain their answers to those three questions in a short answer form. The interview questions (Appendix A) asked students what caused them to contribute more or feel more engaged during the class blogging. I asked the students if they were able to discover any misunderstanding of the science concepts in their peers’ blogs and posted comments. The students were also asked if they experienced improvement in the quality of the blog postings they created over the duration of this research study.

Table 1  
*Data Triangulation Matrix*

| Focus Questions   | Data Source 1                                    | Data Source 2  | Data Source 3      |
|---|--|--|--------------------|
| <i>Primary Question:</i> 1. Is there a relationship with sophomore student e-journaling and understanding of content in Physical Science? | Comparison of unit pretest and posttest scores   | Comparison of nontreatment and treatment class posttest scores | Student Interviews |
| <i>Secondary Questions:</i><br>2. Which question prompt type encourages the most student participation?                                   | Teacher assessment of blog postings and comments | Student Surveys  | Student Interviews |
| 3. Does analysis of the students' entries allow for the teacher and students to discover any student misconceptions?                      | Teacher assessment of blog postings and comments | Student Surveys  | Student Interviews |
| 4. Is there improvement in the quality of student e-journal responses over the course of this study?                                      | Teacher assessment of blog postings and comments | Student Surveys  | Student Interviews |

#### DATA AND ANALYSIS

Data was collected from the treatments group over six weeks to determine the relationship between student e-journaling and understanding Physical Science content. I included the motion unit as a comparison for both the treatment and nontreatment groups as neither group was blogging during that section of the course. Motion concepts are the first unit covered during Physical Science. The units included during the blogging portion of this study covered forces, work and simple machines, and energy. The data

collection tools used for analysis consisted primarily of student interview questions (Appendix A), an online weekly student survey (Appendix B), and a teacher evaluation of the students' blogging and responses utilizing a rubric (Appendix C), that was compiled at the end of the research. Unit testing data from both treatment and nontreatment groups was also analyzed.

### E-journaling Affects Student Understanding of Physical Science Concepts

I thought that a comparison of unit pretest and posttest scores for the treatment group would be an indicator addressing my primary focus question of determining a relationship between e-journaling and student understanding of Physical Science concepts. A noticeable increase between pre- and posttest scores could be indicative of an understanding of class content. The pretest was taken at the beginning of the first day of each unit. Both pre- and posttests contained identical questions specific for each unit. There was a substantial increase in the class average for all three units included in the study (Figure 13). The largest average improvement occurred during Unit 3 ( $n = 17$  students,  $M = 38.65$ ,  $SD = 11.77$ ) which was over work and machines (Figure 14). It was also noted that unit one motion, during which there was not blogging, had an average difference of 44 points ( $SD = 16.25$ ) between pre- and posttest.

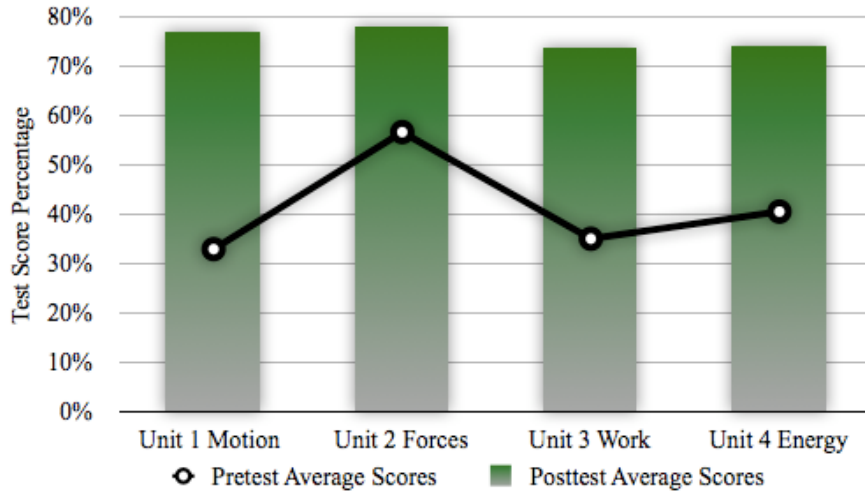


Figure 13. Comparison of treatment group's pre- vs posttest scores, ( $N = 17$ ). Pretest:  $M = 41.25$ ,  $SD = 10.72$ . Posttest:  $M = 75.7$ ,  $SD = 2.08$ .

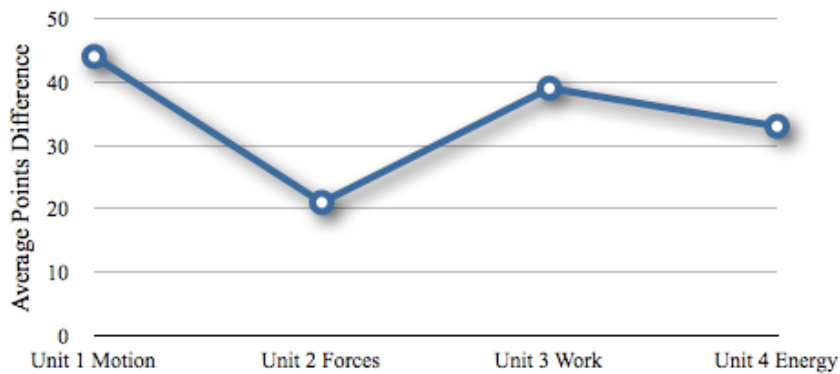


Figure 14. Improvement between pre- and posttest scores, ( $N = 17$ ,  $M = 34.25$ ,  $SD = 9.91$ ).

The only data collected from the nontreatment class were that group's post test scores for Units 1 through 4, which was held in the spring semester of 2012 and consisted of 20 students. A higher average Unit posttest score for the treatment group over the nontreatment class' scores could be an indicator for this research's primary question. The posttest class averages for both groups were nearly identical (Figure 15). No difference was noted.

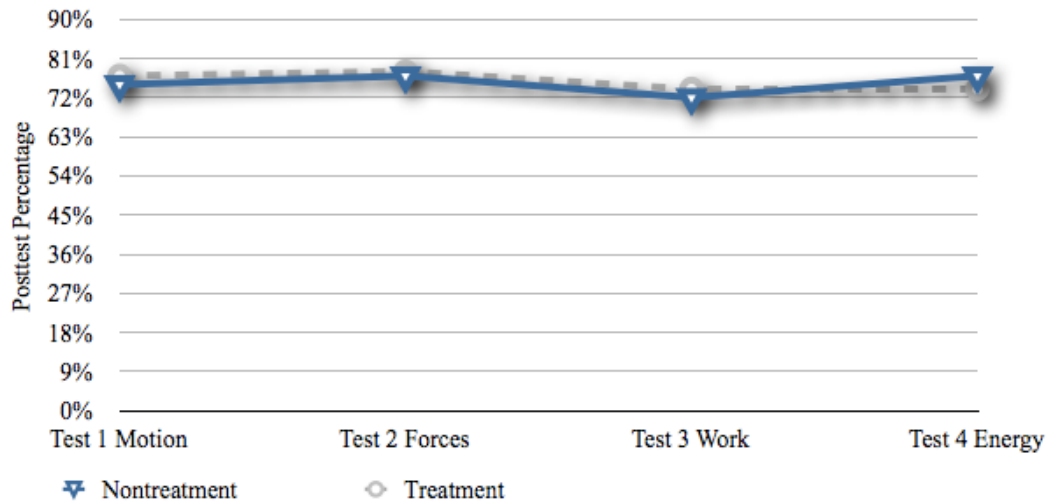


Figure 15. Comparison of treatment vs nontreatment posttest scores. Nontreatment: ( $N = 20$ ,  $M = 75.25$ ,  $SD = 2.36$ ). Treatment: ( $N = 17$ ,  $M = 75.75$ ,  $SD = 6.06$ ).

I utilized a rubric (Appendix C) to score each student's blog to check for an understanding of content based on what the students included in their posts. The students' comments left on their peers' blogs were also analyzed. The score for each student was record for each blog along with the number of acceptable responses that student left for their peers' blogs. The average blog score for the class peaked during week three ( $n = 17$ ,  $M = 16.2$ ,  $SD = 7.73$ ) and decreased until the end of this study (Figure 16).

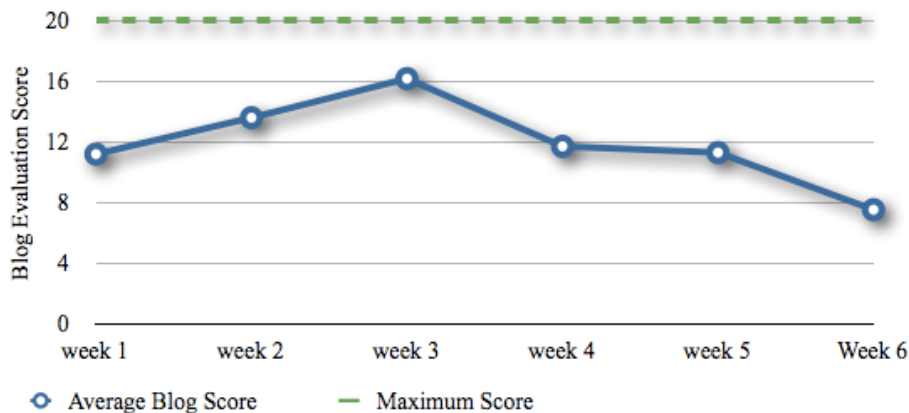


Figure 16. Average blog evaluation score per week, ( $N = 17$ ,  $M = 11.92$ ,  $SD = 2.87$ ).



I divided the class of 17 students academically into three groups to further investigate the results. The top five students were considered group 1, the next seven students made up group 2, and the bottom five students were group 3. Group 1 had the highest average blog score over the course of the six weeks with a maximum average ( $n = 5$ ,  $M = 19.8$ ,  $SD = 0.45$ ) during week three and decreasing over time (Figure 17). All three groups increased from week one to week three. Group 3's lowest average score ( $n = 5$ ,  $M = 6.5$ ,  $SD = 7.78$ ) came during week five and increased slightly during the last week of the study.

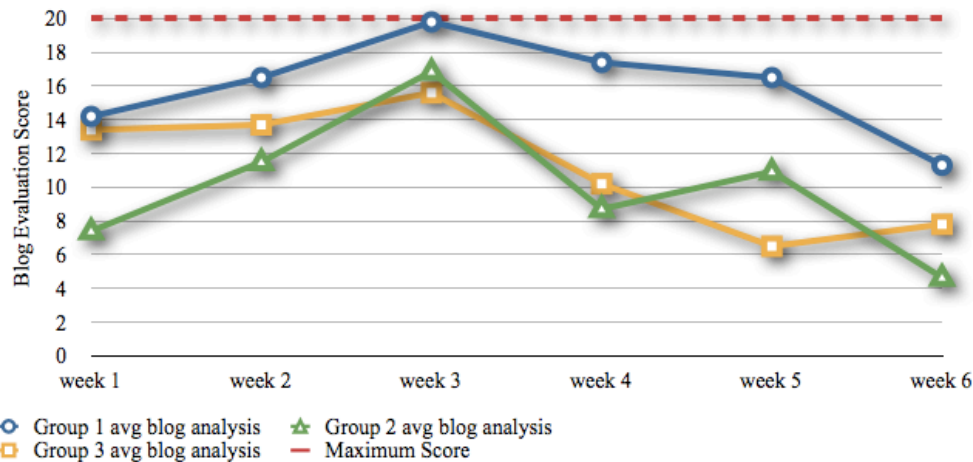


Figure 17. Average blog analysis score for groups per week. Group 1: ( $N = 5$ ,  $M = 15.95$ ,  $SD = 2.91$ ). Group 2: ( $N = 7$ ,  $M = 10.00$ ,  $SD = 4.18$ ). Group 3 ( $N = 5$ ,  $M = 11.20$ ,  $SD = 3.61$ ).

The prompts for each blog directed the students as to the minimum number of responses they were to leave. Students leaving appropriate comments were considered a part of blogging. The average number of blog responses per week were compiled (Figure 18). The maximum average number of responses were left during week three ( $n = 17$ ,  $M = 1.41$ ,  $SD = 1.28$ ) and decreased over the following weeks. Group 1 again ranked above the other two groups with a maximum average of two responses ( $n = 5$ ,  $SD = 1.00$ ) left

per blog (out of three required responses) during week four (Figure 19). Group 3 had the lowest average number of responses left during the first week ( $n = 5$ ,  $M = 0.2$ ,  $SD = 0.45$ ) of the study.

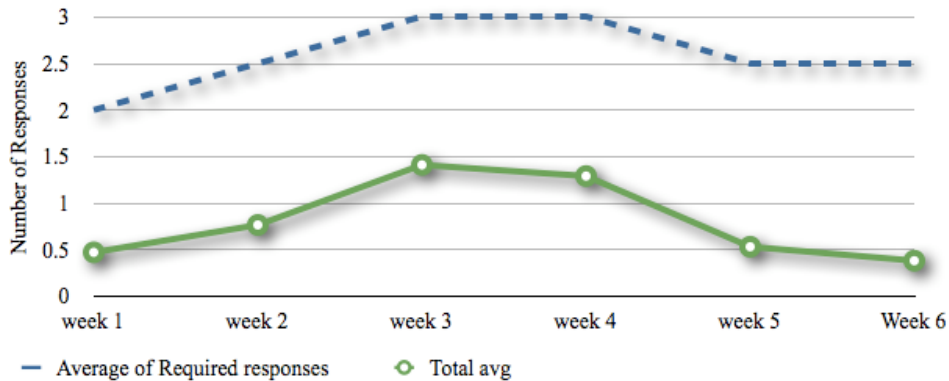


Figure 18. Average number of responses per week per blog, ( $N = 17$ ,  $M = 0.81$ ,  $SD = 0.44$ ).

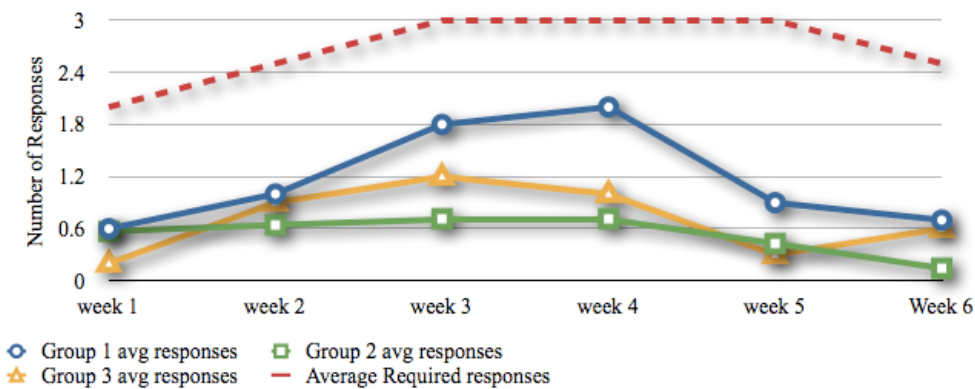


Figure 19. Average number of response per week per blog. Group 1: ( $N = 5$ ,  $M = 1.17$ ,  $SD = 0.59$ ). Group 2: ( $N = 7$ ,  $M = 0.54$ ,  $SD = 0.22$ ). Group 3: ( $N = 5$ ,  $M = 0.70$ ,  $SD = 0.40$ ).

Students completed weekly online surveys and that data was combined at the end of the study (Appendix B). Each question garnered 93 responses over the six weeks. 46% of the students felt the blogs helped them with their understanding of Physical Science (Figure 20). 41% of the class agreed that blogging helped them with their Unit

tests (Figure 21). 37% of the students felt the blogs helped them with their daily assignments (Figure 22). The most curious piece of data from the student surveys was 19% agreed that creating blogs helped them when it came to the quizzes while 34% of the class was neutral (Figure 23).

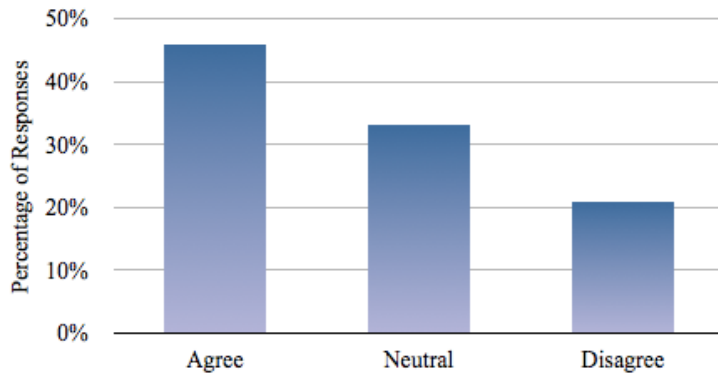


Figure 20. Student survey response to: “The discussion occurring through the blogs have helped me better understand the topics we have covered in *Physical Science*.” ( $N = 93$  responses).

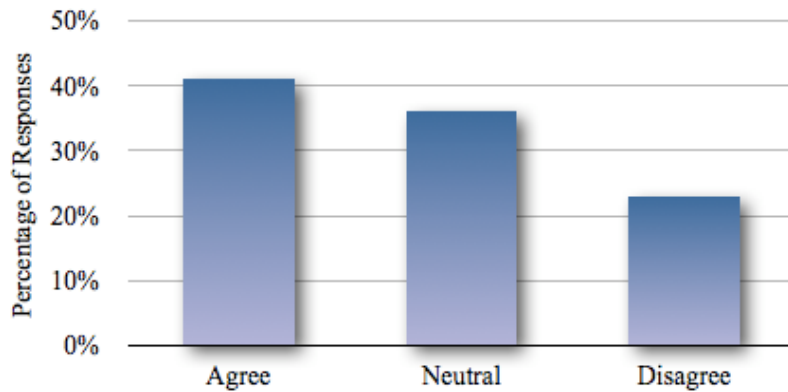


Figure 21. Student survey response to: “Applying what I have learned on the blogs has helped me to do better on the unit test.” ( $N = 93$  responses).

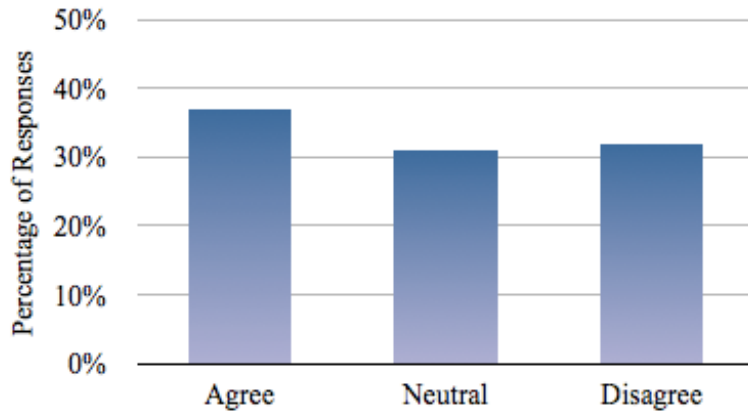


Figure 22. Student survey response to: “Completing and reading the blogs has helped me on daily assignments.” (N = 93 responses).

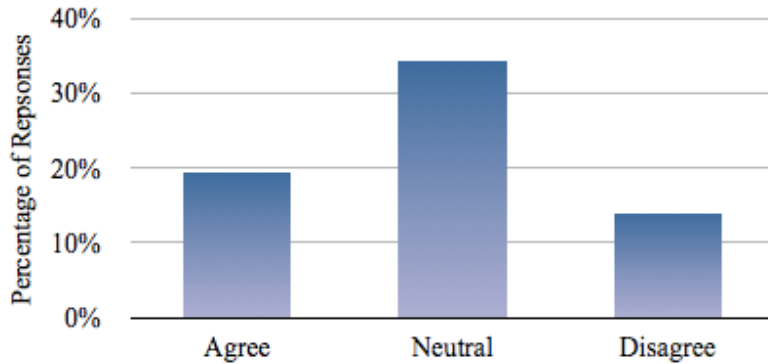


Figure 23. Student survey response to: “Completing and reading the blogs has helped me on quizzes.” (N = 93 responses).

Seven students were interviewed concerning their understanding of Physical Science and e-journaling (Appendix A). They were presented with the question, “Did the blogging help you understand what we covered in Physical Science better?” One student mentioned that blogging really helped them understand the concepts in Unit 4, “Like with energy and the black holes and what makes it work.” Another student agreed, “Yes! Like the black holes [article]. Because it was about what we learned.” A student commented, “It helped with the little things. If you didn’t understand you could ask and someone might answer.” An interviewed student stated, “It helped [the students] in anything because they went over it in their minds.”

### A Real World Blog Prompt Encourages the Most Student Participation

Determining which blog prompt type creates the most participation is a secondary question this study addressed. The number of responses posted to blogs was analyzed (Figures 24). The “real world” prompt (Figure 7) during week three had the highest response rate ( $n = 17$ ,  $M = 1.41$ ,  $SD = 1.28$ ). The same prompt had the highest average evaluation score ( $n = 17$ ,  $M = 16.2$ ,  $SD = 7.73$ ) for the study (Figure 25). The number of completed blogs was further analyzed, removing those that did not blog from the class average (Figure 26). Those that did create blogs and left at least the minimum required number of responses scored an average of 19.6 ( $n = 14$ ,  $SD = 0.50$ ) out of 20 possible points. This evidence suggests class participation was related to well-constructed blogs. The averages for each category were gathered to see if there were higher evaluation scores for one particular prompt (Figure 27). The prompt in which students created blogs based on what they knew as a form of summary had the highest average evaluation score ( $n = 17$ ,  $M = 12.95$ ,  $SD = 1.75$ ). The average responses for each prompt type were also analyzed (Figure 28). The article prompt category had the largest response average ( $n = 17$ ,  $M = 0.73$ ,  $SD = 0.42$ ). The difference between responses left for all three categories were almost insignificant.

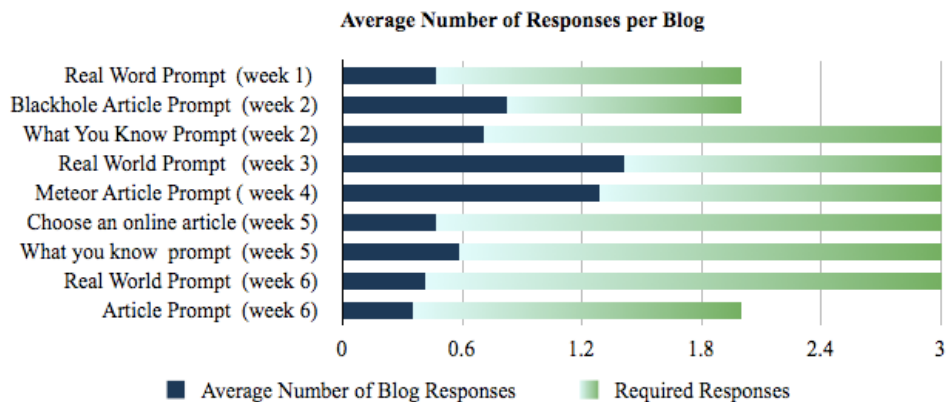


Figure 24. Average responses per blog, ( $N = 17$ ,  $M = 0.72$ ,  $SD = 0.38$ ).

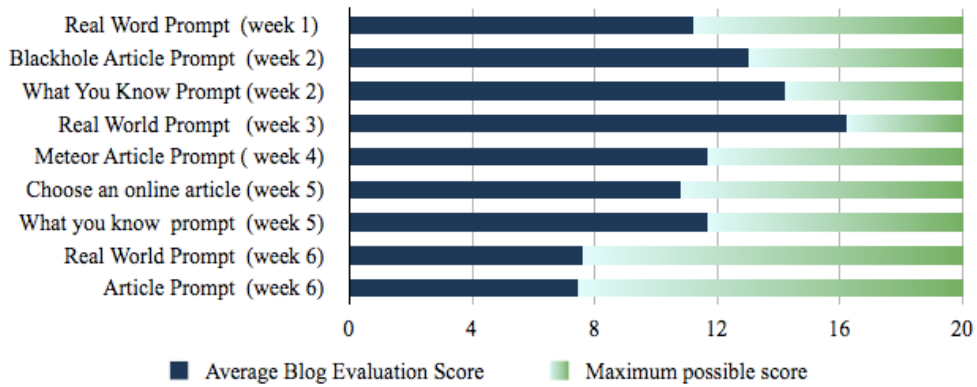


Figure 25. Average blog evaluation score per prompt, ( $N = 17$ ,  $M = 11.54$ ,  $SD = 2.82$ ).

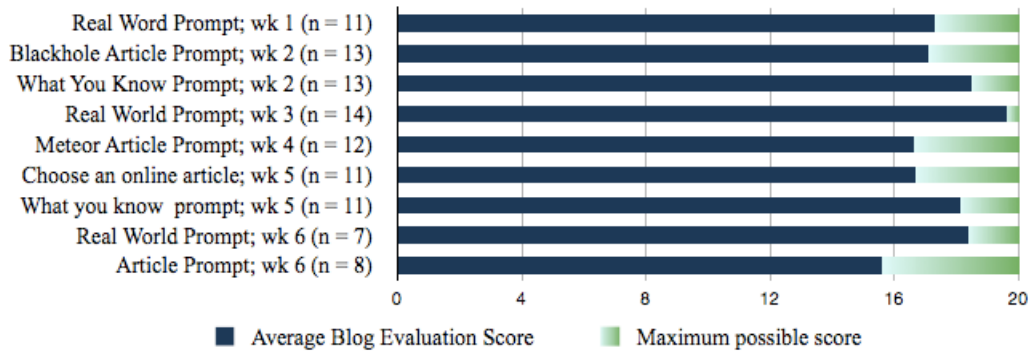


Figure 26. Average score for completed blogs, ( $M = 17.54$ ,  $SD = 1.22$ ).

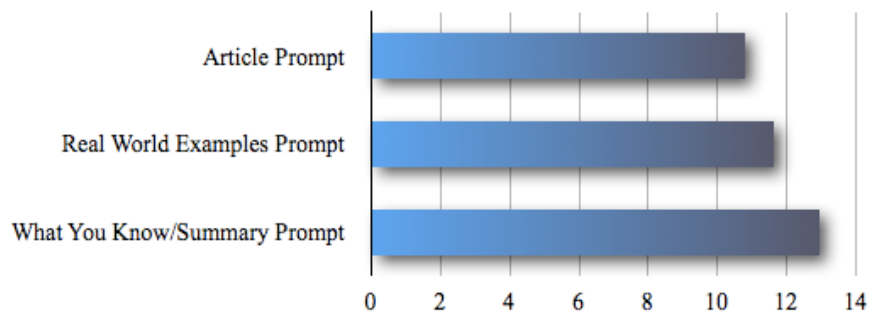


Figure 27. Average evaluation score per blog prompt type. Article prompt: ( $N = 17$ ,  $M = 10.78$ ,  $SD = 2.39$ ). Real world prompt: ( $N = 17$ ,  $M = 11.62$ ,  $SD = 4.37$ ). What you know prompt: ( $N = 17$ ,  $M = 12.95$ ,  $SD = 1.75$ ).

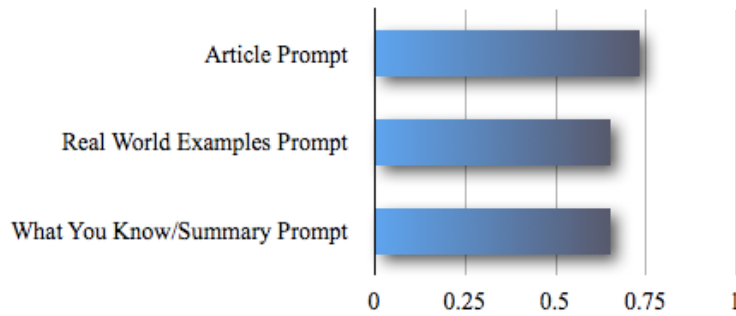


Figure 28. Average responses left per blog type per blog. Article prompt: ( $N = 17$ ,  $M = 0.73$ ,  $SD = 0.42$ ). Real world prompt: ( $N = 17$ ,  $M = 0.65$ ,  $SD = 0.69$ ). What you know prompt: ( $N = 17$ ,  $M = 0.65$ ,  $SD = 0.08$ ).

Student surveys also addressed participation through blogs (Appendix B). 65% of the students felt they were contributing to the class by their participation through e-journaling (Figure 29). Figure 30 illustrates that 49% thought they had posted to at least two of their peers' blogs (though the teacher analysis of the blogs contradicted this). 48% of the students considered it easy to complete the blogging assignments during the week (Figure 31). 41% of students preferred the article prompts out of the three blog prompt types (Figure 32). 36% believed the article prompts had the most participation (Figure 33), while 40% of students did not have a favorite post, did not post at all, or could not decide which prompt they liked better (Figure 34). The students considered the prompt they liked as the one that promoted the most participation.

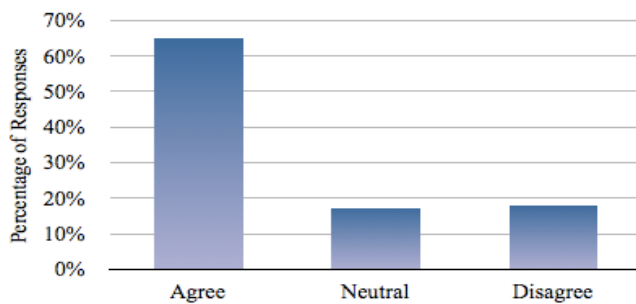


Figure 29. Student survey response to: “I am contributing to the class by my participation in the blogs.” ( $N = 93$  responses).

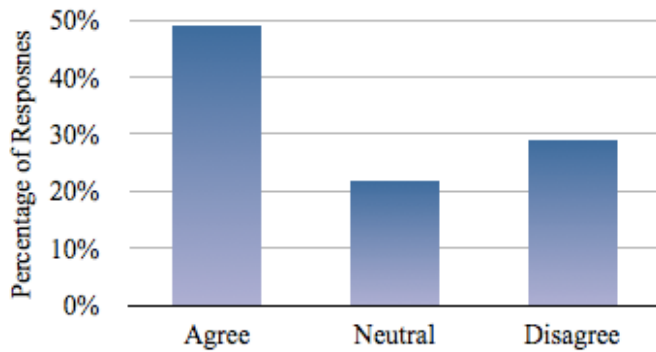


Figure 30. Student survey response to: “I have post to at least two of my peers’ blogs during this week.” (N = 93 responses).

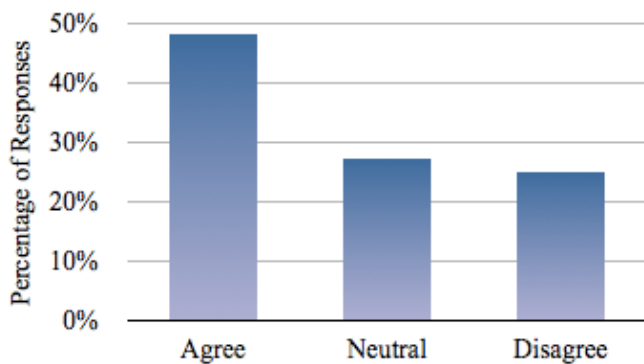


Figure 31. Student survey response to: “It is easy for me to complete the blogging assignment during the week.” (N = 93 responses.)

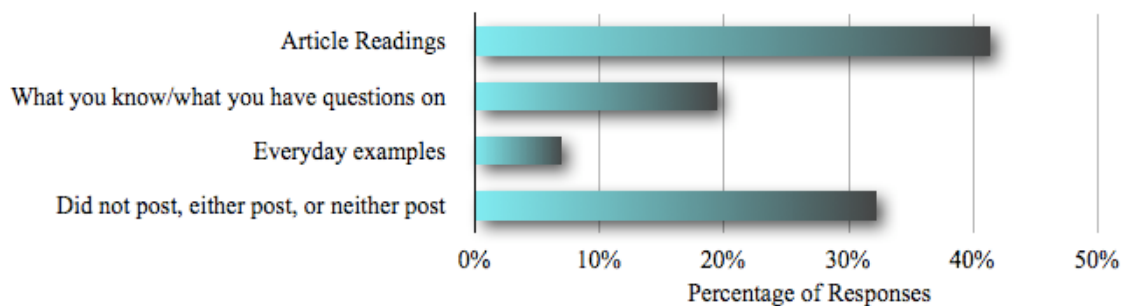


Figure 32. Student survey response to: “Which blog prompt (topic) was your favorite this week?” (N = 87 responses).



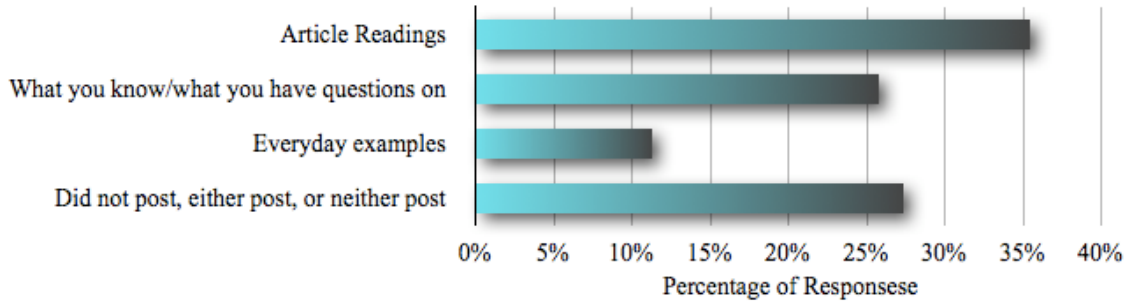


Figure 33. Student survey response to: “Which blog prompt (topic) this week had the most student participation?” (N = 62 responses).

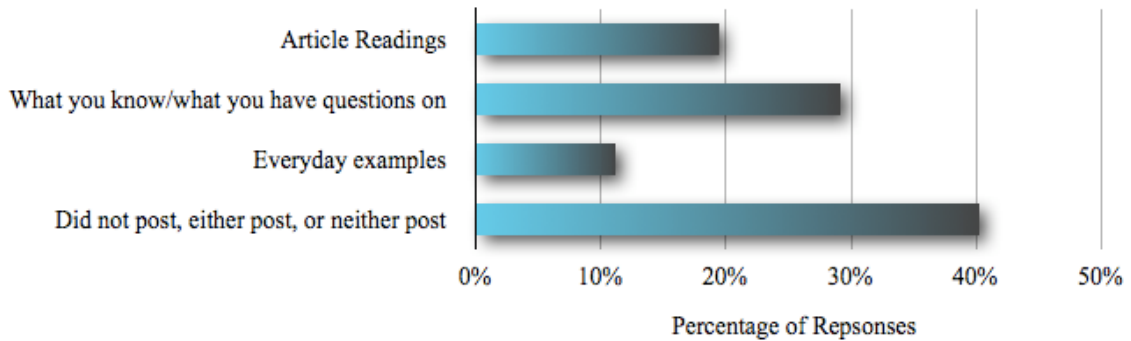


Figure 34. Student survey response to: “Which blog prompt (topic) this week was your least favorite?” (N = 72 responses).

The student interviews (Appendix A) consisted of seven questions relating to class participation through blogs. When asked which type of prompt got the most responses from the class one student answered, “The first [blogs]. And then nobody bothered to do it.” Another student stated, “When we all read the same article because then we all had the same idea and probably formed our own ideas.” A student commented, “The articles if they actually read them. If they liked it they would leave a response.” The interviewed students did all notice when others would not do the blog posts.

It was discovered during the interviews that the students' opinions of which prompt was easiest to create a blog for varied by student. A student thought the What You Know prompt was the easiest, "Because we could just talk about what we knew." Another student indicated, "I like the one when you gave us the article not when we had to find our own." One student answered, "When you had to find an article. They were both easy." Another commented, "Summarizing what you do. Even though it may not be the one you want to do the most it's probably the easiest." A student mentioned the easiest blog prompt was, "What you knew. You didn't have to look at anything or summarize anything." A correlation between the most participation and students' opinion of the easiest prompt to create a blog for was not found.

The students were asked which blog prompt they enjoyed doing. The majority of interviewed students preferred the article prompts. "I like finding my own articles because you have something you are interested in because you went out and found it and then you take what parts of the article you liked and fit it in with [the] class," agreed one student. Another student stated, "The articles [that the teacher chose] because it was something new to read and you didn't have to go over everything we learned again." A student that disagreed commented, "Summarizing what we learned. It is the easiest." Two of the blog prompts that had the highest class participation were article prompts. Students will participate in a blog prompt if they feel they enjoy that type of prompt.

Difficulty in creating a blog could lead to a decrease in class participation. The interviewed students were asked which prompt they perceived as the most difficult to create a blog for. The majority of students agreed on the article blog prompts being the most difficult type of prompt. A student answered, "Finding your own [articles] because

you have to find one that makes sense.” Another student replied, “The online articles that we had to pick because we couldn’t pick something we didn’t know about and we had to go and find them.” One lone student thought the summary of what you know was the most difficult. The blog prompt the students enjoyed also was the prompt type they found the most difficult.

Students were asked which type of blog they liked the least in an attempt to establish a link between student perception of difficulty and participation. Four of the interviewed students did not like the article blog prompt. I then asked the students how they could count this prompt as both their favorite type and the one they liked the least. A student stated, “It depends [on the article]. If you don’t like the article you are, like, ‘this is pointless.’” Two students liked what you know/summary prompt the least. “Summarizing what we did in class. It got really boring,” replied one student. Another had a different reasoning for their least favorite by responding, “They weren’t that fun. They were too easy.”

The interviewed students were asked to reveal how many blogs they read of their peers’ on average. All of the interviewed stated they read at least two other blogs per assignment. “Two or three because we had to respond to them.” replied a student. Another student answered, “Four. I didn’t reply to all of them but I read them.” One student stated, “I probably read two to three. I might read more but I didn’t respond to all of them.” A student commented, “Five. Enough I had to respond to and if I didn’t like them I would go again.” The data indicates that the students did not leave a response for every blog they read (Figure 24).

### Analysis of Student Blog Entries Allows for Discovery of Student Misconceptions

A secondary question of this study concerns discovering student misconceptions by both students and the teacher by reading student blogs. The evaluation rubric (Appendix C) takes into consideration errors in concepts present in the blogs as part of the grading criteria. I attempted to leave comments on all of the students' blogs. I would leave positive comments in regards to well-constructed blogs and if they student had a firm grasp in relating the Physical Science topics related to the prompt. I would also leave corrective comments if students exhibited a misconception in their blog and suggestion on how to improve their blogs or the comments they left. The blogs create another avenue for an informal teacher-to-student or student-to-student conversation that did not have to occur during the class meeting time as Bryant (2011) discovered in her capstone project involving using wikis in Environmental Science online conversations. The student performance on the blogs is another form of assessment for the teacher.

Two questions on the weekly online surveys directly related to student misunderstandings of Physical Science topics. 62% of students felt they were applying what they learned in class to their posts (Figure 35). The application of what the students know would be observable in their blog where student misunderstandings they could be addressed. 38% of students felt the input left by the teacher helped them better understand Physical Science (Figure 36). As mentioned previously, I would address misconception through my feedback on comments.

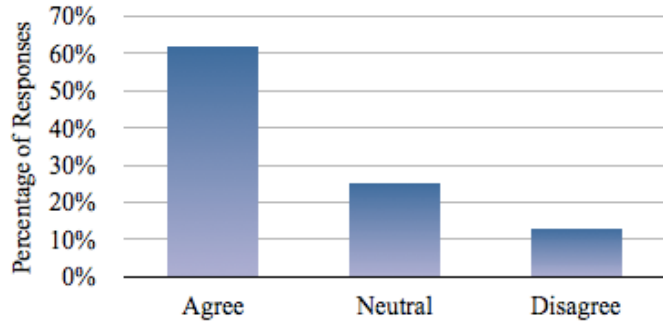


Figure 35. Student survey response to: “I am applying the concepts of what I have learned in class to my blog and in my comments I post on my peers’ blogs.” (N = 93 responses).

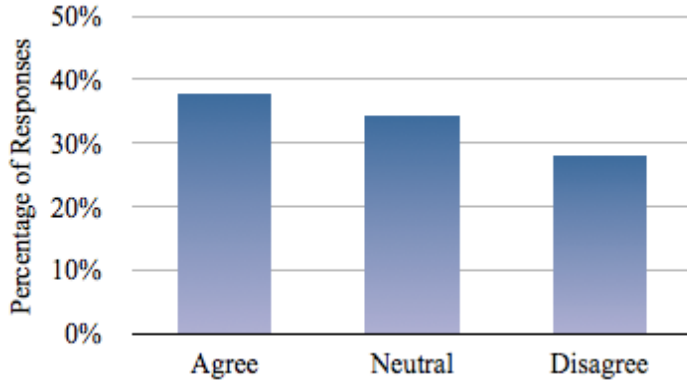


Figure 36. Student survey response to: “The input from the teacher on my blog has helped me better understand Physical Science topics.” (N = 93 responses).

The students were asked three questions relating to misconceptions of Physical Science topics during interviews (Appendix A). Students were presented with the question of “Did you notice any students putting up wrong information on their blogs?” Two of the interviewed said they definitely noticed incorrect information on some blogs. A student answered, “It wasn’t perfect but it wasn’t like very much wrong information.” One student commented, “I didn’t see anything that was completely untrue but maybe just a little confused. Maybe slightly off but I didn’t see anything that was completely wrong.” Another student agreed, “They were just confused about it and put down what

they think.” Students were able to identify errors if they did see them in their peers’ blogs.

I questioned the students checking their information before they posted to a blog. “I just winged it.” admitted a student. One student replied, “I kind of researched it if I didn’t understand it and then responded to it.” Another student rationalized, “You would kind of need to do that.” A student stated, “On the articles I would go back and look at it because I didn’t want to look like an idiot.”

The students were asked if reading another student’s blog helped clear up and of their misconceptions. “Yes.” said a student. “If I read it and didn’t understand the information it kind of helped me along. And your [the teacher’s] responses helped out, too.” One student answered, “Not for me but I think it did for other people.” Another student’s commented, “It cleared things up with another point of view.” A student responding to the question stating, “It’s nice to know what other people think.” This student had a different point of view indicating, “A little bit but most of us put down the same stuff usually so it really didn’t help too much.” The majority of the interviewed students did feel that there was some clearing up of misconceptions by reading the blogs.

#### Quality of E-journaling Responses Declined Over Time Due to Lack of Participation

Determining if there was improvement in the quality of the students’ blogs over the course of this study was a secondary question analyzed using the teacher blog assessment rubrics (Appendix C). Quality of the blog was calculated in the grading criteria for each student’s blog. Week three had the highest average blog score for the class (16.2 out of 20 points) and then there was decline for the remainder of the study (Figure 16). Blog responses also followed the trend of average class score by peaking

during week two (1.7 out of 5 required responses) and declining over the following weeks (Figure 37). The trend is similar for both average blog evaluation score and average response per blog when the class is broken into three academic groups with the exception of the bottom group (3) increasing in both responses and average blog score from week five to week six (Figures 17 and 19). The decrease is evident when the scores for the students who did not blog are removed from the class average blog scores (Figure 38).

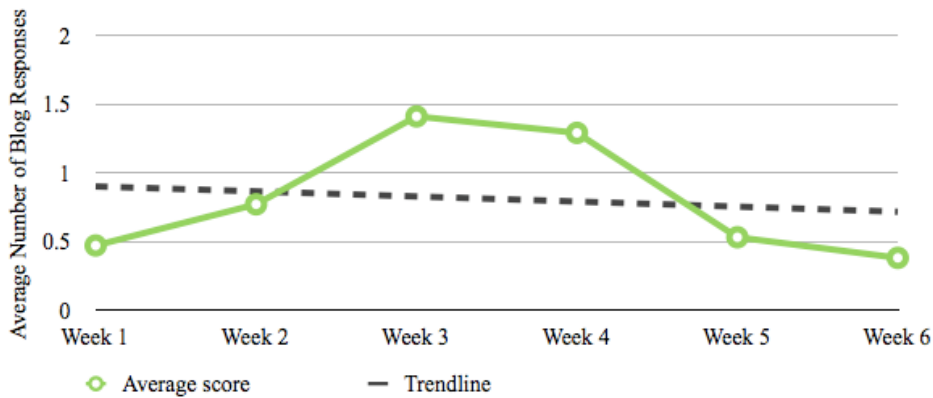


Figure 37. Average class responses per blog per week, ( $N = 17$  students).

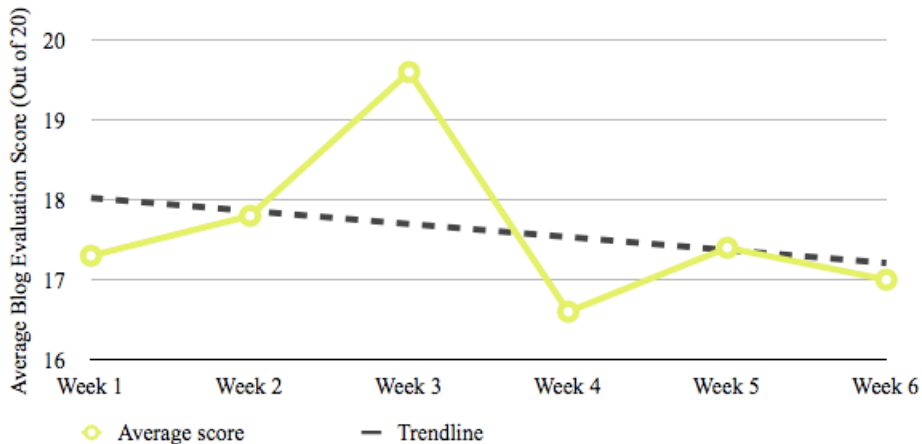


Figure 38. Average class evaluation score for week per completed blogs.

The student online surveys also addressed blog quality over time. 68% of the students had no technical issue with the blogs (Figure 39) so the computer use was not a

barrier for most of the students. I asked students individually if they had any computer issues and none of the students stated that they did. 67% of the students were of the opinion their blog posts had improved since their first post (Figure 40), which data contradicts when compared to the Figures 16, 17, 25 and 38. The students were asked about the allotted time they needed to complete their blog posts. 48% of students said it was easy to complete the blogging assignment for the week (Figure 31). It is this teacher's opinion that there was ample class time for students to complete the majority of the blogging assignments. The students could also work on blogs outside of the school day when they had Internet access. The majority of students did not have computer issues and felt the quality of their blogs improved over time. About half of the students felt it was easy to complete their blogging assignments.

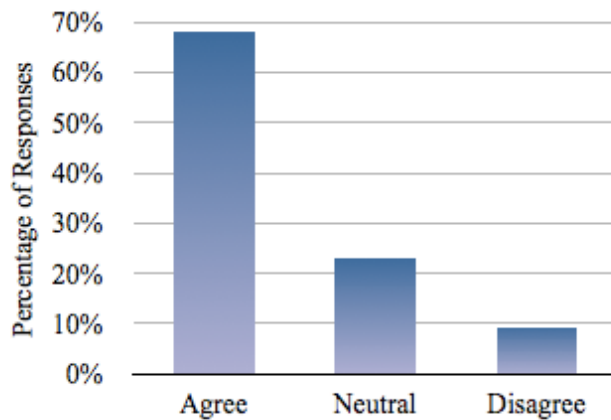


Figure 39. Student survey response to: “I have no technical issues in using the class blog.” (N = 93 responses)



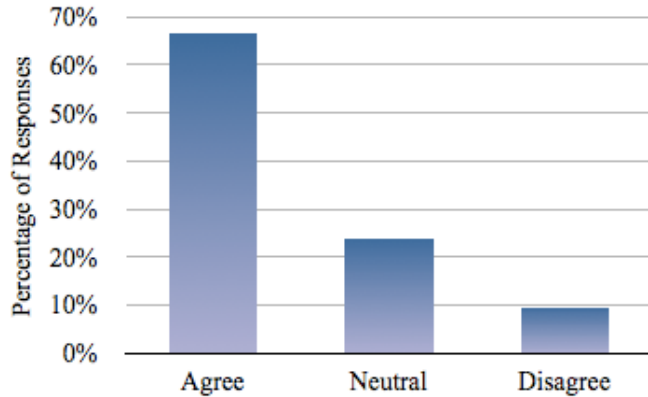


Figure 40. Student survey response to: “I have improved my blog posts and comments in quality since my first post and comment.” (N = 93 responses).

The provided blog prompts gave directions as to what students were to focus on when creating blogs and the minimum number of peer blogs they were to respond to. The quality of the blog was in part related to how well the students followed the prompt directions. Interviewed students were asked if they knew the expectations that the teacher had for their blogs posts. “Yeah, but not 100%.” was one response. Two other students agreed that they did not know what was expected with the responses of, “No, not all the time,” and “Not really.” Another student disagreed with the others by stating, “Every time except for the first time, yes.” The blog evaluation rubric for the previous week was given to the students at the beginning of the following week.

Students were asked if they thought their blogs improved over the six weeks. Three students stated they felt they definitely improved. “It got better after the first time. Definitely. And then I got pretty consistent.” answered one student. Another said, “Mine kind of stayed the same when I did them.”

The students were questioned on the confidence of their blogging ability and if it had increased as the weeks passed. The majority of the students said yes. Another

individual expressed, “It kind of stayed the same and they all were kind of equally boring.”

The interviewed students were asked if they noticed other students’ blogs improving over the weeks. Two students noticed the lack of overall participation as the time went by. “Nobody did them.” said a student. Another agreed stating, “They didn’t do them over time. They started off doing them and then they dropped off over time.” One student replied, “Yes, the ones that DID it.” A student commented, “I think they got better overall.” One individual answered, “It depends on who it is.”

Another question posed to the students was how they could tell if someone had a really great blog. A student responded, “If it is long.” Another student commented, “If they had lots of comments on it.” Four of the interviewed students focused on the actual content of the blogs. “It they explained it. Punctuation [use].” was one analysis. A student mentioned, “If they knew what they were talking about and it was educated. It wasn’t like, ‘this looks cool.’” One student stated, “If it was in their own words and it wasn’t copy and pasted.” I then asked the students how they could determine how much effort went into making a blog post. The length of the blogs post was mentioned by two of the students. “If it is longer than normal. If it has more comments.” said a student. Another student expressed the same thought saying, “How long it is and what information is on it. If it is relatable or not. It’s in your own words.” One student stated, “The amount of thinking you do and how much you type down.” Another student indicated, “I guess what you put into it is what you get out of it. If you add a lot to it you might get the highest grade possible if it is good.”

The students were then posed with the question of describing how they could recognize a poorly constructed blog. A student suggested a blog of only two sentences would be an example of a poor blog. Another student said, “If they [the blog author] talked about random things not connected to the subject.” One student responded, “If they just copy and pasted.” One answer provided was, “If they had just a couple of sentences and they were pretty broad and didn’t explain much.” Another student suggested that vague comments indicated a poor blog, such as, “If they wrote, ‘I read the article ... and it was pretty good.’”

The last question asked of the students was what could be done to improve the blogs. “Less article reviews.” was one suggestion. Another student disagreed and said, “More articles but less blogs in a week and do it over a whole semester.” A student commented, “More [prompts] about what we learned in class.” One student answered, “Look at your notes while you are doing them [the blogs].” Another suggested, “Having more people do it so you feel like you aren’t the only one doing it.” A student stated, “Finding your own article requires you to do more work and then you might actually even learn something that you didn’t understand how the class explained it.” One student mentioned, “Have an article there for us to read but not make it too lengthy because then the people just get bored and sick of it.”

#### INTERPRETATION AND CONCLUSION

Student blogging does promote a better understanding of Physical Science topics. Students that did well academically in the class scored higher on the blog evaluations and left more responses to their peers’ blogs on average. The data indicates that there was no noticeable difference between the treatment and nontreatment group’s Unit posttests

when blogging was occurring. There is a significant positive difference between the Unit pre- and posttest scores that occurred even before the treatment group began blogging. The evaluation of the students' blogs using the rubric indicates most students were relating Physical Science topics to what they were writing in their blogs. Students' surveys convey that students thought the e-journaling process was assisting them in the class with the exception of their quizzes. Student interviews reveal that the students felt creating and responding to the blogs did help increase their understanding of Physical Science topics.

A variety of blogging prompts is the best course of action to encourage class participation. A majority of student felt they were contributing to the class through participating in the class blogs. Using a "real world" blogging prompt had a 47% response rate from the class. Students opinions of which blog prompt was their favorite, least favorite, most difficult, and easiest vary based on the student. There are a variety of reasons as to why a student would want to respond to a peer's blog. All of the interviewed students thought they had read at least the minimum number of required blogs for each blogging assignment but did not necessary leave responses to the blogs.

I feel that blogs are great tools for teachers to discover student misconceptions. Most of the students would double-check any information they were to leave on a blog, which forces the students to take a second look at the topics. The students interviewed did notice other students' misconceptions when they would read their peers' blogs. The student surveys indicate over 1/3rd of the students felt that the comments left by the teacher on their blogs helped clear up any misconceptions they had.

Both the teacher and students observed the decline in participation by the class in blogging over the six weeks of this study which makes it difficult to judge overall quality of the blogs. Both blog evaluations scores and number of responses per blog peaked in the first half of the study and decreased until the end with the exception being the bottom academic group of the class increasing from week five to week six. The weekly survey indicated students felt their blogs had improved since their first post. The survey also indicated 40% of the students agreed that blogging was a waste of time (Figure 41). The survey illustrates that over half of the students thought it to be easy to complete their blogs for the week. Student interviews correlated a longer blog post to one that was well constructed and a blog to which a lot of effort was put into. The interviewed students also indicated they could determine poorly constructed blogs by reading the blog's content and how brief it was. The majority of students interviewed agreed that they felt more confident in their blogs as the weeks progressed.

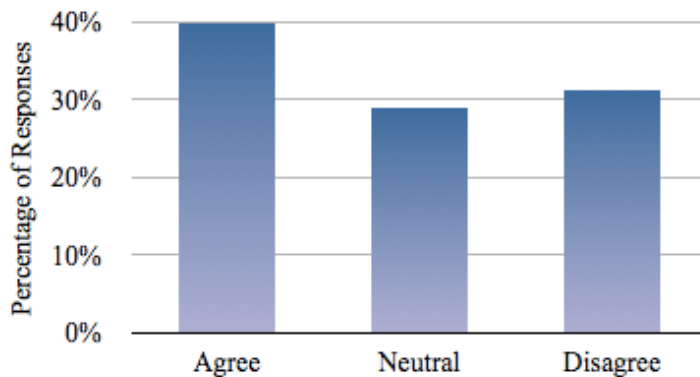


Figure 41. Student survey response to: “Using the Physical Science blogs is a waste of time.” (N = 93 responses).

#### VALUE

This study revealed to me that student blogging does have benefits in a science course. E-journaling can be an effective learning indicator and an interactive teaching

tool for the classroom. The students who were involved (those who were participating by creating blogs and leaving comments) were in the top performing portion of the class. E-journaling provides another avenue for dialogue between students. Blogs also allow for informal conversations between teacher and students. Creating blogs can suit a variety of learning styles by allowing students to compose their thoughts via typing, attach picture of related topics, or paste a URL of an article that further expands on what concepts are being covered in class.

I was hoping to see a noticeable difference between the treatment and nontreatment classes' posttest scores due to student e-journaling. The two groups' scores were almost identical when they were compared against each other. It can be said that in this study blogging did not lead to a decrease in the average posttest scores of the class. There was noticeable improvement between the treatment class' unit pretest and posttest scores. This validates my primary focus question that there is a relationship between student understanding and the use of e-journaling in the classroom.

The conclusion of this study has given rise to new questions in regards to the use of student e-journaling. The length of time devoted to blogging comes in to question. Would there be more student participation if e-journaling was incorporated the entire semester of the class? Could there also be a noticeable improvement in the blog quality in relation to a longer length of implementation?

An offering of different types of blog prompts is another variable to consider. Could choosing different students to be blog leaders who then post their choice of blog prompt impact the blog responses? Another consideration is to look at keeping the same

type of prompt then entire semester. Would requiring students to pick their own articles lead to more class participation?

Another question that comes to light is the success of e-journaling in different science classes. Would blogging be of a better benefit in a Advanced Placement Biology course versus a Physics class? Does the student's age play a role in the effectiveness of the blogs? Could the maturity of the student impact the nature of the online discussions?

This study did provide answers to my primary and secondary focus questions. The results pose other questions that could be investigated in a new e-journaling study. These questions include:

- What is the relationship between blogging participation and weekly quiz scores?
- What time of day are most blogs created? When are students leaving responses to their peers' blog posts?
- What is the link between student e-journaling and performance on the essay questions on the unit posttests?
- How would interaction with people outside of the classroom responding to students' blogs impact participation?

There are some changes I will implement when I use e-journaling again in my class. The first change would be to start the students' blogging during the first week of class and continue throughout the entire semester. I think that if you begin blogging right away the level of participation will be maintained over the course of the class. The second change would be to require only one blog per week. This would allow more time to get accumulate responses over the week. Students could return to a blog post multiple times to add to the conversation.

I intend to continue to use the student e-journaling in my future Physical Science classes due to the advantages brought to light by this research. I will also aspire to improve upon the process to try to have the maximum amount of participation. As Bryant's (2011) study discovered, the success of e-journaling comes down to the attitudes of the students. If you have the entire class on board and all of the students are participating with the blogging there will be positive results. Lack of student contribution or apathy on the part of the students can disrupt and halt the whole discussion process.



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APPENDICIES

APPENDIX A

STUDENT INTERVIEW QUESTIONS

## Student Interview Questions - E-journaling - Reidburn

\*NOTE: I will interview seven students individually.

Your answers will not affect your grade in this course. I appreciate your honesty!

### Secondary Question:

#### I. Which question prompt type encourages the most student participation?

Questions for student:

1. How do you determine how much *effort* you put into your blog post?
2. Which type of prompt did you find the *easiest* to create a blog for?  
Why?
3. Which type of prompt did you *like the most* to create a blog post for?  
Why?
4. Which type of prompt do you find the *most difficult* to blog on? Why?
5. Which type of prompt do you *like the least* to blog on? Why?
6. What kind of blog (or which of your classmates) made you want to leave a response to? Why?
7. What type of prompt made other students *blog the most responses* based on what you read when blogging? What are your thoughts on why it got a lot of responses?

#### II. Does analysis of the students' blog entries allow for the teacher and the student to discover any student misconceptions?

Questions for student:

1. How many other students' blogs do you read during the week?
2. Do you notice any *wrong* information that students post on their blogs?  
Does anyone leave comments on this information?
2. Do you check your information (using notes or textbook) to see if what you write in your blog is correct before you post it? Why or why not?
3. Have you had any other students help you clear up any "hard" science ideas or concepts you didn't know by reading their blogs? Examples?
4. Have you had any other students help you clear up any "hard" science ideas or concepts you didn't know by reading their comments or replies?  
Examples?

5. Do the replies that I (the teacher) leave on your blog help clear up any misconceptions?
6. What could be done to make the blogs better for Physical Science?

**III. Is there improvement in the quality of student e-journal responses over the course of this study?**

Questions for student:

1. What are the characteristics of a well-constructed (*great*) blog entry?
2. What are the traits of a *poor* blog entry?
3. Do you feel more confident in your blog entries since when we started blogging in class?
4. Do you feel that you know what is expected by the teacher when you leave a blog entry?
5. Do you think your blog entries have improved since your first post?  
How so?
6. Have you noticed other students' blogs getting better over the weeks?  
How so?
7. Has blogging helped you better understand what we are covering in Physical Science? Please explain your answer.

APPENDIX B

STUDENT SURVEY QUESTIONS

## Student Survey - E-journaling Opinions

*\*NOTE: This is online in Google form for the students to complete on their computer.*

Please answer the survey below HONESTLY! Your answers will not affect your grade in Physical Science. DO NOT write your name on this survey. These questions are in reference to the blogs (and commenting) we have done in Physical Science.

|   | Strongly Agree | Somewhat Agree | Neutral | Somewhat Disagree | Strongly Disagree |
|---|----------------|----------------|---------|-------------------|-------------------|
| 1. I ( <i>you</i> , the student) am contributing to the class by my participation in the blogs.                                 |                |                |         |                   |                   |
| 2. I am applying the concepts of what I have learned in class to my blog and in my comments I post on my peers' blogs.          |                |                |         |                   |                   |
| 3. I have no technical issues in using the class blog.  |                |                |         |                   |                   |
| 4. The discussions occurring through the blogs have helped me better understand the topics we have covered in Physical Science. |                |                |         |                   |                   |
| 5. Applying what I have learned on the blogs has helped me to do better on the unit test.                                       |                |                |         |                   |                   |
| 6. I have post to at least two of my peers' blogs during this week.   |                |                |         |                   |                   |
| 7. It is easy for me to complete the blogging assignment during the week.   |                |                |         |                   |                   |
| 8. Completing and reading the blogs has helped me on quizzes.   |                |                |         |                   |                   |
| 9. Completing and reading the blogs has helped me on daily assignments.   |                |                |         |                   |                   |
| 10. The input from the teacher on my blog has helped me better understand Physical Science topics.                              |                |                |         |                   |                   |
| 12. I have improved my blog posts and comments in quality since my first post and comment.                                      |                |                |         |                   |                   |
| 13. Using the Physical Science blogs is a waste of time.  |                |                |         |                   |                   |

1. a.) **Which blog prompt (topic) was your favorite this week?**

Topic A: \_\_\_\_\_(example: self-reflection)\_\_\_\_\_

Topic B: \_\_\_\_\_(example: comment on Tuesday's lecture)\_\_\_\_\_

b.) **Explain your answer to the above question:**



2. a.) **Which prompt (topic) this week had the most students in class participate?**

Topic A: \_\_\_\_\_

Topic B: \_\_\_\_\_

b.) **Why do you think this is?**

3. a.) **Which prompt (topic) this week did you like the LEAST this week?**

Topic A: \_\_\_\_\_

Topic B: \_\_\_\_\_

b.) **Explain your answer to the above question:**

APPENDIX C

E-JOURNALING/BLOG ASSESSMENT RUBRIC

| <b>Student Blogging Evaluation Rubric</b>  |   |  |   |  |   |
|--|---|--|---|--|---|
| Student: _____ Blk: _____ Date: _____ Topic: _____   |   |  |   |  |   |
| *NOTE: Rubric indicators improved upon from: <a href="http://members.tripod.com/the_english_dept/critblog2.htm">http://members.tripod.com/the_english_dept/critblog2.htm</a> and <a href="http://chronicle.com/blogs/profhacker/a-rubric-for-evaluating-student-blogs/27196">http://chronicle.com/blogs/profhacker/a-rubric-for-evaluating-student-blogs/27196</a> |   |  |   |  |   |
| Criteria   | Exceptional<br>5  | Satisfactory<br>4  | Basic<br>3  | Needs Work<br>2  | No Credit<br>0  |
| <b>Regularity</b>  | Entries were made in the blog on the same day class was given or concepts were covered.   | Entries in the blog were made within the deadline.   | Entries often respect deadlines but some have been recorded afterwards.                               | Entries are not up to date. Entries are disorganized in structure and do not reflect concepts covered in class.                | Blog has very few entries.  |
| <b>Reflection</b>  | Reflection indicates that student is listening well to concepts covered in class and is able to relate what is heard to what is read                    | Reflection indicates that student is listening well in class and outside the classroom situation   | Reflection alludes to what student has heard in class and outside the classroom situation             | Student makes minimal reference to what is heard in class or outside class   | Student makes no reference to what is heard in class or outside class   |
| <b>Accuracy</b>  | No errors or up to 2 <i>minor</i> errors in content. No major errors. Writing has been checked for spelling and grammar.                                | No more than 6 errors. Errors do not cause significant reader confusion. Writing has been checked from spelling and grammar.   | Some minor & major errors. Some errors cause reader confusion. Writing has been checked for spelling. | Many errors cause reader confusion with interference and understanding. Writing has not been checked for spelling and grammar. | <b>Many</b> major and minor errors causing reader confusion. Very difficult to read. No attempt was made to spell/ grammar check. |
| <b>Overall</b>   | Blog post is focused & coherently integrates examples with explanations or analysis. Entry reflects in-depth engagement of the science concepts/topics. | Blog post is reasonably focused, explanations/analysis are mostly based on examples or other evidence. Entry reflects moderate engagement with science concepts/ topics. | Blog post is mostly descriptive or summary with few connections made with ideas.                      | Blog post is unfocused and does not show student engagement with the topic.  | Blog post is missing or acceptable effort has not been demonstrated.  |
| <b>Total Points out of 20</b>  |   |  |   |  |   |

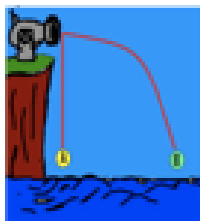
APPENDIX D

UNIT 2 FORCES PRE- AND POSTTEST

### Unit 2 Forces Test – Physical Science

\*This test is administered online through Blackboard. Some questions are adapted from *Physical Science: Concepts in Action* (Prentice Hall) computer test bank.

1. T or F      A force *can* change an object's motion.
2. T or F      Forces *cannot* be combined if they are acting on the same object.
3. T or F      Friction *is necessary* for our world to function.
4. T or F      When forces are equal magnitude and acting against each other the net force is *zero*.
5. T or F      In order for gravity to function between two objects that objects *have to be touching*.
6. T or F      “What goes up must come down.” is *Newton's 3<sup>rd</sup> Law of Motion*.
7. T or F      An object must have a small mass and *small* velocity to have a large momentum.
8. T or F      Momentum is *never* conserved in a closed system.
9. T or F      An object with a large momentum would be *hard for a human to stop*.
10. T or F     The *softer* you throw a ball, the more the ball accelerates.
11. T or F     The gravitational acceleration on Earth is *12.5* m/s<sup>2</sup>.
12. T or F     The weight of an astronaut on the moon is six times *more* than his weight on the surface of the Earth.
13. \_\_\_ The SI unit of force is the  
A. joule      B. newton      C. kilogram      D. meter
14. \_\_\_ Which of the following relationships is correct?  
A. 1 N = 1 kg      B. 1 N = 1 kg x m/s<sup>2</sup>      C. 1 N = 1 kg x m      D. 1 N = 1 m/s
15. \_\_\_ What kind of friction occurs as a fish swims through the water?  
A. fluid      B. rolling      C. sliding      D. Static
16. \_\_\_ Ball B is shot out of a cannon with an elevation parallel to the horizon. Ball A is dropped from the same height that ball B is shot out of the cannon. Which cannon ball will hit the water first?



- A. cannon ball A
- B. cannon ball B
- C. both will hit the water at the same time.
- D. neither will ball will hit the water.

17. T or F When **balanced** forces act on an object, the object accelerates.
18. SHOW YOUR WORK: A 4-kg goose has a momentum of 32 kg x m/s. What is the velocity of the goose (in m/s)?
19. \_\_\_ Newton's 3<sup>rd</sup> Law of Motion describes  
 A. action and reaction forces B. balanced forces C. centripetal forces D. net force
20. \_\_\_ The product of an object's mass and velocity is its  
 A. centripetal force B. momentum C. net force D. weight
21. T or F When you push on a wall, **the wall pushes back on you**.
22. T or F A rocket goes forward by exerting a force **on the ground** to move forward.
23. The mass of a newborn baby is 3.5 kilograms. What is the baby's weight in Newtons? The acceleration due to gravity on the Earth's surface is  $9.8 \text{ m/s}^2$ .
24. \_\_\_ An orange might roll off your cafeteria tray when you stop suddenly because of  
 A. the orange's inertia . B. the balanced forces action on the orange.  
 C. the frictional forces acting on the orange. D. the gravitational pull of Pluto
25. \_\_\_ According to Newton's 2<sup>nd</sup> Law of Motion, the acceleration of an object equals the net force acting on the object divided by the object's  
 A. mass B. speed C. velocity D. weight
26. T or F A push or pull is an example of a **force**.
- T or F **Weight** stays constant no matter what planet you are on; your **mass** changes depending on gravity.
28. \_\_\_ When a pair of balanced forces act on an object, the net force that results is  
 A. greater in size than both forces combines. B. greater in size than one of the forces.  
 C. equal to zero. D. equal in size to one of the forces.
29. \_\_\_ As you push a cereal box across a tabletop, the sliding friction acting on the cereal box  
 A. acts in the direction of the motion. B. acts in the direction opposite the motion.  
 C. equals the weight of the box. D. is usually greater than the static friction.
30. \_\_\_ The forces acting on a falling leaf are  
 A. air resistance and fluid friction only. B. gravity and air resistance.  
 C. gravity and static friction. D. weight and rolling friction.
31. \_\_\_ An open parachute increases air resistance of a falling sky diver by  
 A. decreasing the weight of the sky diver. B. increasing surface area.  
 C. increasing terminal velocity. D. reducing fluid friction.

32. \_\_\_ Projectile Motion is caused by  
A. the downward force of gravity only.  
B. the initial forward velocity only.  
C. both the downward force of gravity and the initial forward velocity.  
D. a final vertical velocity.
33. \_\_\_ In which of the following are action and reaction forces involved?  
A. when a tennis racket strikes a tennis ball.  
B. when stepping up on a curb.  
C. when rowing a kayak.  
D. all of these are examples of action and reaction forces.
34. \_\_\_ What is the momentum of a 50-kg ice skater gliding across the ice at a speed of 5 m/s?  
A. 10 kg/m x s  
B. 50 kg  
C. 250 kg x m/s  
D. 500 kg x m/s
35. \_\_\_ The gravitational force between two objects increases as mass  
A. decreases or distance decreases.  
B. increases or distance decreases.  
C. decreases or distance increases.  
D. increases or distance increases.
36. \_\_\_ As an astronaut travels far away from Earth, her weight  
A. decreases because Earth's gravity decreases.  
B. decreases because her mass decreases.  
C. increases because Earth's gravity increases.  
D. remains the same because her mass remains the same.
37. SHOW YOUR WORK: A 38-kg canoe broke free of the dock and is now floating downriver at a speed of 2.2 m/s. What is the canoe's momentum?
38. \_\_\_ A 0.6 kg ball is thrown with a force of 30 N. What is the acceleration of the ball?  
A.  $0.02 \text{ m/s}^2$     B. 18 N    C.  $18 \text{ m/s}^2$     D.  $50 \text{ m/s}^2$
39. \_\_\_ A bodybuilder is lifting a dumbbell with a mass of 22.2 kg. What is the weight of the dumbbell?  
A. 0.44 N    B. 2.27 N    C. 22.2 N    D. 217.56 N
40. \_\_\_ You have a sled that has a mass of 2 kilograms. As you increase the force with which you pull the sled  
A. acceleration increases.    B. acceleration decreases.  
C. both acceleration and mass decrease.    D. acceleration remains constant.

41. \_\_\_ Which below is NOT an example of acceleration?  
 A. a car traveling down a perfectly horizontal road at a constant 100 km/hr.  
 B. a jet slowing down for a landing on the runway.  
 C. a merry-go-round turning at a constant 2 m/s.  
 D. a bottle rocket shooting into the air after being lit.
42. \_\_\_ What is the speed of a rocket traveling a distance of 2 km in 25 seconds?  
 A. 12.5 km/s    B. 0.08 km/s    C. 50 km/s    D. 100 km/hr
43. T or F    A frame of reference needs to include a non-moving object to determine relative motion.
44. \_\_\_ A motorcycle speeds up from 10 m/s to 80 m/s in a time of 3 seconds. What is the motorcycle's acceleration?  
 A.  $23.3 \text{ m/s}^2$     B.  $93 \text{ m/s}^2$     C.  $30 \text{ m/s}^2$     D.  $73 \text{ m/s}^2$
45. SHOW YOUR WORK: A girl jogs 1 km north, 1 km east, 3 km south and then 2 km to the west. What is the jogger's **distance** covered?

ESSAY PORTION (version C)

1. (2 pts) The metal weight below is not moving. Draw and label the force vectors acting on the metal weight.



2. (2 pts) The planet Mercury has a gravitational acceleration of  $3.7 \text{ m/s}^2$ . Explain how both your mass and weight on Mercury's surface compares to your mass and weight on planet Earth.
3. (2 pts) Describe an everyday situation where you witness Newton's 1st law of motion using **three complete sentences** and **EXPLAIN** why it is an example of Newton's 1st law of motion.
4. (2 pts) Identify a situation where you have **balanced forces**. What is the **net force** if you have balanced forces?



5. (2 pts) A 200 kg bumper car is traveling at 2 m/s and crashes into a 280 kg bumper car that is parked. 1. What is the *momentum* of the 1st car before the collision? 2. **Velocity** of 2nd car AFTER the collision?

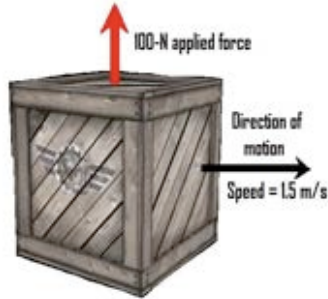
APPENDIX E

UNIT 3 WORK & SIMPLE MACHINES PRE- & POSTTEST

### Unit 3 Work & Simple Machines Test – Physical Science

\*This test is administered online through Blackboard. Some questions are adapted from *Physical Science: Concepts in Action* (Prentice Hall) computer test bank.

1. \_\_\_ An applied force acts upward on a moving wooden crate as shown below. Which of the following statements is TRUE?



- A. The power used to move the crates is 150 W.  
 B. The force does no work on the crate.  
 C. The force does 150 J of work on the crate.  
 D. The force does 66 J of work on the crate.

2. \_\_\_ Which of the following is NEVER true?

- A. The input force equals the output force. B. The ideal mechanical advantage is 1.  
 C. The actual mechanical advantage is 1. D. The efficiency is 100%.

3. \_\_\_ A machine is used to lift boxes in a warehouse. Which change will increase the power of the machine?

- A. decreasing the distance the boxes are lifted.  
 B. decreasing the force exerted by the machine.  
 C. increasing the friction inside the machine.  
 D. decreasing the time it takes to lift the boxes.

4. \_\_\_ Which statement is NEVER true for a machine?

- A. The output force is greater than the input force.  
 B. The machine changes a force.  
 C. The machine changes the direction of a force.  
 D. The work output equals the work input.

5. \_\_\_ Which of the following will increase the actual mechanical advantage of a machine?

- A. decreasing the output force. B. decreasing the friction.  
 C. increasing the input force. D. increasing the time required.

6. \_\_\_ You exert a horizontal force of 50 N to push a box a distance of 4 meters in a time of 3 seconds. How much work is done on the crate?

- A. 200 J B. 50 N/m C. 150 J D. 150 W

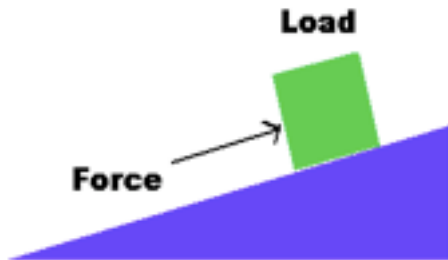
7. \_\_\_ You exert a horizontal force of 50 N to push a box a distance of 4 meters in a time of 3 seconds. How much power is used to move the crate?

- A. 66.7 W B. 200 J C. 16.7 W D. 37.5 J

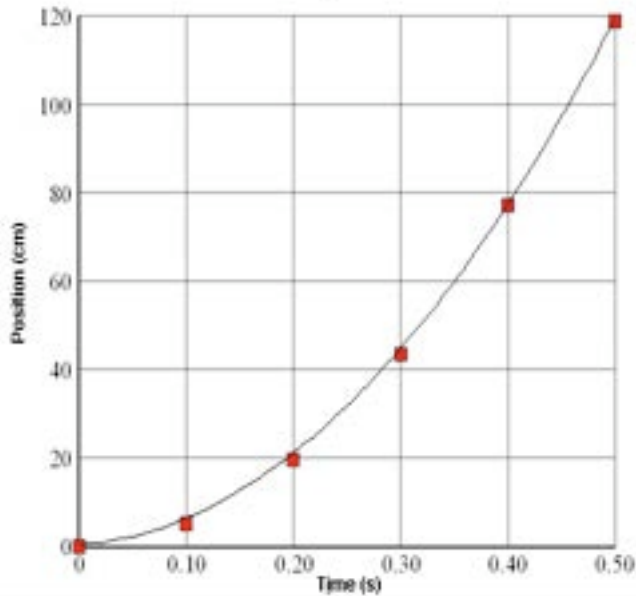
8. \_\_\_ In which statement below is NO work done?
- A. A bowling ball is lifted off the floor to a height of 1 meter.
  - B. A bowling ball is carried horizontally across a room for 10 meters.
  - C. A bowling ball is rolled down an 18 meter lane.
  - D. A bowling ball is lifted off a bench a height of 0.5 meters.
9. \_\_\_ Which statement below is TRUE?
- A. If a man takes one hour to load 100 sacks of flour in a truck, or if he takes eight hours to load the 100 sacks of flour in a truck, he does the same amount of work.
  - B. If a man takes one hour to load 100 sacks of flour in a truck, or if he takes eight hours to load the sacks of flour in a truck, the amount of power expended is the same.
  - C. A 130-pound girl and two 65-pound girls are opposing one another in a game of tug of war. The rope is not moving. The bigger girl is doing more work.
  - D. None of these answers are true.
10. \_\_\_ A weightlifter lifts a 600-N barbell a distance of 1.5 meters above the ground. How much work is done on the barbell?
- A. 900 J
  - B. 400 J
  - C. 400 W
  - D. 0.0025 J
11. SHOW YOUR WORK: A shopping cart that has a mass of 25 kg is pushed a distance of 10 meters in a time of 90 seconds with a force of 120 N. What is the work done on the shopping cart?
12. \_\_\_ Machines make work easier by
- A. changing the size of the force needed.
  - B. changing the direction of the force.
  - C. changing the distance over which a force acts.
  - D. ALL of these answers are correct.
13. \_\_\_ You do 200 J of work pulling on the oars of a rowboat. What can you say about the amount of work the oars do to move the boat?
- A. Less than 200 J of work is done by the oars because you lose some work input to friction.
  - B. You get exactly 200 J of output work from the oars.
  - C. The work output of the oars will be greater than 200 J.
  - D. None of these answers are correct.
14. \_\_\_ If you apply 400 N of force on a crowbar to lift a rock that weighs 2000 N, what is the actual mechanical advantage?
- A. 5
  - B. 20%
  - C. 500%
  - D. 800,000
15. SHOW YOUR WORK: A machine does 320 J of output work compared to the 560 J of input work. What is the machine's efficiency?

16. \_\_\_ The actual mechanical advantage of a machine  
 A. is less than the ideal mechanical advantage of the machine.  
 B. cannot be less than 1.  
 C. decreases as the input distance increases.  
 D. increases with greater friction.
17. T or F If you know the input distance and the output distance of a machine, you can calculate the *ideal mechanical advantage*.
18. T or F The difference between AMA and IMA is the that AMA is calculated *without* friction.
19. A person pushes a cart with a force of 35 N a distance of 6 meters in 5 seconds. How much power is expended?
20. \_\_\_ Which of the following is a unit of power?  
 A. joule      B. newton/meter      C. watt      D. meter/second<sup>2</sup>
21. \_\_\_ Power is equal to the work divided buy  
 A. time.      B. force.      C. distance.      D. mechanical advantage.
22. T or F James Watt first defined horsepower, which is equal to *1 kilowatt*.
23. T or F If an object doesn't move there is *no power exerted*.
24. T or F Work is performed only if the object moved *in the direction* of the force exerted.
25. \_\_\_ The correct formula for work is  
 A. distance/force.    B. force x distance.    C. force/distance    D. distance x time
26. \_\_\_ A 750-W motor might also be rated as a  
 A. 0.5 horsepower motor      B. 1 horsepower motor.  
 C. 2 horsepower motor.      D. 10 horsepower motor
27. \_\_\_ 3730 watts equals about how many horsepower?  
 A. 5      B. 10      C. 30      D. 30
28. \_\_\_ The ideal mechanical advantage of a pulley system is equal to the  
 A. distance the load has to move.    B. number of rope segments supporting the load.  
 C. length of rope.      D. weight of the object being lifted.

29. \_\_\_ An inclined plane reduces the effort force by  
 A. increasing the distance through which the force is applied.  
 B. increasing the work.  
 C. reducing the effort distance.  
 D. reducing the work.
30. \_\_\_ A motor with an efficiency of 75% must supply 240 J of useful work. What amount of work must be supplied to the motor?  
 A. 75 J      B. 320 J      C. 180 J      D. 420 J
31. \_\_\_ The efficiency of a machine is always less than 100% because  
 A. a machine cannot have an IMA greater than 1.  
 B. some work input is lost to friction.  
 C. the work input is too small.  
 D. the work output is too great.
32. \_\_\_ Reducing friction in a machine  
 A. decreases its actual mechanical advantage.    B. increases its efficiency.  
 C. decreases the work output.                    D. increases its ideal mechanical advantage.
33. T or F      The ability to do work or cause change is the definition of **energy**.
34. SHOW YOUR WORK: A forklift raises a 230 N crate 3 meters above the ground. What is the work done by the forklift?
35. SHOW YOUR WORK: A pulley raises a net filled with fish 8 meters above the ocean in a time of 1.5 minutes. The net weighs 200 newtons. What is the power the pulley expends to raise the fish?
36. A machine has an input force of 80 N and an output force of 115 N. The actual mechanical advantage of the machine is \_\_\_\_\_.
37. \_\_\_ A machine has an actual mechanical advantage of 7.6 and an input force of 40 N. What is the output force exerted by the machine?  
 A. 340 N      B. 5.3 N      C. 5.3 J      D. 0.19 W
38. T or F      The simple machine pictured below is a **pulley**.



39. \_\_\_\_ A machine has an efficiency of 90% and has an output work of 100 J. What is the machine's work input?  
 A. 111 J      B. 9000 J      C. 1.1 J      D. 900%
40. A machine has a work input of 200 J and an output work of 180 J. What is the machine's efficiency?
41. \_\_\_\_ What is the average speed of a bus that travels 40 km in 30 min, 50 km in 45 min, and then 20 km in 23 minutes?  
 A. 1.1 km/min      B. 0.89 km/min      C. 98 mi/hr      D. 0.11 m/s
42. \_\_\_\_ A plane taxis down a runway traveling at 5 m/s to 75 m/s in a time of 6 seconds. The plane's acceleration is  
 A.  $11.6 \text{ m/s}^2$       B.  $0.09 \text{ m/s}^2$       C.  $76 \text{ m/s}^2$       D.  $420 \text{ m/s}^2$
43. What is the speed of the object graphed below at 0.2 seconds?



44. \_\_\_\_ Which below is an example of Newton's 1<sup>st</sup> Law of Motion?  
 A. A rock thrown into the air and comes back down again.  
 B. If you step on your car's brakes your books sitting on the seats go sliding off the front of the car seat.  
 C. The harder you jump off of a trampoline the higher you go in the air.  
 D. The more force you apply to a baseball with a bat the more the ball accelerates.
45. SHOW YOUR WORK: The gravitational acceleration on Earth is  $9.8 \text{ m/s}^2$ . What is the weight of a 10 kilogram dog on Earth?

46. \_\_\_\_ Which below has the MOST momentum?
- A. a 200-kilogram jet ski traveling at 15 m/s.
  - B. a 4-kilogram goose flying at 20 m/s.
  - C. a 120-kilogram motorcycle traveling at 23 m/s.
  - D. a 0.1-kilogram ball thrown at 30 m/s.

ESSAY PORTION (version B)

1. (3 pts) Provide an example of a **compound machine** and *identify each simple machine* in that compound machine using at least **three** complete sentences.
  
2. (2 pts) Jon and Dave are identical twins that are in a 100-meter swimming race. Both Jon and Dave weigh 760 Newtons. Dave wins the race ahead of Jon by 3 seconds.
  - A. Which twin does more work during the race? *Explain* your answer.
  - B. Which twin exerts more power? *Explain* your answer.
  
3. (2 pts) Describe how work is done when you pick up a book off of a table.
  
4. (2 pts) Explain the relationship between *friction* and the *efficiency* of a machine. Use at least **three** complete sentences.



APPENDIX F

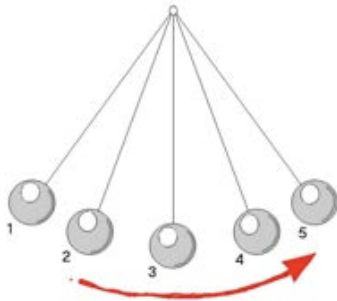
UNIT 4 ENERGY PRE- & POSTTEST

### Unit 4 Energy Test – Physical Science

This test is administered through the class Blackboard website. Some questions are adapted from *Physical Science: Concepts in Action* (Prentice Hall) computer test bank.

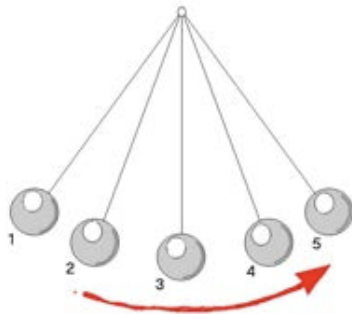
1. \_\_\_ A 1.8-kg falcon spots a snake crawling across the prairie. The falcon is flying at a height of 200 meters above the snake. What is the falcon's gravitational potential energy?  
 A. 3528 J                      B. 360 J                      C. 36.7 J                      D. 1088.9 J
2. \_\_\_ The energy of a moving object is  
 A. kinetic energy.      B. chemical energy.      C. potential energy.      D. nuclear energy.
3. SHOW YOUR WORK: A 0.024 kg toy car is moving at a speed of 1.50 m/s. What is the kinetic energy of the toy car?
4. \_\_\_ An example of electromagnetic energy is  
 A. sunlight.      B. a falling rock.      C. a stretched spring.      D. a speeding train.
5. T or F      Speeding trains, bouncing balls, and sprinters all have **nuclear** energy.
6. In the equation  $E = mc^2$ ,  $c$  is the speed of \_\_\_\_\_.
7. \_\_\_ Walking converts what type of energy directly into mechanical energy?  
 A. chemical energy      B. nuclear energy      C. electrical energy      D. electromagnetic energy
8. \_\_\_ Which of the following statements is true according to the law of conservation of energy?  
 A. energy cannot be created.                      B. energy cannot be destroyed.  
 C. energy can be converted from one form to another.      D. ALL of these are correct.
9. T or F      The **mechanical** energy of an object equals its kinetic energy plus its potential energy.
10. T or F      When a person throws a ball straight into the air, the ball has its greatest **kinetic** energy at the highest point of the ball's trip.
11. \_\_\_ Energy from the sun reaches Earth mostly by  
 A. radiation.      B. conduction.                      C. convection.                      D. thermal expansion.
12. Matter is needed to transfer thermal energy by (select ALL of the answers that apply)  
 \_\_\_conduction.      \_\_\_convection.      \_\_\_radiation.                      \_\_\_black holes.
13. \_\_\_ The transfer of thermal energy when particle of a fluid move from one place to another is called  
 A. conduction.                      B. convection.                      C. radiation.                      D. NONE of these.

14. T or F **Wood** is a better thermal conductor of heat than **metal**.
15. T or F According to the **third law of thermodynamics**, absolute zero can never be reached.
16. \_\_\_ The gravitational potential energy of a 65-kg high diver on a platform 15 meters high is  
 A. 9555 J.                      B. 975 J.                      C. 99.5 J.                      D. 0 J
17. \_\_\_ At which location(s) does the pendulum have maximum potential energy?



- A. 1 and 2  
 B. 2 and 3  
 C. 4 and 5  
 D. 1 and 5

18. \_\_\_ At which location(s) does the pendulum have maximum kinetic energy?



- A. 1 and 2  
 B. 2 and 3  
 C. 3 only  
 D. 1 and 5

19. \_\_\_ Which statement about work and energy is NOT correct?  
 A. both can be expressed in joules.                      B. energy is the ability to do work.  
 C. work done is always equal to energy input.                      D. energy is transferred in order to accomplish work.
20. \_\_\_ What form of energy does a plant store when light is transformed during photosynthesis?  
 A. chemical energy.                      B. thermal energy.                      C. electrical energy.                      D. nuclear energy.
21. \_\_\_ Which of the following is NOT an example of kinetic energy being converted into potential energy?  
 A. a sprinter running down a track.                      B. a meteor shooting across the sky.  
 C. a bowling ball rolling down the lane.                      D. None of these.



33. T or F      The mechanical energy of an object equals kinetic energy plus nuclear energy.

34. \_\_\_ If no friction acts on a diver during a dive, then which of the following statements is true?

- A. The total mechanical energy of a system increases.
- B. Potential energy can be converted into kinetic energy but kinetic energy CANNOT be converted back to potential energy.
- C.  $(KE + PE)_{start} = (KE + PE)_{end}$
- D. All of these answers are correct.

35. SHOW YOUR WORK: A 0.47-kg squirrel jumps from a tree branch that is 3.5 meters high to the top of a bird feeder that is 1.2 meters high. What is the change in gravitational potential energy of the squirrel?

36. \_\_\_ What is the best explanation as to why a bouncy ball does not return to the same height after it bounces off the floor?

- A. Most of the GPE is converted to nuclear energy.
- B. Some of the GPE is converted to mechanical and thermal energy and not all goes back to kinetic energy.
- C. Most of the GPE is converted into kinetic energy so the bouncy ball bounces higher.
- D. All of the GPE is converted to electromagnetic energy so there is no energy left to be converted back to kinetic energy.

37. SHOW YOUR WORK: A 0.09-kg ball is thrown straight up in the air and it reaches a height of 10 meters before it comes back down. What is the ball's initial KE at the beginning of its arc? Assume there is no friction acting on the ball.

38. \_\_\_ You have created a frictionless roller coaster! The car with riders has a mass of 900 kg. The KE of the car is 1764000 J. How high is the first drop to achieve this amount of energy?

- A. 150 m                      B. 200 m                      C. 1960 m                      D. 21609

39. T or F      The type of energy pictured below is chemical energy.



40. What types of energy occur in our given off directly by the sun? Mark ALL that are correct.

- \_\_\_ Nuclear    \_\_\_ Electromagnetic    \_\_\_ Hydroelectric    \_\_\_ None of these

41. \_\_\_ Which below is NOT a simple machine?  
 A. fulcrum    B. pulley    C. wedge    D. wheel & axle
42. SHOW YOUR WORK: A machine has 8000 joules of output work and 10000 joules of input work. Calculate the efficiency of the machine and round your answer to the nearest TENTH.
43. \_\_\_ A shopper pushes a cart down an aisle 25 meters with 200 newtons of force in a time of 60 seconds. What is the power exerted by the shopper?  
 A. 7.5 W    B. 83.3 W    C. 1500 W    D. 300,000 W
44. Match the simple machine with the correct example.
- |                    |                           |
|--------------------|---------------------------|
| ___ Wedge          | A. Knife                  |
| ___ Inclined plane | B. Wheelchair access ramp |
| ___ Screw          | C. Pop bottle lid         |
| ___ Lever          | D. Wheelbarrow            |
45. SHOW YOUR WORK: A lever has an input distance of 5 meters and an output distance of 0.5 meters. Calculate the ideal mechanical advantage of the lever and round your answer to the nearest TENTH.
46. \_\_\_ Motion is described with respect to a  
 A. graph.    B. displacement.    C. slope.    D. frame of reference.
47. \_\_\_ The rate at which velocity changes is called  
 A. speed    B. vectors    C. acceleration    D. motion
48. A 0.3-kg ball is accelerating at  $13 \text{ m/s}^2$ . What is the force exerted on the ball? Round your answer to the nearest TENTH.
49. \_\_\_ Newton's third law of motion describes  
 A. action and reaction forces.    B. balanced forces.  
 C. centripetal forces.    D. net force.

ESSAY PORTION (version B)

1. (3 pts) Provide the correct form of energy with the examples given below using ***complete sentences for each example.***  
 A. the Sun    B. a bicycle    C. a AA battery
2. (2 pts) Describe the energy conversions that take place when you are shooting an arrow with a bow and at a target. You need to include at ***LEAST four forms of energy.*** You can draw and label an illustration or use complete sentences for your answer.

3. (4 pts) Which has more energy: a 0.25-kg ball on a roof 4 meters above the ground or a 1.0-kg ball rolling on the ground at 6 meters per second? SHOW WORK to explain your answer. Use at least one complete sentence.
4. (2 pts) Describe the Law of Conservation of Energy in your own words using at least two complete sentences.