THE EFFECTS OF USING LAB REPORT BLOGS TO IMPROVE THE LABORATORY EXPERIENCE IN HIGH SCHOOL CHEMISTRY CLASS

by

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ABSTRACT

The use of Internet technology can be used in the science classroom much like it is used in other areas of educations. In this study students use web blogs to publish, share results, observations, and opinions based on laboratory experiments. This study looked at the effectiveness of just such a strategy in a high school chemistry classroom, to improve various areas of learning and science skills.

INTRODUCTION AND BACKGROUND

Project Background

Many years ago in the summer of 2005, the first paper I wrote as I began my MSSE experience was entitled “What's bugging me”? This was following my third full year of teaching science and my biggest issues that ended up being addressed in that paper was my unhappiness with the results from labs. I wanted to see more genuine learning in my students during labs. I wanted them to get more out of labs. By this statement I mean that I wanted students having a better idea of what lab results did or didn't mean, and I wanted students more involved, emotionally invested into the lab experience, and therefore less dependent on me delivering the content from the front of the room. In my research and experience I discovered that collaboration and technology might be a good combination to improve the lab process.

Communication is an essential part of what I try to do in class every day. Not just one-way communication, but I strive for a give and take, a two-way path of ideas. Students too would like to be able to communicate but perhaps the way we think about communication for this generation should change. The advent of text messaging has created a different form of communication that many have relied so heavily upon that verbal communication might not be fully developed. Anyone not living in a cave also knows that literally many millions of people have their own Facebook account. The amount of communication that is going on in cyberspace is hard to comprehend and impossible to adsorb completely. I believe that face to face communication will always be most important in one's human development, but it is irresponsible to ignore the

amount of communication that now takes place virtually. I have embraced the virtual form of communication in my classroom wherever possible to make use of this tool.

As my MSSE experience continued I came upon an idea of making a blog for a class activity. I thought about the possibilities of using individual student or student lab group blogs to study the material. I came up with the idea of having students make blogs about various laboratories they conducted in class. It was my thought that this would be a new, fun way for students to interact with each other and the material in the laboratories. I wondered if I could increase collaboration, increase understanding of the material, increase engagement in the material, and help students become better at reflecting on lab experiences.

The hope of this project was to help make my student's lab experiences more genuine and effective by using the Internet and blogs for my students to publish their findings in the form of lab report blogs. Instead of a lab report submitted as a hard copy, I assisted my students in producing web pages called blogs for the purpose of reporting their lab results and conclusions. It was my hope that by making lab report blogs, students would be more engaged in the process of reflection. Students would also comment on blogs of their classmates, which potentially offer more opportunities for collaboration. Collaboration is very important to the scientific process and the acquisition of deeper understanding in the study of science. "When meaningful-use tasks are performed in cooperative leaning groups, they promote two aspects of cooperative learning, group reward and task specialization" (Marzano, 1992, p.178). I was also determined to make sure that lab investigations were more meaningful, and I wanted to quantify the ability of the lab report blogging process to do just that.

Why is lab so important? I believe in the scientific inquiry model for teaching secondary science. My college professors have been singing the praises of using scientific inquiry in the science classroom for years, and the literature supports this model. "Learning science is something students do, not something that is done to them" (National Research Council, 1996, p.21). Just as it is important for a science teacher to teach the mathematical skills needed to understand science, and for science teachers to make connections between science, culture, society, and the environment, it is also important that students understand inquiry in the process that is science. "For students to develop the abilities that characterize science as inquiry, they must actively participate in scientific investigations, and they must actually use the cognitive and manipulative skills associated with the formation of scientific explanations" (National Research Council, 1996, p. 173). Lab is supposed to be a staple in the acquisition of new knowledge and understanding in science. I need to make sure I am using lab investigations in the most effective manner I possibly can, for the best development in my students.

I feel collaboration is very important to the scientific process and the acquisition of deeper understanding in the study of science that lab investigations be more meaningful to students as they are working with classmates on a common goal. The importance of mixing up the modes of delivery has always been in the back of my mind as I present material. I always had the intuition that I need to challenge my students' paradigms of how things should be, and put them in situations that keep them on their toes. Collaboration in a new medium, the Internet, is one way to approach the process of inquiry and keep those kids engaged.

My action research project tackled collaboration just as the philosophies of

inquiry for science education do. I focused my research on collaboration, which is found to be a centerpiece of inquiry-based learning. Any good inquiry lesson has a clear focus on looking at the results closely, in learning groups, at reflection and drawing strong conclusions, perhaps for later study. This was the inspiration of my research questions, mentioned in this paragraph, to increase collaboration, reflection, and draw better conclusions by the use of lab report blogs, all of which focused on making me a more effective teacher. These skills are necessary for any solid citizen in my point of view, and in my project it was believed that we can do all of this using emerging technologies and methodologies that are similar to what students are doing for leisure on their own time. "73% of online teens age 12-17… use social network sites" (Lenhart, 2010, para. 3).

I would also add that this activity allowed for students to really get creative. The way students use words, images and photographs they themselves take, really turns into a creative expression. Any time students' creativity is nourished; I believe it to be a big win. "Businesses say they want to hire creative employees, but 70% report deficient problem-solving skills in their recently hired high school graduates" (Casner-Lotto & Barrington, 2006) as cited by (Eyster, 2010, p. 35). I want my students prepared to compete with students from around the world that are starting to be able to solve problems and think for themselves, all while communicating and collaborating on the Internet.

In piloting this treatment in the spring of 2010, there were some issues with privacy. This experience led me to clearly outline some guidelines for blogging (Appendix A). In the beginning of this treatment I went over the ground rules of

blogging, and sent home blogging guidelines, which needed to be signed by parents before the students would be allowed to participate. Touching base with parents was done periodically and it paid dividends as, “Parents are their children's first and most influential teachers” (Wong, 2004, p. 103). I had just one set of parents that had reservations, which opened up the lines of communications. That student was able to do her blog after a good discussion with the parents, which was very worthwhile. I wanted students to be free to share their blogs with their parents, and that was just one more reason high quality, safe, and appropriate material needed to be present.

I had been focusing much of my efforts in the recent part of my science-teaching career improving the model of my classes. I tried to make the learning more authentic, and student-centered. Early in my career there was the pressure to abandon my early training in the inquiry model of science instruction, and spend more time lecturing and less time on student-centered activities. There was a time when I was instructed to focus on more individual work, and less on group work. I believed this was wrong, and still do as good science involves collaboration, as does good learning. Since that time I have found much more support, not only in the National Science Standards, for the inquiry model of science education, which I am committed to improving upon. I have managed to eliminate much of the direct instruction that was the model, for too many years, in many academic content areas in America. Since my first graduate course in 2005, after my third full year teaching science, I have focused my efforts in creating a very progressive, student-centered, inquiry type of classroom. Instead of direct instruction, I try to get the basic content across through discussion and student research, with my planning and efforts to steer and guide students through the acquisition of science content

understanding. As a science teacher I want and need my students to gain much of their understanding of science through investigation in a collaborative setting. Furthermore, I needed students to have a better understanding of process skills, specifically collaboration, evaluation, reflection and laboratory techniques.

My hope was to help make my student's lab experiences more genuine and effective by using the Internet and blogs for my students to publish their findings in the form of lab report blogs. Instead of a lab report submitted as a hard copy, I had my students produce web pages called blogs. Traditionally after a student does a lab, what the student turns in is either a worksheet that they filled out while doing the lab, or a lab report, which was done after the lab is finished. Generally by junior chemistry class students have been asked to do at least one lab report in biology, physical science, or even in middle school in most school districts. I later discovered that my chemistry students had never ever done a lab report, so in this project we skipped lab reports altogether and went straight to the blogs. In the construction of a lab report students are looking more closely at a lab than they may have been in the years of filling out a lab worksheet, or set of questions at the end of a lab worksheet or packet. It was my hope that by making lab report blogs, students would be more engaged in the process of reflection on the labs that were performed. Students also commented on the blogs of their classmates, which ideally would open up more opportunities for collaboration. "A good school is always committed to being a community of learners" (Wong, 2004, p.264).

After many challenges to my ideas as I went, leading to many changes along the way, I narrowed my focus to the following three questions:

1-How might the use of lab report blogs make me a better teacher?

2-How does the online format improve overall student learning?

3-How does the use of lab report blogs encourage student initiated independent Internet research?

Teaching and Classroom Environment

School Demographics

The students in this study are in two sections of high school chemistry (at Star Valley High School) mostly juniors with five sophomores, with one of the juniors taking it a second time. SVHS is in the 90th percentile of all of Wyoming Schools in standardized test scores. Over eighty-five percent of students at SVHS are proficient or advanced in reading, which is more than 20% higher than the state average. 96% of SVHS students are proficient or advanced in writing, compared to a state average of 77.5%. 74.4 % of-SVHS students are proficient or advanced in math, compared to a state average of 46%. SVHS students scored 63.1 % proficient or advanced in science, and since the science test is so new, there are no state averages to compare to. ACT scores are valuable for comparison and all Wyoming students took the ACT last spring, as they have since 2008. On these ACT tests Star Valley students averaged 21 where the state average was 19.9 (http://www.svhs.lcsd2.org/). The free and reduced lunch rate is between 20% and 30&, even though Lincoln County does have the highest unemployment rate in the state of Wyoming.

The 45 students that participated in this study are a cross section of the college bound students of Star Valley. The chemistry students are generally above average when compared to other students in the school. These students performed the three labs

they blogged during the first semester with the first one at the beginning of October and the last one some time near the end of November. Each of these three labs was about two to three weeks from one and other. Students constructed blogs for each of the labs, and commented on classmates' blogs, eventually scored their own blogs with the provided rubric, and completed the perception surveys, interviews, and minute papers. These blogs are archived at http://svhschem.blogspot.com/. The first lab was a fun lab to review scientific method, and study the behavior of bubbles. The second lab was an introduction to the chemistry lab, with a look at physical and chemical reactions. The third blog was a blog looking at two labs done the same day. The purpose of the labs was to look at atomic masses using candy and coins to calculate relative mass and isotopes.

CONCEPTUAL FRAMEWORK

The Internet is an ever expanding explosion of idea sharing, and it can be used to improve the instruction of science or any other content area, but how did we get here, a look at some of the pioneers and research in this field will be necessary before we move on.

Technique

It was fitting that the first article that I reviewed was co-written by a professor I had for a Webtools distance course in summer of 2009. The idea for my capstone project came from my work in Brunsell's Web2.0 class. Eric Brunsell and Martin Horejsi put together a column for The Science Teacher magazine starting in January of 2010 that speaks specifically about different uses of what has been coined "web 2.0." In the first article about social networking, it was pointed out that social networking "sites

have become part of the lives of millions of high school students" (Brunsell & Horejsi, 2010a, p. 12). The connection then is a natural one within the framework of professional ethics as I too am a savvy user of social networking:

> Jasper Howell (@jasperhowell on Twitter), a science teacher in Libby, Montana, finds that social networking is a great way to collaborate. 'I live and teach 90 miles from any other chemistry teachers,' Howell says. 'I use Facebook and Twitter to find teachers to collaborate with.' (Brunsell & Horejsi, 2010, p. 12)

The bottom line is that social networking and other computer-based media that didn't exist ten years ago, or were in their infancy, have now opened up a whole world to teachers and students of science. The amount of ideas, information and viewpoints that can be shared has the effect of "exponentially expanding supply of resources and information, and limitless ways to collaborate and share" (Brunswick et al., 2010). I know I sometimes try to share what I am up to with colleagues that have been teaching science for 35 years and they really have no interest in trying these new ways, but they think they're neat. More than neat, as Brunsell and Horejsi (2010a) say, "science will never be the same" (p. 12).

In February the science 2.0 column spoke about creating a classroom blog, and I had already fallen in love with the idea I had initially come up with in June 2009. I knew, as Brunsell and Horejsi (2010b) knew, "Science education blogs can serve as powerful digital lab notebooks that contain text, images, and videos" (p.12). The part of the lab report blogging that I am very excited about is the fact that as soon as students begin making comments it becomes interactive and is a "realistic experience of the peer-review process and generate evolving descriptions of observations through time"

(Brunsell & Horejsi, 2010b, p. 12). My students used Blogger, which is free, to share results from three different investigations. There were several other free sites mentioned as well as some pay sites, which I am fundamentally against using. Brunsell and Horejsi (2010b) also noted that it is "critically important to protect students' privacy... (students) should never use their last names or other identifying information when posting" (p.12). I made it very clear and had very few problems as I "Set ground rules for appropriate use and quickly corrected inappropriate posts" (Brunsell & Horejsi, 2010b, p.12). Students understood quickly the need for anonymity and although they wanted the world to know who they were as they happily shared their lab experiences with the world, they were fairly well behaved when it came to resisting the desire to share too much information.

Students really liked reading comments from other groups and it seemed to really spark new ideas as was noted, "they seemed more confident in their class discussions" (Brunsell & Horejsi, 2010b, p.12). Another really cool aspect of students having the massive world wide web at their finger tips was the ability to do completely "self-directed research" (Brunsell & Horejsi, 2010b, p.12). My hope was that the observations of the few other teacher-researchers that have used this sort of technology for these applications, found that it did "increase student interactions" (Brunsell & Horejsi, 2010b, p.12), and that is really what its all about for me. My search for a new type of pedagogy that uses existing technology to make existing curricula more exciting and interactive, and hopefully more in line with how students learn in this new century, found me here leading my students into cyberspace to report their lab results.

Theoretical Underpinning

A large part of my project's themes reflected inquiry in some form, and the desire to morph my teaching pedagogy into an inquiry model where applicable. Learning a bit about the history of inquiry as a form of science teaching and where science teaching pedagogy began is beneficial. The last 200 years, when looking at the history of science teaching, we see a transformation that had teachers "conveying science as a body of knowledge to a more learner-centered approach" (Chaippetta, 2008, p. 23). Early on in the nineteenth century secondary schools were not found nationally but instead regionally. At the beginning of the nineteenth century secondary schools could not be found in many areas of the country. Furthermore, what was being done at the secondary school level was merely college preparation for the wealthy kids. For the most part it stayed that way for half a century and toward the second half of the century secondary schools were only serving those going on to college. Then in 1893, the "committee of ten...proposed to standardize the high school curriculum," (Chiappetta, 2008, p. 23), but it was not until 1915 when new standards stressed the "students should be taught the methods for obtaining accurate information" (Chiappetta, 2008, p. 23). Then, John Dewey in 1938, had some even better ideas that shaped inquiry as we know it now when he "stressed learning by doing, and was opposed to learning simply for the sake of gaining knowledge" (Chiappetta, 2008, p. 24). Later the cold war "demanded military preparedness as well as scientific and technological advancement" (Chiappetta, 2008, p. 24). The time that is being referred to here is the time that the USSR sent the Sputnik into outer space. We are in a similar situation now as we enter the information age,

where the world has flattened out a bit with the rise of web 2.0.

Joseph Schwab had a lot of influence on the change of American science education in terms of inquiry when he stressed that students needed to look at science the way that scientists did. He recommended that students become "active in the laboratory and that they develop their critical thinking skills by analyzing the works and original papers of scientists" (Chiappetta, 2008, pp. 25-26). The ideas of Piaget (1896-1980) as well as many other psychologists and researchers "stressed the importance of getting students to think about and discuss their own ideas of phenomena and the importance of focusing on students' misconceptions and preconceptions" (Chiappetta, 2008, p. 26). These are the areas that my study focuses on. The investigations done in a very inquiry-based way followed by the in-depth analysis, and subsequent simulated peer review process is addressing these areas that these researchers and the most recent standards that came from their findings have been stressing. Students sharing their results and conclusions, and then observing and commenting on the observations and conclusions of others to then modify their own ideas is what I was hoping would happen as part of the blogging process. Much confidence was gained as I looked at how we arrived where we are now in the history of science education with the simultaneous explosion of the web.

Methodology in the Literature

As I read through some literature and engaged in class discussions the topic of validity and reliability came up, so I did a bit more research and found that Donald Ratcliff does a very nice job addressing validity and reliability. It is based on a chapter in a book and is a brief, to the point, discussion of validity and reliability

posted as a short web document. Some good practices to increase validity in my type of project was to show “convergence with other sources of data...triangulation and comparison with the literature” (Ratcliff 1995, para. 3). All along the way through my project it was very important to keep up with some reading that related to what I was doing at that specific time. Ratcliff (1995) recommends that there be “extensive quotations” (para. 4) based on other sources as well as my own writing. Keeping really good notes and journals allowed me to add validity to my project. Although my journaling was a bit sporadic, and somewhat incomplete, the journal entries I did make proved very valuable in the overall process. Archival data was effective in increasing validity in the project, which was easily done since the students created blogs that are accessible for years.

Ratcliff's (1995) short discussion about reliability gave a bit of insight into how to have a reliable project as well. He noted, “multiple viewings of videotape...multiple listening of audio tape...multiple transcriptions of audio tape” (para. 6). I recorded the audio of student interviews so I was able to check my reliability this way. This combined with comparisons to survey data, minute papers, and observations further ensured reliability in this study. Multiple viewings of the archived blogs were helpful to establish reliability. The fact that there were multiple archived blogs that can be reviewed by others helped to keep the reliability of this project. There was a possibility of “low reliability could be consistent with high validity if the social situation is constantly in flux...two very different accounts—reflecting low reliability-- could produce even higher validity” (Ratcliff, 1995, para. 8). So it seems that the view from Ratcliff was that validity would be the more

important of the two; reliability and validity, when doing qualitative research such as an action research project in a high school science class.

Speaking of using new and different methods, the article by Mark Vondracek (2009), was a great case-study type article that showed how a teacher would lead students through a topic using a number of methods in hopes of reaching every student. "Some like to discuss the topic in a small study group, which is where most of their learning takes place" (Vondracek, 2009, p. 40). He noted that "For example, when students were confronted with instruction outside their preferred learning style, they perceived the task to be more difficult, and worked harder and learned more as a result" (Olsen 2006; Solomon 1984 as cited in Vondracek , 2009, p. 40). I guess I remembered reading information like this ten years ago when I was finishing my prep work at college before heading off to become a professional teacher, but it is great to reinforce my philosophical point of view on teaching with such research. I would agree with the statement that, "it has become clear there is a real need to teach with the goal of variety in mind" (Vondracek, 2009, p. 39). As we began a lesson and moved through the various practice activities and into investigations, I had found success along the way, but at some point I realized that I wanted students to do a better job of internalizing the information as part of solidifying their understanding. Students "should be able to define it in their own words, write down and apply any relevant equations, understand the physical evidence that supports our understanding of the concepts, understand the relationship between the topic and some other related concepts" (Vondracek, 2009, p.41). This is what I was looking for in the lab report blogs. "If a student is able to, on a moment's notice talk about a topic in multiple ways, chances are he or she has gained some level of mastery"

(Vondracek, 2009, p.41). I see these attributes in the process of making a blog about laboratory experiments, and was excited at the idea that I could make my students' lab experiences much more effective by reaching out to all or many students with this treatment.

"The design of instruction should be guided by... a theory of how instructional methods affect learning processes" (Mayer, 2010, p. 143). This article is in response to de Jong's critique of an article about a theory called cognitive load theory. This article was a nice theoretical look at how students learn which helped me look at my treatment. Later there are discussions of actual research in the field I was researching in, and how students learn. I feel like I am really part of something as Mayer pointed out that, "it is widely recognized that educational research is strengthened by multiple research methods" (2010 taken from Shavelson, (2010): Towne 2005, p.144). In some of our discussions there was concern by some classmates that they would discover that the treatment they did action research on really was not that effective, or even hurtful. I, like many of my classmates thought that this would not necessarily be the end of the world, and that those results would be just as valid and valuable to the researcher and the body of knowledge about teaching and learning. As Mayer said it, "The call to conduct research in lab and school venues should not be seen as a challenge to instruction theory but rather as a way of broadening it" (2010, p. 144). My excitement about my treatment was reinforced as I read, "including selecting relevant words and pictures for further processing, organizing the selected material into coherent mental representations, and integrating the mental representations with each other" (Mayer 2010, p.144). These ideas are ways to make learning more meaningful and are necessary steps to making

blogs. I saw my students making blogs and having to really understand the material, even doing some independent research with the Internet at their hands, to produce a blog that many of them were willing to publish on the World Wide Web. I saw them having to do those things mentioned by Mayer and thus really putting an exclamation point on their learning, on top of the many other benefits.

Conclusion

There was a study performed at King Saud University in Riyadh, Saudi Arabia on the use of blogs and in this study it was discussed that "Visitors to the blog can read, comment and link to the blog postings. From an educational perspective, the availability and ease of the use of blogging software makes blog a practical tool" (Al-Fadda & Al-Ahyah, 2010, p.100). In this study which used similar data collection as mine, specifically "To evaluate students' experience on using the blogs, a survey was conducted to measure students' attitudes towards using the blog and its effectiveness as a tool for encouraging pre-class readings and post-class reflections (one minute paper)" (Al-Fadda & Al-Ahyah 2010, p.102). Al-Fadda and Al-Ahyah (2010) used the same methods as I did in terms of surveying and minute papers. In their study they found that, "receiving comments from other colleagues will increase the rate of collaboration between the learners" (Al-Fadda & Al-Ahyah 2010, p.102). The goals of my treatment were exactly that, finding ways to increase collaboration between learners. In the research that was done prior to this study some findings similar to mine were found in the usefulness of blogging in the classroom context. Although the study group in this study was college students, the same advantages that students "will be careful if they know

someone will comment on their work" (Al-Fadda & Al-Ahyah 2010, p.101). In this treatment my hope is the same as others' research and hopes for this blossoming field of an educational tool that "By using blogs, teachers can arrange a collaborative learning environment where students can peer edit and comment on other students' posting" (Al-Fadda & Al-Ahyah, 2010 as cited by Dieu, 2004; Mitchell, 2003, p. 101). Students can see their work as well as other students' work and be able to collaborate on the learning activities" (Al-Fadda & Al-Ahyah, 2010, p.100). I am lucky to have found my way to this treatment and although not the first to use this emerging technology, I feel good to be on the cutting edge. These researchers used very similar treatments to mine, and their data collection is very similar to mine, so looking at what they did was very helpful to help shape my research.

In summary, the World Wide Web has exploded onto the human scene and is now opened up to the whole world of teachers and students and is a great place for information and viewpoints to be shared. The use of text, images and viewpoints of students can be shared and a new kind of dialogue can take place. Students enjoy being on the Internet, and enjoy taking part in a discussion that includes their own viewpoints, comments on others' work, and responses to the comments of others. Students also have a world of information to expand their own understanding, and the emergence of this storehouse of information and new technologies has the potential to make science and any other curricula more exciting and interactive.

Embracing the possibilities with a focus on inquiry allows us to shift from the stand and deliver approach to a more student-centered approach. As inquiry, and the pioneers of the process starting with the cave-people, ideas have stressed the process of

learning by doing, the same process we should use as science teachers. Students are able to use an explosive emerging technology to think about and discuss their own ideas related to phenomena. We want to harness this power, but as I look at the small way I help students learn using blogs, I must keep in mind the reliability and validity of such a study. My hopes are that with the mass of literature I have reviewed, the amount of my own reflective writing and the presence of vast archival data in the form of blogs stored in cyberspace, the validity of my project has been preserved. This whole process should have appealed to some students as an embodiment of their special learning style, as well as being a challenge to others preparing them to work harder and learn more than they would have before.

The availability of the web to research allowed those students with the initiative to make some new connections between the new material and earlier topics they were already comfortable with, thus creating a more authentic learning experience. When all is said and done, was this treatment better? The answer to that question will be valuable whether it is yes or no. That is what scientific research is all about. Others have done similar studies with similar data collection techniques, and had positive findings. When others tried this they found an increase in understanding, help in encouraging students to collaborate, and what my hope was: a better way.

METHODOLOGY

My focus from the beginning of my journey through the MSSE program has been to improve the whole process of laboratory investigations. I made great strides just as a

natural result of the readings, assignments, content, and discussions in the various classes I had taken through the program. My treatment for my Action Research project intended to find a new way to reflect on lab using emerging web 2.0 technologies. 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.

The classic lab write up is just hand-written or typed on a word processing program, printed, and handed in. The lab report is designed to carefully describe a lab investigation that was performed and report out the results. Students made 19 blogs with three entries per blog. Essentially there were 54 lab report blogs produced. I helped my students create a blog of their lab reports. A blog is basically a web page of a document, which can be seen by members of a community, and be commented on. Then, I put together a blog myself where there is a page with links to every student's blog in my two chemistry sections. This allowed students to go to each other's blogs with ease and timeliness. The students needed to go to a minimum of ten of their classmates' blogs from any of the two sections. They were expected to analyze their classmates' blogs and make complimentary comments and suggestions for improvement on them.

In the blog, which is basically a free web page, I had the students do a traditional lab write up. However, additionally a requirement was to use photos taken by themselves or classmates of the lab set-up, results, or helpful images they found in their research. My idea was that if I had them do the lab reports in a visible way on the World Wide Web, perhaps they would look a bit deeper at the experiment to put out a better product. As students looked at other student's blogs they analyzed what they did, which

I hoped would encourage students to look at the lab experience more critically. My hope was that as students looked at their own work comparing it with the work of their classmates they would develop deeper understandings. My main goals for these modifications were for students to more deeply analyze results and develop better conclusions as a result of collaboration with their peers. I wanted my students to do a better job of reflecting on the lab process and hopefully begin to acquire a better understanding of the concepts that the investigation was attempting to uncover. In addition, I hoped to see more collaboration during the reflection on investigations similar to the actual lab experience where students are counting on one another. I observed in this treatment that having the Internet at their disposal did encourage students to engage in independent research to clarify what they didn't understand; although, not to the level I had hoped. Changes that could be made that would help with this are discussed in the conclusion and value portions of this paper. Independent student-centered learning, fitting the inquiry model, and with a few modifications this end could be effectively achieved.

I ran three trials of this treatment for study purposes. We conducted three labs in the first and second quarter of junior chemistry that students were asked to blog. We looked at the guidelines that would keep us safe on the World Wide Web in terms of privacy and etiquette in the use of social media in the high school setting (Appendix B). After parents had been communicated with and students signed off to do the blogs, the blogging accounts were set up. An email address is necessary to acquire a blog in all cases I am aware of. The students can set up an email address just for the purpose of having their blogs, or the teacher can set up the blogs with names, and a password already

set up. I had my students set up accounts using stock names that were assigned. The passwords were predetermined so that if there were any problems I could access both the email accounts as well as the blogs. It is problematic for students to use personal email accounts for this purpose, as the process gets complicated when the personal emails are used.

A format for the lab report blogs was developed and presented (Appendix C). Also the specifics of each category were laid out with the rubric. Students needed to have a title that they made up that describes the lab in a sentence. Then there was an introduction that needed to have a statement of problem. There was also a requirement that students include preliminary observations and background information on the topic of the laboratory investigation. This was where the students were encouraged to use the Internet to learn more about the topic and include that information here. Students were also expected to list the hypothesis that they were to write down before beginning the lab. Images from their research could have been included here as well. The materials portion of the blog was expected to have a list of the materials used for the lab. Pictures that show the materials that were taken during the lab were also supposed to be there. The next heading of the blog was the procedures. The procedures of the lab were to be laid out either in paragraph format or in a bulleted list. Any experimental set-up should have been photographed and included in this section of their blog as well. The data section of the blog should have included a data table of the results, if applicable, as well as any notes or observations, with all being properly labeled. Any photos showing any results that were taken during the investigation should have been included here as well. The discussion portion of the blog included a summary of the data including any trends that

were noticed. Also in the discussion, students were asked to list one thing that they learned and how it may have applied to real-life situations. Sources of error were to be discussed in the discussion section of the blog. In the last section of the blog students were asked to accept or reject their hypothesis and they were expected to explain why they accepted or rejected their hypothesis.

In addition in the discussion section students were asked to discuss additional discoveries they made, and state any questions that could be used for further study. These were the basic guidelines, and the rubric which was given to them (Appendix G) prior to them starting on the blog. These guidelines showed indicators of how each part of the blog should have been constructed to achieve desired scores. The students were then required to make comments on ten of the twenty blogs made by the two chemistry sections. At the end of it all they were scored using the rubrics where comments students made were also noted. For a bit more reflection students were asked to score their own blogs first, and then I scored the blogs using the same rubric. The score they received was an average of their score and my score. Finally rubrics were shared with them after I scored them, so they could see where we might have differed in the interpretation of the rubric. This was done each time we conducted the three labs and constructed subsequent blogs over a time period of eight weeks.

Table 1
Data Collection Instruments

Question/data source	Surveys	Interviews	Journals/ obs. data	Blog rubric scores/ archival blog data
How might the use of lab report blogs make me a better teacher?	X	X	X	
How does the online format improve overall student learning?		X	X	X
How does the use of lab report blogs encourage student initiated independent Internet research?	X	X	X	

I wanted to know if the students felt good about the experience of blogging the lab reports, making comments on other lab reports, and what they got out of the comments that were left for them. I like that this process is similar to the peer review process, or at the very least, makes for a nice conceptual model of peer reviewing. I was also hoping that the students saw the necessity of publishing results in science. As a result of this process I was hoping to observe if students-see how peer review is part of the scientific process as a great by-product; to steal a term from chemistry. I was also hoping to find that having the Internet would lead to students conducting their own independent research. To answer my questions accurately, as well as find ways to

improve the process I used several data collection techniques.

A list of the data collection techniques I employed are as follows:

- I used student ***interviews*** (Appendix A) to assess many of my questions and sub questions as well as to address things that came up during analysis or in my observations and journal entries.
- Likert scale student perception ***surveys*** (Appendix B) on active votes are a valuable source of quantitative data. The results can be immediately exported in Excel format and are readily available for analysis. The way these were administered the results are displayed in a bar graph immediately after each question. I was able to ask follow-up questions after the survey to address trends that were noticed immediately, or in response to some other observations I had made in analysis.
- I utilized the ***minute paper*** twice at the end of the treatment. The first of the two prompts that I used was, "Please discuss your favorite and least favorite aspects of blogging your lab reports." The second prompt was, " Did you identify any personal strengths of weaknesses during the blogging process?"
- The ***journal*** entries that I made regularly during the treatment were full of useful information. I made an entry on each of two days doing treatments in two different sections that meet on alternating days. I used a template to keep my journal entries focused and to the point. I also made informal observations throughout the process.
- Students were given the rubric with which their lab report blogs would be scored. The ***rubric scores*** of the students' self-assessments as well as my assessment were another valuable source of quantitative observations. The rubric scores were entered into a

spreadsheet so that scores in the rubric categories could be compared from each of the three blogs that were produced by the students. I looked at high averages in terms of category, as well as overall trends over time. There were some strong correlations between blog scores and student journals and to a lesser extent with attitude surveys. Also with those rubrics that were used to score students' lab report blogs, I asked an English teacher colleague to score a random sample of blogs (8 of them) to include some inter rater reliability in my data analysis.

• ***Student Blog archives*** of all of the student work for this project are fully accessible to me or anyone else. This fact alone made the student work samples helpful and informative, and surely of value to this study. These were included combined with the rubric scores as another data source. The student blogs proved to be great archival data as I looked back a number of times at student produced blogs, something that helped to ensure some level of validity to the results.

First a look at some of the raw data, then an analysis of the research questions and the answers.

As I went through the data analysis process I found that I needed to trim my questions down to three that really applied. I also found that one of my questions was really part of the second question, so I will deal with these three questions:

1. How might the use of lab report blogs make me a better teacher?
2. How does the online format improve overall student learning?
3. How does the use of lab report blogs encourage student initiated independent Internet research?

I had the question, “Do students put more effort into lab report blogs than they would on a product that is not viewable to the whole world?” I felt that the latter was simply an extension of the first of these two questions. I will include some reference back to this theme as well as addressing research questions in the data analysis, but it will not be one of my formal research questions.

In the matrix shown in Table 1, I revealed which pieces of data I used to answer my three research questions. One would notice that the student perception surveys were widely used to figure out how this treatment made me a better teacher, and they revealed if students were encouraged to do independent research. The surveys told me a lot of other information about how students felt about blogging, and whether students put more effort into blogging than they would have in a regular class activity. The interviews were so versatile that they yielded information about all of my questions. The journals, both my own and the student’s minute papers, were valuable in answering all of my questions. The blog rubric scores were used to show improvements or deficiency in academic areas of my questions.

The journal entries and observations have proven to have some valuable insight. Using digital photography in the first lab conveyed how much more engaged students were, as they were having fun with the picture taking. In the picture-taking students were naturally encouraged to look much more closely and make better observations as a result. Several students in more than one interview noted this phenomenon, and the digital photography angle never occurred to me until analysis of interview data.

Archival blogs proved to be a vast source of information. I was able to see what improvements groups had made, but because of the format of the blogs, the students do

everything as a group, which made a look at specific individuals difficult in terms of who did what in the construction of blogs. I have created a blog page where all of the student blogs created during the treatment can be viewed. (http://svhschem.blogspot.com). It will be difficult to isolate individual gains in areas using the blogs themselves, but I will be able to show some relationships between the members of different groups feelings about blogging, the product they put out and the scores they receive. Correlation with interviews and surveys will help with this, as well as scores on subsequent assessments covering this material. I have included some references to individual blogs or trends I observed when looking over the blogs and they will be included in data analysis as part of my journals and observation data.

The rubric I used to score the blogs is full of useful information as well. I looked at the correlation between perception survey results on a student-by-student basis with rubric scores, and the actual blogs themselves to search for qualitative connections to the quantitative data from the rubrics and perception surveys. In looking at these in this way I was able to see student's strengths and weaknesses in terms of scores earned in different categories of the rubric.

DATA AND ANALYSIS

The blog rubric scores and data contained within them is a good place for us to start. In the following data table the scores for the three blogs by lab group is displayed. All lab report blog groups consisted of pairs of students. These blogs were scored with the rubric in appendix G. The scores are out of a possible score of 32.

Table 2
Blog scores using rubric for all three blogs, scores are out of 32

Group number	Blog 1 Bubble Lab	Blog 2 Physical Chemical Reaction Lab	Blog 3 Candy and Penny Labs
20	26.5	26	31
21	29	31	30
22	25	26	25
23	24.5	26.5	24
24	27	23	22
25	22	29.5	25
26	27	27.5	26
27	28	27	26
28	26	29	28
29	27	28.5	28
30	18	29	26
31	26	28	29
32	26	27	26
33	29.5	32	32
34	21.5	22	20
35	22	29	23.5
36	26.5	17.5	17
37	28	30	26.5
Average	25.5	27.1	25.8

This table was helpful to look at individual groups and how they improved or where they might have struggled. It can be seen that many groups went up then down in their scores. There was an increase from the first blog to the second of the equivalent of a 5.3 percent increase, while the scores decreased the equivalent of 4.3 percentage points. This is addressed later on. So the question that arose as I looked at the overall scores was, why did the scores have such a promising increase from the first blog to the second, then take such a dive from the second blog to the third? Of course when this question is answered, an exploration of what is necessary to keep this from happening again is

necessary. The results also point to some other findings that were totally unrelated to my study questions accept of course, how can I improve as a teacher. They point to nothing about collaboration or online technology, but a look at how students respond to homework. You can see that groups; 23, 25, 27, 35, and 37 all showed a drop from blog 2 to blog 3, and I would attribute this to the fact that more of the work to construct this blog was assigned to be done independently and with very little seat time with me present. We can see the other side of the data where we saw large improvements. When given adequate time, and through the self assessment process using the rubric, students knew exactly what to do to receive full credit on different aspects of the blog. This is very common when using a rubric for tasks that are done repeatedly.

In the following figure, their overall scores were graphed to show that on average the scores of the first blog were much lower than those of the second blog. Then we see a definite downturn in the scores. Possible reasons for this and implications for future use of lab report blogs are explored further as well.

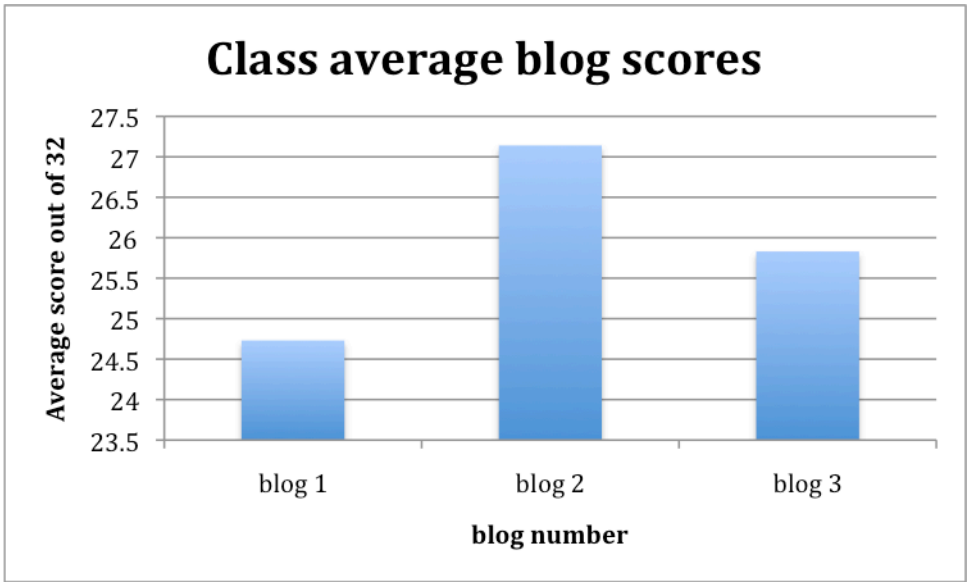


Figure 1. Average blog scores among both classes on the three lab report blogs, (*N*=18).

As I looked at the reasons these scores fell off, two things became apparent. The first issue that students came up against on the third blog was time. As students seat time (time in class) went down, so did the blog scores. This was not just a general trend but as you can see the scores in the previous table that fourteen out of the eighteen groups (77.8%) had a decline in their scores from the second blog to the third, when time was more limited. Also as they worked on the third blog they didn't have all the help they needed. These issues are addressed later in the conclusion of the data analysis. These scores show that the expectations were too high of the students in the third blog.

Students were asked to actually blog over two labs, which turned out to be just too much. In the process of assigning too much with not enough help, students ended up putting in too much time on the front end in the introduction, procedures, and data, and not enough time in the discussion and the conclusion. Two specific areas that I looked at in my analysis of blog rubric scores were how well students drew conclusions, and how

well students did in the discussion portions of the blog. We can look back at some of the minute papers where students mentioned being rushed. In a follow-up informal interview which I recorded in my journal, this showed that students were frustrated and felt like we were trying to cram too much in to the third blog. These areas seemed to suffer as the next figure shows.

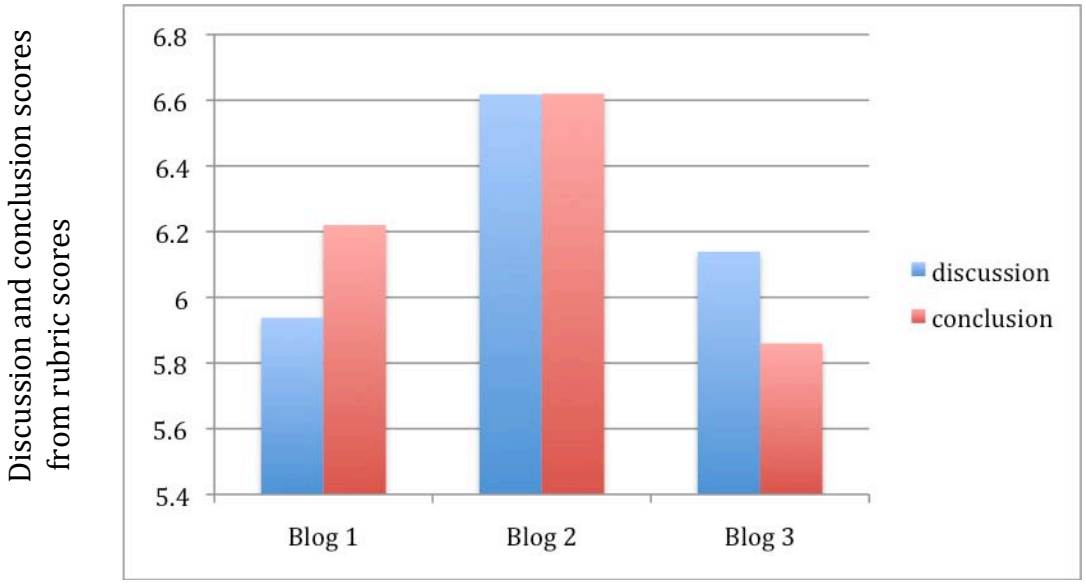


Figure 2. Rubric scores on all three blogs from the discussion and conclusion categories.

There is a rise in scores from the first blog to the second and then we see a decline from the second to the third. Initially we see a greater fall in the case of the conclusion. There are reasons that both of these scores fell. The specifics of why I observed a general fall in the rubric scores in all areas are discussed later in this paper. One thing that might help is to understand that the conclusion was the last part of the blog, and it seems that it is the last part of the blog that students got around to doing. When they ran out of time on the third blogs, it seems that the conclusions really suffered. One student that had expressed that he really liked doing blogs at the beginning of the treatment, had a

visibly poor attitude, and I wrote in my journal that this student felt overwhelmed and stated that “blogs were dumb.” Part of this decline can be attributed to limited class time to complete the last blog as well as more to do on the last blog for full credit.

The survey results are laid out here in the next section. The amount of information found in the surveys was vast. I took the data, and broke all responses down into either agree or disagree. Then I was able to assign a percentage to my students in terms of what percent of them agreed, and what percent disagreed. This would be a great place to give an example from the below. Trends were much easier to recognize this way.

Table 3
Percentages of agreement for all six surveys conducted during treatment

Question #	*N*=24 Class 1 Survey 1	*N*=20 Class 1 survey 2	*N*=22 Class 1 survey 3	*N*=18 Class 2 survey 1	*N*=17 Class 2 survey 2	*N*=18 Class 2 survey 2
1	88.89%	95.00	77.78	87.50%	94.12	86.36
2	55.56%	85.00	61.11	79.17%	88.24	63.64
3	77.78%	80.00	61.11	83.33%	82.35	47.83
4	88.89%	80.00	77.78	95.83%	88.35	78.26
5	na	90.00	66.67	Na	82.24	63.64
6	72.22%	100	88.89	83.33%	100	77.27
7	88.89%	95.00	100	95.83%	94.12	80
8	72.22%	100	66.67	83.33%	100	70
9	na	90.00	72.22	Na	87.5	70

The first question was, “Making this activity online made it more meaningful than regular classroom activities.” I was happy that although we saw the increase then decrease trend that we saw throughout, even in the lowest scores of the three surveys, more than three quarters of the students agreed, that the online aspect of this treatment was positive. I would attribute this trend found throughout, the increase and decrease, to the fact that students had an overall decrease in their positive feelings towards blogs as

they were given less class time and less personal attention as they built the last of the three blogs. Students' perceptions changed as time and help was taken away at the end of the treatment period. A colleague noted that perhaps students' attitudes went down as the newness of the treatment wore off, perhaps. You can see that students agreed less in nearly every question on the survey when we compare survey number 2 and 3.

The second question was, "I learned more information by reading other students blogs than I would have in regular classroom activities." With this question over half did express learning more from reading others' work, but the numbers depended very much on which lab we were talking about. A lot of this had to do with how much of the background material had been taught, and how much time students had to put in on the blog. In the first of the three labs, there was very little background given related to why and how bubbles form, so students did a bit more research and a bit more explaining in their blogs. On the second lab that was blogged, students learned less from looking at other student's blogs as well as on the last blog, because much of the purpose of the lab was to practice material that had been covered in detail in class, so they learned less from the blogging experience.

The third survey prompt was, "I used the Internet to gain additional knowledge about what was going on in the lab." Here again much of whether students jumped on the Internet to look information up or not depended on how much background material had been taught, and how many questions, or lack thereof, were generated during blogging. The survey results showed that 19% fewer students did Internet research and nearly 35% fewer students in the other class did independent research on the third blog compared to the second blog. Once again I would say time was an issue here. The

fourth survey item addressed collaboration with the statement, “I saw value in the collaboration among myself and my lab partners.” Even as scores went down between five and ten percent fewer students agreed as time went on, but even the lowest percentage of agreement had three quarters of students agreeing that they saw value in the collaboration among themselves and their lab partners. As I analyzed data I added another question to my survey that looked at the collaboration that was going on between lab groups, not just in groups. The item that addressed this read, “I saw value in the collaboration among our group and other groups in the blogging process.” Here I saw some real telling data, and it pointed to the fact that students got a lot out of working in small groups, but the aspect I was hoping for was for students to see value in a wider circle of collaborators much like that in the real world, and this was not as successful. These results showed that students were not all getting that point. In interviews students expressed that, “having a partner is great, and working with them is awesome, but I’m not sure if everyone takes the commenting very as seriously.” In the rush to complete the assignment, students raced through the commenting aspect, and therefore didn’t get the time to really get deep into the commenting process. I also saw that when in a time crunch students saw less value in the collaboration between groups. This would relate to the commenting portion of the lab report blogging process.

The next item on the survey was the statement, “I feel better able to draw conclusions from experimental observations and data than I was before this activity.” I was happy after the results of the first survey. After completion of the second blog when this survey was administered a second time, every student surveyed agreed with the statement. Part of the focus of the chapter that was being taught was the scientific

method, and with that focus being part of the instruction, students really were able to draw conclusions as that was part of my learning objectives and a focus on the design was expressed. This fact helps to remind me that I need to be very deliberate with final objectives in mind and this fact will be elaborated upon later.

The seventh item on the survey asked stated, “I have a better understanding of the importance of collaboration in the scientific process.” This is a very common theme that comes up again as we see the drop from the second to the third blog, and that is if there is not sufficient time given by the instructor, students tended to lose the belief that collaboration was important. Even with the drops, we did see that even at the lowest 4 out of 5 students better recognized the need to collaborate after this treatment. This was a success. The eighth prompt in the survey spoke to the need for students to understand the purpose of lab investigations. To the prompt, “I gained a better understanding of the purpose of this investigation as a result of any of all aspect of the lab report blogging process,” there were some very mixed results. Again much like the last question, we saw the exact same numbers in the first two surveys. Then we saw a huge drop-off when we looked at the third survey data. Here we saw that again when time became a premium. There was way too much busy work involved with blogging two labs at once, and the focus and purpose of the lab was lost on almost a third of all the students surveyed.

Upon noting the students felt there was a large time commitment involved in the blogging process, I asked a new question the second time I administered my survey that stated, “Blogging was a good use of time compared to other class activities and homework.” In survey number 2, 89% of students surveyed either agreed or strongly

agreed that blogging was a good use of time. To add strength to the findings only two students disagreed, and there were no students that strongly disagreed with that statement. It was telling that the next time that survey was administered to the same group, only 64% of students agreed that this activity was a good use of time. There were five more students present when I administered survey number three. As more of the time spent on the blogs was their own time, their support seemed to dwindle. So the time spent was worthwhile as long as it was class time. For students to feel that the time spent was worth it I guess it needs to be class time being used, and not their own. In the other class, 88% agreed in the second administration of the survey to the same prompt, and in the third administration of the survey, 79% of students surveyed agreed that this activity was a good use of time. The drop was nearly as dramatic, but there was indeed a decline in support for the time used to blog. I noted in my journal that time could be used more effectively and some of my ideas can be found in the conclusion and value sections of this paper. In interviews students all were in support of this format, it was worth their time, but support needs to be present so that students continue to feel great about this. All 8 students interviewed stated that they preferred blogging to traditional lab activities. This was supported by each of them responding to a question I included in my interview format that asked if they prefer traditional lab worksheets or lab reports blogs, to which each of the eight interviewed students stated they preferred blogs. We saw in the surveys that as time went on, and was taken away from the students they didn't feel so good about blogging.

The interview data is understandably quite qualitative and not very easily represented by a figure or table, so a discussion of the themes that arose in student minute

papers are helpful.

I found this entry from one of the student's journals that seems to sum up the general idea how students seemed to view the blogging experience, "Helps me to learn better but it can t*akes along time* to do it". One student suggested in her journal that a way to improve the blogging process would be to, "more time spent in class on the blogs". In one student's journal was written, "the computer just freaked out? And it didn't take our comments, take more time on the comments." When things like this happen to students while the teacher is not there to help, it really doesn't give students the best experience with the blogs.

I did see some students that traditionally scored low in class on average scoring in the C range overall (between 70% and 77%), pull high B scores on the rubric for both of their first two blogs. As many of the students scores went down as the cramming began, these students scores went down as well when class time was reduced.

I made many observations and in journal entries found some useful data. I will summarize some highlights of observations I made as well. My observation of the use of digital photography was noted early on. I noted how effective the digital photography was at engaging the students and getting them thinking in my journal on the first day, "students are really getting into the picture taking, and this will be very useful to get kids looking more closely at results." As I looked at blogs after the third blog was completed I made a note of the incompletion of blogs in blog three. The reasons for blogs being left incomplete, especially the fact that questions were written out but not answered were sought as a result of observations I made. Students outwardly seemed to be really enjoying the formatting and individual nature of the blogs. Creativity was encouraged

not just in the picture taking but also the many artistic or practical uses of the digital photography in the layout of the blogs. I also made note of some observations made by several of my colleagues. Our technology coordinator made some observations from time to time as I had him look in on us. He noted a high level of engagement among students while blogging when students were in the library stating, “cool, on-task, on the computers, and they seem to be into it.” An English teacher that looked in on what was happening a couple times as well as looking over my capstone drafts early on, really liked how many of the group learning strategies we are encouraged to employ on a regular basis are automatic in this treatment.

Observation data mirrored very much my journal data. Many of my observations were later written into my journal at the end of the day. Some highlights of my teacher journal will be laid out to hopefully tie together the other data sources. Many of the common trends observed in the other hard data sources were also noted in my journal. The journal prompts are found in Appendix C. A few of the important impacts I noted on 10/8 by the blogging process on students were that right away I could see that students were paying closer attention to lab results and set-up. Also on 10/9 I made an entry into my journal that the students were really enjoying the photography. On 11/2 I noted that in looking for better photos much better observations were made in this lab compared to previous years. The next questions looked at the commenting aspect of blogging. Students are definitely looking at other students work (10/13). On the 11/4 I it was noted that, “I saw both very positive student reactions to comments and at other times it was a good lesson in taking constructive criticism without becoming defensive.” I wrote down a student quote in my journal, “how could they say they don’t like the layout of our blog,

it's sweet!" On 11/5 I noted that, "I need to make a few changes to encourage students to make a stronger effort in the commenting aspect of this, what exactly to do, I am not sure but I have some ideas." On the next blog I made an entry, (students) "Hurried through and lots of skimming and less meaningfulness in the comments" (12/3).

My next question in my journal addressed how my role changed or didn't during the blogging process. "How does blogging impact my role as the teacher?" Right away changes were noted with my first entry, "As the teacher with this sort of activity I morph much more into a technical advisor" (10/3). The next month in my journal I noted that blogging, "Opens up my ability to discuss results, conclusions, data analysis, as well as many more technical questions. There is, unfortunately, time lost from science instruction for technical instructions, the how-tos of building a blog. This needs to be minimized" (11/4). In December I made an entry that became a common theme, "Need to be present for the building of the blogs for this to be effective" (12/3). I noted some changes either were possible or that were happening. "Better discussion is possible, the follow-up discussions were pretty good. Shared lab and blogging experience, especially discussions even debates about how much photography to use." I also wrote a question in my journal that asked myself, "How do I show improvement in their understanding of scientific method and confidence in that fact" (10/13). I noted that this treatment is beneficial and detrimental in ways. "Allows for another medium to communicate with and between my students. Students can do much to reinforce learning through discussions" (10/4). On the flip side of the coin, "Takes time away from delivery of science content trading it for time dealing with technical issues. This has lessened but in a school where classes are set up in semesters it makes it tough to have students 'blog

trained' within a semester" (12/4).

In the journal I made note of some obvious benefits to student learning. "Yes, students need to have some new skill sets in the future's economy. Students need more experience being creative and collaborative to be successful in the future in whatever their endeavors. Class relationship building also goes on as a result of these blogs and the subsequent commenting" (10/30). There were some pleasant surprises noted in my journal as well, "Students really had a good time with the photography portion of the lab, and it's fun for me and the kids when they get a good shot" (10/8). It made an impression on me as I reflected that, "Kids took a really good photo of the lab results, and as a result of looking real close they ended up making some observations that generally in previous years I had to show them… through this process and knowing ahead what they needed to look for and get photos of, students make very good detailed observations in their science journals" (11/2).

My journal entries had some nice ideas for improvement as well, "Go through the rubric at the beginning of the lesson and really point out where points will be earned and for what will it be earned and use an archival blog as an example to demonstrate various proficiencies in the rubric used to score the blogs" (10/13). This information is interwoven with my other data sources to answer some of my questions and come up with a better way to do this. One good idea that a kid suggested and that I modified was an idea to do, "One lab at a time, or have different groups do different labs then compare results." I might think about trimming the workload by simply giving them the procedures and materials, and even the discussion questions so that they can just cut and paste them into their blogs and modify them as they each see fit, saving them time and

perhaps making the blogs higher quality in the end. Putting less focus on typing and formatting and more focus on the important things" (12/3). When I try this treatment again I will implement some of the ideas that came out in the journaling process, to make this a better process.

INTERPRETATION AND CONCLUSION

In both surveys and interviews students show genuine excitement about the collaboration going on. The data seems to show that students feel better about and perceive that they get more out of working with their lab partners than they get out of the commenting process, as indicated by results from question four and five on the survey, results are in Table 3.

Students felt like publishing their results making the activity more fun, and they expressed they looked a lot more closely to what was going on in the lab while the lab was being conducted (surveys and interviews). Sixty-seven percent (N=12) of students expressed that they looked more closely at labs during the reflection period in surveys and 84% of those interviewed expressed that they did a better job of reflecting (survey and interviews). In half of the interviews students noted how much they valued the digital photography portion of the activity, which as I mentioned wasn't one of my points of emphasis initially, but has been a great discovery in my personal growth as a teacher (interview data). The act of photo documenting their lab experiences seems to have had wonderfully positive effects on the student as well. The use of digital photography in the lab is something that students really loved doing and it was noted in my journal. In observations later recorded in my journal, after the first blog, I definitely noticed that

students really got into lab more than maybe they have in past years. The low areas in rubric scores on the first lab was identified as being in the areas of conclusions and discussions, the areas I would like to see much improvement. I was a bit disappointed that the rubric scores did not improve as much as I had hoped, but later I will address why this is. Others have observed a high level of engagement during the periods of time that students are allowed to work on these during class, specifically our school's technology coordinator who has really been enthusiastic about what we have been doing. I observed and students expressed in interviews that they do engage in independent research while blogging. Students suggested some improvements could be made in this area as well that are discussed in the value section of this paper as well as following here. Modifications to this process such as requiring students to engage in independent research, and assigning a grade to it should help improve the independent research component of this treatment (interviews and journals). I see students' activities to be very similar to the peer review process. With the proper focus prior to heading into the lab report blogging process on the peer review process this activity could be a great one.

Now I will talk about specific findings as they relate to each of my three research questions found in my data triangulation matrix (Appendix D).

How might the use of lab report blogs make me a better teacher? I did feel a bit rushed in late November when we were finishing up our third lab report blog. In multiple student journals students often felt rushed, and when the teacher has high expectations that include time outside of class, the frustration mounts. Fifty-three percent of students expressed they needed more time or they felt rushed in their journals. Out of a necessity, students were required to spend more time out of class for work to be done

on the blog. After spending a good portion of time teaching students how to build the blogs, and what the expectations were on the blogs in terms of scoring, I felt I could assign much of the blog work and commenting be done outside of class. In lieu of the normal homework I would assign in chemistry class, I assigned work be done on the blog.

One of the findings made to improve my teaching is that I definitely must commit more class time with the teacher present. The discussions with students following the last survey, the student journals, and my own journal all point to this need. One work-day was given to students at one point with computer access, but a substitute was present to work on the third blog of the treatment. I would have done things different in that aspect if I did this again, or should I say the next time I do this. As it was pointed out that some of the time spent on the blogs was spent with a substitute. My thinking was that since in the blog they were working on their third blog, most of the technical issues would be worked out, and the students would be able to work independently with little problems.

How does the online format improve overall student learning? According to all of my interview subjects the online format was very favorable to the standard classroom activities. The students I interviewed were supportive of the format and those comments led to some other discoveries and helped to answer some other questions. The fact that students “don’t just write it down on paper, you have to put it up for other people to read” as a student stated in the interviews, lends merit to this technique. The product of the student’s labor as another student noted in interviews is “on computer, see other people’s work as well.” So the product was visible and students noted this, but more importantly

one of my sophomores in the junior level class hit the jackpot with the statement, "Because it involves you more than writing a report it gets your mind going gets your creativity going." Indeed the creativity that is allowed with this treatment was one of those very valuable aspects. Creativity and interaction are keys to a good lesson, forcing kids to think and collaborate and in another interview a female student noted, "we get to interact more with other groups were (sic) with worksheets we don't." The interview data was one more great point that adds validity to the fact that this activity mirrors millions of people's leisure activities. This fact could make this sort of activity students could get used to as another female interview subject noted that "more fun to do than like a worksheet, I'm on the computer every night, it's something that can just hop on and do at home without having to crack a book."

Earlier I discussed the circumstances that may have led to students feeling less like the blogging was a good use of time, as I assigned more work to be done outside of class, and class time was spent with a substitute. As we look at the archival data of blogs that were made, we saw on the third blog that students had posted the discussion questions that they were supposed to have answered to complete their lab report blogs. It looks as if they just seemed to run out of time. I discussed this omission of answers of discussion questions to find out if they had misunderstood the directions some how or if they just ran out of time or didn't do it. I did see that the quality of blogs went up from the first blog to the second, then the quality went down on the third blog, as the average scores of the first round of blogs was 5.08 and the second was up to 5.53 and the third dropped to 5.38, and these were out of a score of 6. The scores for the discussion scores of the blogs went from 6.00 to 6.53 and finally to 6.65 on the final blog. (rubric scores).

The scores for the conclusion portion of the lab report blogs went up from 6.22 to 6.62 on the second blog, then disappointingly dropped to 6.35. (rubric scores) Once again overwhelming students by not giving them the time and individual attention that they needed showed in attitudes, observations and grades; rubric scores. I did not get a chance to formally interview any of my students at the very end of the treatments, but in informal discussions with students they mentioned that there was too much in the last blog, and this was found as a very common theme in minute papers, with nearly 50% of students expressing time issue frustrations.

How does the use of lab report blogs encourage student initiated independent Internet research? I did discover that having the Internet at their disposal might lead some to do some independent research, but I would need to change the way I do things to achieve the goal of a large percentage of students independently researching. With the average students response on the survey at 2.80 out of 4 these results were consistently the lowest (least in agreement) in regards to independent Internet research. To me this indicated that students did not just automatically do independent research just because they had the Internet at their disposal. In one interview a student noted that although they weren't sure about what really caused the formation of bubbles, they didn't automatically think to look it up. On the next lab which they blogged they had what they felt was adequate information to complete the blog so there was no need to conduct any Internet research. In her minute paper one student indicated that she thought that if there was a requirement, which was rewarded points towards their grade, students would be more likely to conduct independent research, as noted in informal discussions with students, follow up questions during the administration of the survey, and noted in my

journal. On November 30th, I noted in my journaling that, "It is tough to get students to do independent research without some prompting. It seems that they are satisfied with a shallow understanding without extra effort rather than researching in a quest for a deeper understanding. I should modify my rubric to reflect a need for independent research."

Having the Internet at their disposal does not guarantee students will use it to enhance their own understanding. If this is something I want students to do, I need to make it a part of the assignment. I could modify the rubric to have a portion where students indicate what new material they learned from Internet research. One could make it a requirement that students add quotations and links to websites where extra information can be found. Although it would make students uncomfortable and open myself up to criticism from parents for not teaching the material, I could tell the students very little about the investigation, and require them to figure it out themselves with a bit of guidance. In an informal discussion I had with a female student while they were blogging, I noted in my journal, "On the first lab we did a bit looking up on the Internet because we didn't know exactly what caused the formation of bubbles, but then on the next couple labs you had taught us already what we needed to know to complete the lab."

There were some very quality discoveries to me as a teacher, as I strive to always get better. It is very important to commit enough time for students to work on blogs. When technical troubles pop up, it is very frustrating to students if they can't mediate those problems right away. Writing or constructing a blog can be a very large amount of work. Some of the pressure could be taken off the students by giving them some of the information to simply cut and paste into the blogs to take pressure off of student's that expressed in interviews, and journal entries a bit overwhelmed by all the typing. Along

these same lines it will be important for me in the future to not bite off more than my students can chew. On the last of my three treatments students were asked to actually blog about two labs they conducted. Keep it simple will pay dividends as rubric scores did go down when I tried to cram two labs into one blogging session. All this reminds me of my most significant discovery about my teaching and that is that I have a tendency to overwhelm my students with too much in my desire to get more done. In fact when I lay too much at my students' feet to do I actually get less out of them. Addition by subtraction is the term that would describe a way I can definitely improve my trade.

In the future I will commit enough time to the treatment for it to be a primary delivery method, cut out other types of activities, be more deliberate towards achievement of learning goals during the blogging activity, and make sure more guided help is given so that technical issues don't take away from the experience. A student wrote in her journal, "it could be improved by not having to cram so much in." I am guilty of feeling like we are falling behind as a class or really need to squeeze the most out of the time with students. I had a moment like this around the time we did the third blog. I decided that we could get two separate labs in one class period as each lab was fairly simple with measurement and observation periods that did not take very long. In retrospect I really should have done just one of the labs at a time and not had students try to blog both labs, especially with a substitute present. There was a suggestion from one of my students in a follow-up question of the surveys that half of the class could have done one lab, and half could have done the other. Then the whole blogging process would have had another dimension as students were looking at blogs of labs they themselves may not have performed. When we listen to students we nearly always learn

a lot about our teaching.

It became abundantly clear that students will independently utilize the Internet to conduct research about a topic, but they would be much more likely to conduct said research on their own, if it was required of them. When I use this technique again I will modify instruction, as well as the rubric and subsequent scoring to include independent research on the Internet as a part of the blogging process.

VALUE

The use of lab report blogs could be used from the elementary level on up to the college level and even beyond. Research laboratories on college campuses and even corporations could use this idea to share results with the world. The use of these I feel will be especially valuable in school settings. I am not the first to use blogs in this way, but in the future I see lab report blogs as having uses in all levels of school from elementary on up to college level. I feel blessed to be on the cutting edge of what I feel will be a widely utilized method in years to come. Blogging is being used in other content areas, and my findings will hopefully help to build a body of evidence that this method is very effective across many curricular areas. Many teachers at many levels will hopefully capitalize upon the collaboration and creativity possible in the utilization of lab report blogs.

The scientific method at its core and inquiry are what I would use ideally to cultivate knowledge and understanding of complex scientific ideas. This as well as the ability to do the process of scientific investigation is very important, and the use of blogs can do this. As with any classroom technique lab report blogging must be used correctly

for it to be successful. Being very deliberate with how lab report blogs are used with the final objectives in mind will be very important as this technique is refined by teacher-researchers to come. If the idea is for students to report out results, or if the goal is to emphasize the peer review process, or if the goal is for students to engage in independent research, have these goals in mind as specific blogging activities are planned. As always final goals should be in mind as we design the lab and the subsequent blogging activities, as with any good lesson.

For those science teachers that are still reading and interested in trying this in their own classrooms, I have a few suggestions. Be willing to give students the time to refine the blogging process so that time is not wasted on technical issues. Have in mind if you want to improve writing in science, or if you want time spent analyzing results, plan accordingly. Blogging cannot be busy work for when there is a substitute teacher either, unless the students in question are better than novice at the craft of blogging. With necessary help for our students lab report, blogs will be a powerful tools on one's own classroom.

The commenting process was part of the treatment that I hoped would mirror the peer review and collaboration aspect of the scientific method. There were some aspects of the commenting that were very positive, and there were some ways it could be improved. Some of the changes that would be helpful would be to spend much more time on the commenting part of the blogging process. Students suggested groups splitting up and doing several different labs over similar content. I would take this idea and use it. Commenting on another blog over a lab that was completed by the commenter has its place, but I think the commenting could be more vital, and the whole

class collaboration aspect of this treatment could be maximized, with a similar material but different investigative approach. I look forward to the fall to try this, as well as future opportunities to read about some other teacher-researchers experiences with this sort of approach.

The big question that begs to be asked is how exactly can this treatment be modified to accent the independent research aspect of the possibilities of this treatment. In the future in many classrooms for this technique to be effective, students will need to do some of the blogging at home for homework. How can student technical problems be mitigated effectively so that blogging can be done as homework? There are many angles to lab report blogging, which angle does the next science teacher want to explore? In my own design of this research, I made some "rookie mistakes" which would be expected when a classroom is turned into a research lab as things don't always mesh perfectly. In trying to accomplish learning goals in a timely manner and maximize the use of time in the classroom, I flawed my data by "cramming" too much into the third blog of the three-blog treatment. I have an idea that this could be much more effective if I can work on the blogs for a small amount of time every day over a week, so students can break the work up into chunks, questions can be addressed, and then students can do a little more the next night.

If I were to conduct similar research in the future I would make sure to actively collect more baseline data for the purpose of comparison. I would have liked to have looked at students at various achievement levels and studied how this treatment effected them. How does this benefit A students, D students, and all in between? The next researcher in this field can get the hard numbers that I neglected, but I felt I was showing

a new way to the world, not necessarily quantifying it with a pile of numbers and hard data. For someone to suggest that this should have been a research paper with t-tests and significant statistics, is not being realistic. There are way too many variables here to split hairs and expect this to be something a statistician would find useful. Does this treatment help struggling students by bringing them into the loop, and does it level the playing field for them? I think a comparison to how students perform on blogging activities and their learning styles would also give a large amount of insight into learning in the 21st century. This treatment certainly brought the level of collaboration up in my classroom, and the continued use of this technology with end goals in mind should keep expanding my student's abilities as scientists, as well as help me to accomplish specific learning goals in a fun new way.

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APPENDICES

APPENDIX A

INTERVIEW FORMAT

Participation is voluntary and participation or non-participation will not affect grades or class standing.

Date____/____/____ period____ student_____lab blog_____

2010 Action Research Student Interview Format for lab report blogs MSSE 2010-11

Do you prefer writing a lab report as a word document or as a blog? 1) Why? 2) Pros and cons of each?

What new material did you learn from this experience? 1) Content….. 2) technology …. 3) Student comments

What would be some/any Suggested improvement(s) for lab report blogs? 1) the Format? 2) configuration and cooperation needed of Groups? 3) Comments? 4) Scoring?

If you were to assign this activity a score out of 10 with ten being very good and 1 being terrible, what would you score it? _____/10 why? 1) High 2) low 3) compared to other class activities?

Do you feel this activity did a good job of improving collaboration among students? 1) If so how? 1a) Increase communication? 2a) What made it more enjoyable? 3) Why do you think other students learn more with this type of collaborate?

Do you think this activity helped you do a better job of reflecting on the lab activity? 1)how did it help you to look closer at the results? 2) How did it help you to look closer at lab technique? 3) How did it help you look closer at why we did the investigation?

Did you find yourself doing independent research as you worked on your lab report blog? What did you learn as a result of searching the Internet while building your blog?

How would you compare how hard your classmates worked on their blogs compared to standard formats?

Will this change the way you go into lab? Examples?

APPENDIX B

LIKERT SCALE STUDENT PERCEPTION SURVEY

Participation is voluntary and participation or non-participation will not affect grades or class standing

Question	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly agree**
Making this activity online made it more meaningful than regular classroom activities.	1	2	3	4
I learned more information by reading other students blogs than I would have in regular classroom activities.	1	2	3	4
I used the Internet to gain additional knowledge about what was going on in the lab.	1	2	3	4
I saw value in the collaboration among my lab group and other lab groups.	1	2	3	4
I saw value in the collaboration among myself and my lab partners.	1	2	3	4
I feel better able to draw conclusions from experimental observations and data than I was before this activity.	1	2	3	4
I have a better understanding of the importance of collaboration in the scientific	1	2	3	4

Question	**Strongly Disagree**	**Disagree**	**Agree**	**Strongly agree**
process.				
I gained a better understanding of the purpose of this investigation as a result of any of all aspect of the lab report blogging process.	1	2	3	4
I felt that blogging was a good use of my time.	1	2	3	4

APPENDIX C

STRUCTURED TEACHER-RESEARCHER JOURNAL PROMPTS

Date___/___/___ lab being blogged_____

1.) What impact does blogging have on the student bloggers? Positive behaviors observed in students during the blogging process…

2.) How does the commenting affect the students?

3.) How does blogging impact my role as the teacher?

4.) Identify criteria that I believe will show where change is happening.

5.) How can this be a benefit and detriment to my teaching?

6.) Is this a benefit to student learning? How so?

7) Where there any surprising results/observations today as students worked on blogs?

8) As a result of today, would I change anything about this treatment?

What are 3 positive observations from the activity today? 3 negative observations?

Other useful observations:

APPENDIX D

DATA TRIANGULATION MATRIX

Question/data source	Surveys	Interviews	Journals/ obs. data	Blog rubric scores/ archival blog data
How might the use of lab report blogs make me a better teacher?	X	X	X	
How does the online format improve overall student learning?		X	X	X
How does the use of lab report blogs encourage student initiated independent Internet research?	X	X	X	

APPENDIX E

INITIAL BLOG SETUP HANDOUT

Blog:

Group number_____ 3 ketchup 2mustard

Group members _____

_____

_____

- Go to google
- click on gmail.
- Click on the button “create an account”
- For first name enter: svhs
- for last name enter: chem followed by your group number
- login name should be svhschem__ with your group number after svhschem
- password should be “braveblogs” entered twice
- do not choose to stay signed in
- do choose to enable web history
- choose a security question write it here:

- Write your answer here:

- for your recover email write: svhschem@gmail.com

- for your location choose United States

- Choose a birthday that belongs to nobody in your group any birthday will work just

not yours

____/_____/_____

Now enter the word verification and you now have a blog!!!

choose your template.

Text should be typed directly into blogger, avoid problems caused by formatting issues that come from cutting and pasting.

Turn this page into Mr Howell

Nice idea to give them written instructions on how to do this.

APPENDIX F

BLOG REPORT FORMAT

Title:

* *a brief, concise, yet descriptive title*

Introduction:

2 parts:

Statement of the Problem:

* *What question(s) are you trying to answer?*

* *Include any preliminary observations or background information about the subject*

Hypothesis:

* *Write a possible solution for the problem.*

* *Make sure this possible solution is a complete sentence.*

* *Make sure the statement is testable.*

Materials:

* *Make a list of ALL items used in the lab.*

* *Images of materials used*

Procedures:

* *Write a paragraph or a numbered sequential list (complete sentences) which explains what you did in the lab.*

* *Your procedure should be written so that anyone else could repeat the experiment.*

* *Images that show experimental set-up*

Data:

** This section should include any data tables, observations, or additional notes you make during the lab.*

** All tables, graphs and charts should be labeled appropriately* data tables and graphs should be made in excel and saved as images, then inserted into the blog as an image.

** Images that show results*

Discussion:

** Include a summary of the data - averages, highest, lowest..etc to help the reader understand your results*

** List one thing you learned and describe how it applies to a real-life situation.*

**Discuss possible errors that could have occurred in the collection of the data (experimental errors)*

Conclusion:

** Accept or reject your hypothesis.*

** EXPLAIN why you accepted or rejected your hypothesis using data from the lab.*

** discuss additional discoveries made and questions for further study*

** Keep this page for your reference in your 3-ring binder**

APPENDIX G

LAB REPORT BLOG SCORING RUBRIC

Note that the printed version of this is on a landscape format and has been changed to portrait layout for formatting purposes

RUBRIC FOR ASSESSING LAB REPORT BLOGS

Students will score themselves using this rubric (score will be based on student assessment and teacher assessment)

Participation is voluntary and participation or non-participation will not affect their grades or class standing

Names of lab partners_____section

(circle one) 3R 2G

(No more than three no less than two)

Lab name_____ Blog url:

http://SVHSchem____.blogspot.com (2 digit code)

	1 **Beginning or incomplete**	**2** **Developing**	**3** **Accomplished**	**4** **Exemplary**
Introduction **4 pts**	Very little background information provided or information is incorrect	Some introductory information, but still missing some major points. No hypothesis	Introduction is nearly complete, missing some minor points, Hypothesis present.	Introduction complete and well-written; provides all necessary background principles for the

				experiment Clear properly written hypothesis
Experimental procedure 4 pts.	Missing several important experimental details no materials list	still missing some important experimental details, incomplete materials list	important experimental details are covered, some minor details missing, materials list	all experimental details including materials are covered in logical order in paragraph or list format
Results: data, figures, graphs, tables, etc. 8 points	Figures, graphs, tables contain errors or are poorly constructed, have missing titles, captions or numbers, units missing or incorrect, etc. (2)	Most figures, graphs, tables OK, some still missing some important or required features (4)	All figures, graphs, tables are correctly drawn, but some have minor problems or could still be improved (6)	All figures, graphs, tables are correctly drawn, are numbered and contain titles/captions.
Discussion 8 points	Very incomplete or incorrect interpretation of trends and comparison of data indicating a lack of	Some of the results have been correctly interpreted and discussed; partial but incomplete understanding of	Almost all of the results have been correctly interpreted and discussed, only minor	All important trends and data comparisons have been interpreted correctly and discussed, good

	understanding of results (2)	results is still evident (4)	improvements are needed (6)	understanding of results is conveyed
Conclusions 8points	Conclusions missing or missing the important points. No additional findings or questions for further study noted (2)	Conclusions regarding major points are drawn, but many are misstated, indicating a lack of understanding, few additional findings or questions for further study noted nor adequately described (4)	All important conclusions have been drawn, could be better stated, additional findings and questions for further study described with only minor improvements needed. (6)	All important conclusions have been clearly made, student shows good understanding, additional findings and questions for further study discussed in clear detail
Spelling, grammar, sentence structure 4 points	Frequent grammar and/or spelling errors, writing style is rough and immature	Occasional grammar/spelling errors, generally readable with some rough spots in writing style	Less than 3 grammar/spelling errors, mature, readable style	All grammar/spelling correct and very well-written
Appearance and formatting	Sections out of order, sloppy formatting, no images	Most sections in order, formatting is rough but readable,	All sections in order, formatting generally good but	All sections in order, well-formatted, very readable, images

4 points		there are images but with no descriptions	could still be improved photos with incomplete descriptions	used with complete and well written descriptions

Commenting rubric on back ** fill out both please

Avg. score _____

Comments (10 minimum)

to team #	positive comment	constructive criticism	response from or idea taken
1)			
2)			
3)			
4)			
5)			

6)			
7)			
8)			
9)			
10)			