THE IMPACTS OF CLASS WEBSITES ON STUDENT ENGAGEMENT

IN MIDDLE SCHOOL SCIENCE

by

Marka Latif

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STATEMENT OF PERMISSION

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

Marka Latif

July 2014

DEDICATION

I dedicate this capstone to my family and friends for their love and support throughout the entire process. A special thanks to my husband, Quresh Latif and my daughter Pearl, for allowing me the space and time to advance my education.

ACKNOWLEDGMENT

I would like to acknowledge all of the Headwaters Academy staff, students, and parents who were instrumental in all aspects of my capstone project. I would not have been able to complete my project without the honesty and care that my Headwaters Academy family gave me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The purpose of this action research-based classroom project was to understand the impacts of class websites on student engagement in middle school science as well as on student autonomy, student attitude towards homework, and teacher practices. This study was a descriptive study in which 7th and 8th grade science students were observed over a period of a little over four months during which class websites were used in a variety of capacities. It was determined through direct observation, interviews, class assignments, and surveys that class websites increase students' sense of autonomy, but do not change students' feelings about homework. From this research it could not be determined if student engagement is affected by the use of websites, but it was found that teacher practices were positively influenced.

INTRODUCTION AND BACKGROUND

Project Background and Support

Motivation

The Internet is becoming increasingly integrated into society, yet this development is not fully reflected in teaching methodology and classroom experience for K-12 students. One educational researcher commented, "in a world connected and driven by technology, classrooms need to reflect the use of computers by students in their everyday lives" (Bisland & Fraboni, 2007, p. 1). Most classes that I have taught and observed mainly relied on textbooks and paper references. While certain technological developments are becoming more prevalent in the classroom, such as word processing software and Smart boards, the Internet is still used minimally. Students may use the Internet independently to complete schoolwork, but Internet resources are not integrated into the basic functioning and curriculum of classes. The Office of Educational Technology stated in the National Education Technology Plan Executive Summary (NETPES) that "the challenge for our education system is to leverage the learning sciences and modern technology to create engaging, relevant, and personalized learning experiences for all learners that mirror students' daily lives and the reality of their futures" (2010, p.8). Additionally noted in the NETPES was, "that transitioning from predominantly print-based classrooms to digital learning environments promotes organized, accessible, easy-to-distribute and easy-to-use content and learning resources" (2010, p.20). For these reasons I was inspired to investigate the use of class websites in my middle school science classes.

The purpose of this action research-based classroom project was to determine the impact of integrating class websites into a 7th grade life science class and an 8th grade Earth science class on student engagement. Decades of research show that student engagement is significantly related to student learning and thus student engagement provides a logical measure for successful student experience in education (Adkins, n.d.). "In 2009, Gallup studied 78,000 students in 160 schools in eight states, finding that a one-percentage-point uptick in a school's average student engagement was connected to an average six-point increase in reading achievement and eight points in math" (Kamenetz, 2014). Student engagement occurs when there is relevance in learning. Technology is relevant to students as it has become incorporated into the ways in which students think (Prensky, 2001b). To better understand how integrating web resources through class websites impact my students, I created a class website for each of the subjects I teach and monitored my students' reactions to the websites. I also assessed the influence of using those class websites on my attitude towards teaching and my teaching methodology.

Students use the Internet for various personal tasks, including listening to music, checking bus schedules, communicating with others, and learning about world events. Given that students already use the Internet, why separate school from every other part of a student's life by not using web resources for education? As stated in the NETPES, "technology is at the core of virtually every aspect of our daily lives and work, and we must leverage it to provide engaging and powerful learning experiences" (2010, p.7). Using the Internet opens doors for my students to take part in their own education in a

new way and provides ways to advance their understanding of concepts and practice

skills that would not otherwise be possible within the constraints of a normal class.

"Technology should be leveraged to provide access to more learning resources than are

available in classrooms and connections to a wider set of 'educators,' including teachers,

parents, experts, and mentors outside the classroom" (NETPES, 2010, p.8). Researchers

Chandra and Fisher (2009, p.32) state, "the internet has great potential to aid in using

innovative teaching methods." Class websites represent a potentially useful tool for

integrating Internet resources into the classroom.

School Description

I conducted this action research-based classroom project at Headwaters Academy

in Bozeman, Montana. Headwaters Academy is the only independent private middle

school in Bozeman. Thirty-four students are currently enrolled in grades 6th, 7th, and 8th.

The student body is 100% Caucasian and English is the first language for all of our

students. Most of the students come from upper-middle or middle class families, although

30% of the student body receives financial aid. All students have access to computers

with Internet access at home to use for schoolwork, including student's that receive

financial aid. Additionally, most students had personal Internet accessible devices

(phone, tablet, or computer) that they brought to school with them on a regular basis.

In my classes (7th and 8th grade), 4 of 22 students had Individual Education Plans.

Two of these students were diagnosed with dyslexia, one student was diagnosed on the

Autistic spectrum and other displayed language-processing difficulties (F. McDonough,

personal communication, March 2014).

Headwaters Academy's mission is to support the education of "confident, capable learners and leaders for a changing world" (HWA website home page). I did not believe traditional classroom methods were sufficient to meet this mission and therefore wanted to investigate the benefits of class websites as a supplement to traditional resources. In particular, I examined whether using class websites allowed students to learn more independently and to extend their learning experience beyond the classroom, which would better equip them for future experiences in academia and the workplace.

Focus Question

I investigated the impact of integrating class websites into my middle school life science (7th grade) and Earth science (8th grade) classes on student engagement and teaching methodology. The specific research questions that I addressed were:

Overarching Question

- What are the impacts of class websites on student engagement in science class?

Sub Questions

- What impacts do class websites have on students' sense of autonomy when learning science?

- What are the impacts of class websites on students' perception of homework?

- What are the impacts of using class websites as a tool for teaching?

CONCEPTUAL FRAMEWORK

Students currently in grades K-12 have been exposed to technology and the Internet for most of their lives. Students are well versed with the use of technology to gain information and to access digital sources. In contrast, most teachers were born and educated in a time before the Internet was mainstream and before there was a computer in

every home or for that matter in every pocket. Because of these differences in current versus historic childhood and adolescent experiences, "today's students think and process information fundamentally differently from their predecessors" (Prensky, 2001a, p.1). People who were not raised with computers and have developed the current education system think in a step-wise manner; their thoughts progress linearly. William D. Winn Director of the Learning Center, Human Interface Technology Laboratory at the University of Washington described today's students as associative thinkers. Winn said, "It's as though their cognitive structures were parallel, not sequential" (as cited in Prensky 2001b, p.3). Having teachers and students with brains that function differently presents a challenge for the educational system. It is suggested by Peter Moore that, "linear thought processes that dominate educational systems now, can actually retard learning for brains developed though game and Web-surfing processes on the computer" (as cited in Prensky 2001b, p.4). Teachers must educate students in a way that addresses these differences in how they versus their students think. Teachers could use class websites as one tool to bridge this gap by including all their desired content in a format with which students would be comfortable. Even if teachers understand the advantages of using a class website, however many are uncomfortable with technology in general and therefore reluctant to use technology in their classes. In a study of the implementation of information and communication technology in ten Dutch secondary schools, researchers Mooij and Smeets found that, "If teachers are not confident in their ability or competence to handle computers this may hamper their willingness to introduce technology in their classrooms" (2000, p.266). In a survey of over 2,000 Advanced Placement and National Writing Project teachers it was found that 75% of the "teachers say the internet and other

digital tools have added new demands to their lives, agreeing with the statement that these tools have a "major impact" by increasing the range of content and skills about which they must be knowledgeable" (Purcel, 2013). One factor that affects the likelihood of a teacher using Internet based technology is age. According to the previously mentioned study, "45% of teachers under age 35 have their students develop or share work on a website, wiki or blog, compared with 34% of teachers ages 55 and older" (Purcel, 2013). Given this, a factor as to why Internet based resources are not yet integrated into the education system might be because only 15.3% of teachers are 30 years old or younger and 30.7% of teachers are 50 years old or older (Statistics from the Institute of Education Sciences survey, 2009).

There are multiple potential benefits to student learning provided by classroom websites. Class websites can provide a tool for students to navigate the vast amount of resources available through the Internet. In a study of two sixth grade classes that integrated Internet resources into their classes, "extensive support and scaffolding" were necessary for best results when using Internet resources to achieve specific learning goals (Hoffman, 2003, p.323). Students' can become frustrated when using Internet resources without assistance because the enormous amount of information available makes it difficult to locate information relevant to specific questions. For this reason, a class website could be used to focus students towards a body of information relevant to specific assignments. An Edutopia post describes, "Successful technology integration is achieved when the use of technology is supporting the curricular goals, and helping the students to effectively reach their goals" ("What is," 2014). Students use of the Internet needs to be supported and specific to be most affective. Class websites could be used to aide students in affectively integrating Internet resources into their learning.

Class websites could also improve learning by allowing students to take an active part in their education. A study of 302 secondary school students from 11 different science classes analyzed the impact of a teacher-created website on students' perception of science lessons (Chandra & Fisher, 2009, p. 35). The students in this study found the website to be convenient for accessing web resources linked through the teacher-created websites and, consequently, they felt more independent and involved with their learning (Chandra & Fisher, 2009, p. 43). One 10th grade student from this study stated, "Students can have another source where they can gain information. This enables them to have a better opportunity to achieve better results" (Chandra & Fisher, 2009, p. 40). In addition to having multiple sources from which to glean information, a blended learning environment has the potential to utilize class time more effectively. In a document titled "Understanding the Implications of Online Learning for Educational Productivity from the Department of Education" it is stated, "online learning allows class time to focus on activities and discussions that take greater advantage of teacher skills and real-time interaction with students" (2012, p.24).

Class websites can also increase student motivation, which is required for learning. A review of 30 qualitative and quantitative studies found that students who combined online learning tools with conventional classroom experiences were more self-motivated than other students (Bekele, 2010, p.125). Additionally, some studies in this review found a positive correlation between motivation and achievement. Factors enhanced by the use of online tools that increased motivation were the flexibility/convenience of Internet resources, knowledge acquisition, and accomplishing

learning goals (Bekele, 2010, p.119). This concept was also supported by U.S.

Department of Education research, in an article that stated, "productivity gains can result

from focusing on specific student needs in order to improve learning or from using

student time more effectively" (2012, p.23).

Given these potential benefits of a class website, I was inspired to develop a class

website to improve my student's learning experience. My position in a small, private

school provided me with particular opportunities that facilitated this endeavor. For

example, I had full control over my curriculum and did not have to worry about following

a pacing guide to prepare my students for standardized testing, allowing tremendous

flexibility for trying alternative teaching methods. Also, working in a small private

school, learning individualization was expected of my by parents and administrators. In a

gathering of educator, it was determined that online resources are an effective tool in

tailoring education to each student's specific needs (Twigg, 1999). From this meeting of

minds it was also discussed how not only does the use of online resources provide

individualization in education in and of itself, but also because learning can take place

outside the classroom, the time in the class can be better focused on individual student

needs (Twigg, 1999). Finally, all of my students had consistent access to the Internet at

home and most of my students had either a laptop or tablet that they brought to school.

Given these aspects of my teaching situation, I was able to ignore some of the factors that

could interfere with studying impacts of class websites. Thus, I was able to focus on

examining whether using a class website bridged my linear way of thinking with my

students' more associative way of thinking. As an indicator of success, I examined

whether the website I created increased student engagement.

I drew inspiration from Chandra and Fisher (2009) when designing this study. They analyzed the impact of integrating a teacher-created website on students' perception of science lessons. Their website was designed in ways shown to increase ease of use and accessibility of information, as well as improve students' interactions with information in a way that is not possible with printed material. With multiple surveys and email feedback, this study documented the effectiveness of the website from the students' perspectives. I was additionally inspired by Asunka, Chae, Hughs, & Niatriello (2008) who analyzed the habits of students when seeking information from websites. I used similar data collection and analysis methods as used in their study.

METHODOLOGY

I preformed a descriptive study for my action research-based classroom project, which consisted of observing and monitoring the impact of utilizing class websites on student engagement in my 7th grade life science class and 8th grade Earth science class. Over the span of time from late October 2013 until the beginning of April 2014, I observed the response of my students to the different ways in which the class websites (one for each class) were utilized. Every student in both of my classes participated in my study by providing feedback on the use of the websites through teacher observation, starter questions, exit cards, surveys, class assignments, and interviews. This project received exemption by the Institutional Review Board of Montana State University and complied with standards for working with human subjects (Appendix A).

In the beginning of the 2013-2014 school year (end of August 2013) I set up a website to be used by both my classes and then began heavily utilizing the website in October. Throughout the treatment period I made many changes to the websites. For

example, in December 2013 I split the original website that I used for both classes into two different website so each class had a unique website. By constantly checking in on my students' opinions of the websites, I altered the websites to best meet the needs of my students. I did not simply want to replace old paper methods of teaching with digital methods, but rather, I wanted to transform the students' experience in learning by using the websites to customize their learning experience. As described in an eSchool report, "simply overlaying technology onto traditional teaching practices 'will have only a limited impact on learning'" ("Powering the Digital Classroom," 2013, p.19). For example, on my class websites, instead of simply linking a study guide document before a test, I created interactive study tools such as flashcards, vocabulary games, practice quizzes, and review videos.

Table 1 indicates some of the ways in which I used the class websites, in both the classes.

Table 1
Avenues of Integration of Class Websites

Website features	Purpose of feature
Homework videos/links to Internet resources	Provide options for various learning styles and a tool for navigating the Internet
Class information (due dates, calendars, extra credit opportunities, etc.)	Encourage student autonomy in keeping schedules and awareness of grades
Important documents (i.e. permission slips, syllabus, project guidelines, science fair forms, etc.)	Save paper and time by not printing materials
Class surveys/polls	Allow student's opportunities to give feedback on various aspects of class
Student blog page	Encourage student participation in website material
Class resources (study guides, flash cards, practice quizzes, vocabulary games, etc.)	Differentiation and opportunity for students to further areas of interest

Classroom details

I teach one 7th grade life science class and one 8th grade Earth science class. There

are 14 students in the life science and 8 students in the Earth science class for a total of 22

students that were a part of my study. The classes are both on a modified block schedule

so that I only teach three days a week. On Tuesday and Thursday the classes last for one

and a half hours and on Friday the class is only an hour. The websites that I used for the

treatment were similar for both classes. Most of the time students did not independently

use the website in class, but instead I had the website accessible on the projector so that I

could reference features of the website that related to the lesson at hand. This way the

students knew how to use the websites at home or in study hall to support them in their

learning or further their interest in the topic. If students chose to bring their own device

(i.e. laptop, tablet, or smartphone) they could access the resources during class but in

general students mostly accessed the websites outside of class time. The exact material

that I included on the website for each lesson varied depending on the content of the

lesson.

Website Descriptions

The teacher made website was created through the "Weebly" website as an

education website. The website that I initially created was titled, "Ms. Marka's Science

Classes." I used this one website for both classes from October until December. For the

arrangement of the website I created seven tabs to help students best navigate the

resources. The tabs included, Home, 7th Grade Life Science, 8th Grade Earth Science, Life

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general information that is important for all students in both classes such as my office

hours, a contact form, and the student blogger assignment. On the pages for each of the different classes I had information pertinent for just that class. For example, I posted homework videos in chronological order pertaining to what each different class was learning at the time. However, it was getting cumbersome for students to scroll through all the information as time went by, so in December, over the Winter break, I split the website into two different websites. The new websites were also though the Weebly site and named Ms Marka's Life Science Class and Ms. Marka's Earth Science Class for my 7th and 8th grade classes respectively. Once I split the website, I changed the available tabs so that each tab related to a specific unit. For example, on my life science website I have tabs for "Cells," "Genetics," "Anatomy & Physiology," and the like. I also have a Home Page, Test Resource, Science Fair, and RAS (blog page) tab for the website in each class. The reason organization and design of the websites is so important is because I do not have specific lessons given through the websites rather students must be able to navigate the website to best support their learning. While I may assign students to watch a specific video posted on the website (similar to a flipped classroom) it is then their responsibility to use the other resources on that topic if they need to review or relearn some of the concepts or if they want to delve further into the topic.

<center>Data Collection</center>

For my research, I included all of the 22 students from both classes that I teach. I decided to use the treatment in both classes to be fair to students and to understand if there are any nuances in the effectiveness of the websites depending on the class. Between both the classes there are 13 girls and 9 boys between the ages of 11 and 13.

Four of the students have designated learning disabilities with an Individual Learning

Plan mostly pertaining to language processing skills such as dyslexia.

For both the life science and Earth science classes I used the same methods to

integrate the websites into the classes but depending on the topic of the lesson I used

different aspects of the websites at different times. During my study I used a variety of

data collection methods as stated in Table 2 to be able to address my research questions.

Table 2
Triangulation of Data Collection Methods

Research Question	Data Source	Data Source	Data Source
Overall engagement	Student group interviews	Student survey and starter questions	Website use
Independent learner/autonomy	Student group interviews	Starter questions	Teacher observations
Homework perception	Student group interviews	Student blog/ blog comments	Parent survey/ inter view
Effect on teacher	Teacher Survey	Attitude scale	Teacher Journal

Student survey

At the end of October 2013 (at which point I only had one website for both

classes), I posted a student survey (Appendix B) on the website to gain background

information concerning the students' attitudes towards science, use of Internet resources,

and homework in general. The survey asked students to rate their agreement (1=strongly

disagree, 5= strongly agree) to a series of statements (table 3). Students were encouraged

to provide their honest opinion by clearly stating that their responses would have no

effect on their grade or class standing and by allowing students to keep their responses

anonymous if desired. Nineteen of 22 students responded to this survey.

Table 3

Elements of Student Survey Used to Address Two Research Questions. Students were Asked to Rate their Agreement to These Survey Statements

Related research question	Survey statement	Statement number
Overall engagement	I think science is interesting	1
	Science is boring	2
	I would like to be a scientist	3
Homework perception	Homework helps me learn	4
	I hate homework	5

Blog Assignment

　　　　Early in the school year, I initiated an ongoing homework assignment for which

students were asked to contribute collectively to a blog. Each student was asked to

contribute a posting once per semester. The purpose of this assignment was twofold.

First, it gave students an alternative to traditional worksheet-based homework by

incorporating web resources and blogging. Reactions to this assignment therefore

provided data addressing the question of how websites affect student opinion of

homework. Second, this assignment was intended to inspire independent investigation of

topics that interested them personally. The extent to which this occurred had implications

regarding whether websites affected overall student engagement in science and

autonomous learning. The assignment was entitled "Random Act of Science (RAS)" and

involved students conducting independent research into any topic related to science and

then briefly summarizing their findings (assignment instructions in Appendix C). For

example, last semester a 7th grade student completed a RAS for which he watched a

YouTube video that described the role of cell organelles by comparing them to robots. He

then summarized the main points of the video, described why he found the video

interesting, and then hypothesized broader implications of the information he learned

(i.e., why people in general should find the video interesting) (see Appendix D for this RAS). Once submitted, I would post students' summaries and the sources they used (e.g., articles, website, or videos) on the blog page of the website. Students could then view and comment on each other's work. After all students submitted at least one RAS (submission of multiple posts yielded extra credit), I queried students regarding their experience using a starter question (a question given at the start of a class and completed immediately). I asked them, "Are you excited to do another RAS this semester?" To understand whether the assignment affected student engagement, I asked, "Do you think the RAS makes science class more interesting?" I asked students to rate their responses from 1 (strongly disagree) to 5 (strongly agree).

Classroom Assessment Techniques

Starting in January 2014, I periodically asked students starter questions or had students fill out exit cards pertaining to website use and the effect of using the website on their learning. For example, prior to January 14th, I created tabs entitled "science fair" and "finals review." I did not assign students to look at these tabs, but I did inform them that they were available and contained useful resources. On January 14th, I asked students, "Did you look at the science fair tab or the finals review tab? If not why?" This question allowed me to understand whether students independently accessed the website without being required to do so.

Group Interviews

On March 5th and March 18th, I conducted focus group interviews with my students. I first interviewed five of my 8th grade students (four female and one male) to discuss how the class website had affected their learning and engagement in science

class. During the interview, I asked four main questions (table 4) and allowed students to

volunteer answers as desired (i.e., without having to raise their hands; main questions and

follow-up questions listed in Appendix E). I recorded the interview using an Ipad (video

recording setting on the Ipad camera) so that I could focus my attention on the students'

discussion rather than on writing. I asked the students questions concerning all aspects of

my AR project (overall engagement, learner autonomy, and attitude towards homework).

Before starting the interview, I informed students that their participation was purely

voluntary and would not affect their grade or class standing. For the second interview, I

spoke with ten 7th grade students (five male and five female) using the same protocol.

Table 4
Interview Questions Used to Address Three Research Questions

Interview question number	Interview question	Related research question
1	How often do you access the class website without being asked to do so?	Overall engagement
2	Do you feel more involved in the class because you can access information whenever you want through the website?	Overall engagement
3	Do you feel like you have more control over your learning because of the resources available on the websites?	Independent learner/autonomy
4	Does the websites resources change your opinion of homework?	Homework perception

Parent Survey

In late March, I asked parents of all 22 students to fill out a survey pertaining to

how they felt about the website and how much their son/daughter used the website at

home (Appendix F). Asking parents about their student's use of the website provided

insight relevant to all of my study questions.

Website Statistics

Beginning in early February, I began compiling statistics generated through Weebly on the number of times the class websites had been viewed. Weebly allowed me to summarize how frequently each website was viewed, how frequently a unique viewer visited the website, and which pages on the website were viewed. In early March, I also set up Google analytics account to track the average amount of time spent on each page of the class websites per visit.

Teacher Journal/self survey/attitude scale

Throughout the study period, I maintained a teacher journal in which I recorded events pertinent to my study and my reactions to apparent effects of the treatment. Journal entries provided a longitudinal view of my attitude towards the websites and the effects of the websites on the students over the course of the study. In addition to the journal, I answered a self-survey each week concerning my feelings on the general effectiveness of and attitude towards the websites.

Validity and Reliability

To improve the validity of my inferences, I collected data using at least three methods for each study question (Table 2). To best account for reliability I carefully documented my observations and other data sources so that I have a clear record of how my study questions are addressed using my data.

DATA AND ANALYSIS

Website effect on overall student engagement

To better understand the students' general impression of science (early in the
year), in a survey, I asked students opinions of the statements, 1) "I think science is
interesting," 2) "Science is boring," and 3) "I would enjoy being a scientist" on a scale of
1 = strongly disagree and 5 = strongly agree. Table 5 below shows the average initial and
final rating for each question as well as the p-value from a Fisher's exact test (two other
survey statement results are in Table 5 that will be discussed in a later section).

Table 5
Student survey data regarding student opinion of science

Statement (statement number)	Initial response rating (mean, SD)	Final response rating (mean, SD)	Fisher's P
I think science is interesting (1)	4.3, 0.79	4.4, 0.68	0.9
Science is boring (2)	1.5, 0.69	1.4, 0.74	0.6
I would like to be a scientist (3)	3.9, 1.25	3.2, 1.21	0.4

On average the students agreed with statement 1 and disagreed with the statement
2. Responses to both statements indicated a generally positive view of science. There was
a slightly lower average rating to statement 3 as compared to statement 1, indicating
some students have an interest in science but do not necessarily want to pursue a career in
science. An eighth-grade female student stated in the comment section "I would enjoy
being a scientist but I am interested in other things as well." Three other students wrote
comments with a similar sentiment. At the end of the study period, in late March,
students were again asked to rate statements 1–3, to which they provided similar
responses very similarly as they had in the beginning of the study (see Table 5). From
Fisher's exact test comparing initial versus final responses for statements 1, 2, and 3

resulting p values indicate that there is no statistical difference between students' initial and final responses to statements 1, 2, and 3.

In March, I conducted two group interviews: one with a portion of the 8th grade Earth science class and the second with a portion of the 7th grade life science class. During the first interview, I asked the group, "How often do you look at the website without being asked?" (Question 1, table 4). Four of the five eighth grade students said they looked at the website once or twice a week even if they had not been asked. One student said, "I usually check it before every class, even if just on my phone, so like three times a week." Many students also stated that they check the website more frequently when there was something important that they were working on in class like science fair or studying for the semester final. One student added, "Sometimes I check without being asked to see if there is extra credit that I can do." The students from the seventh grade who participated in the second interview had a broader range of answers to this question. Four of the students answered that they check the website 3-4 times a week usually once for each class period and then once on the weekend. Three other students responded that they check the website once a week during the weekend. One of those students said, "I check it then [during the weekend] because I have time to look through stuff and listen to the videos that are not required but fun." Two other students responded that they check the website every other week or less unless otherwise instructed and one student said she never checks the website unless it is specifically required.

I also asked the two groups, "Does having the website make you feel more involved in class?" (Question 2, table 4). One student in the 8th grade group immediately answered, "No! I just feel like it's nice to have it because we can have somewhere where

we can look but it [the website] doesn't make me more involved." Another student in the 8th grade group responded, "I like being able to recap class videos or notes or the other stuff you put there. It's a nice reference point, but I would not say I am more or less involved in class because of it." The 7th grade student's responded similarly in that the students enjoyed the website but did not feel more involved in class because of the website. One student in the 7th grade student answered, "It's not that I am more involved in class because of it [the website] but it makes class easier because either I can prepare for class before hand by looking on the website or I can review what happened in class afterwards." Another 7th grade student said, "I like the website because there is a transition between each class which makes not being in science class everyday easier." As mentioned previously, both the life science and Earth science classes were on a block schedule and therefore I only met with each class three times a week.

Data provided by Weebly showed that students were viewing the websites almost every day, which was more frequent than required to complete particular assignments (Figure 1). The spikes in the number of views often corresponded with a day in class when resources were made available on the website that were specific to what we were doing in class that day. For example, on February 18th the class was working on designing and putting together their science fair boards, and I had posted examples of good and bad poster designs as well as a check list of what exactly needed to be on their boards. During that class I noticed a lot of students used their personal technology (such as laptops, tablets, and phones) to go to the website and view the available resources. After February, the science fair was over and I did assign homework that was accessible through the website for the life science class. I assigned website based homework on

March 18th, 25th, and 27th. Figure 1 shows that there was a spike in page visits for the life

science website on the 27th and views were well above the mean number of page views

per student (1.5 [0.83] for the life science website) for the other days homework was

assigned. In addition to spikes corresponding with specific assignments for which the

website provided resources, however, there was a daily baseline of page views. For the

Earth science class, I did not assign homework through the website that had to be

completed on any particular day even after the science fair (through March), but I did

provide resources related to topics I was teaching in class. While there seems to have

been more views of the Earth science page in March than in February, there was no

particular day when views spiked dramatically. Data on website views also indicated life

science students viewed their website more frequently than Earth science students.
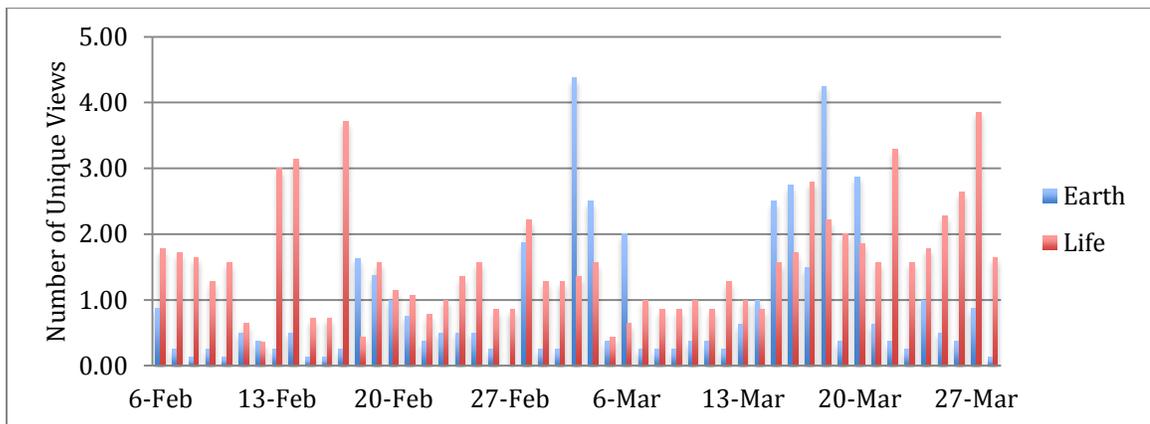
Figure 1: Unique Views of Class Websites per Student - Earth and Life Science Classes,
(*N=8 and 14, respectively*).

From February 26th to March 28th, Google Analytics recorded that the average

time spent on the life science and Earth science websites were 2 min, 34 sec and 3 min,

23 sec, respectively.

The main question in the survey sent to parents at the end of the study period related to students overall engagement. I asked parents to rate their response (1 = strongly disagree, 5 = strongly agree) to the statement: "I feel my student is more engaged in learning science because of the resources on the website." The mean rating for this question was 4.4 (SD = 0.84 for responses by 10 parents). Six of 10 parents strongly agreed with this statement, indicating parents felt the websites did increase their student's engagement in science class. One parent commented, "I do think the website is effective at engaging our child. She does comment on the videos she watches for your class, and I have no doubt that she is more engaged because of your use of technology." As part of this survey, parents also indicated that they did not often do school work with their student at home, but many parents commented that their student frequently told them about the available resources. The fact that the students communicate with their parents about what is available on the website suggests that the website does encourage student engagement even outside of class time. None of the parents surveyed, reported that they independently viewed the websites but they did acknowledge that they often heard or saw their student using the website.

<center>Data to understand website effect on learner autonomy</center>

From the first student interview that was comprised of five 8th grade students I asked students, "Do you think you have more control of your learning because you have a place to go [the website] to help you learn?" One student immediately replied, "Yeah! You don't have to wait for the teacher to tell you stuff because you can just look on the website and get it yourself." Other students mentioned they really like having the website as a test resource because the flashcards and practice questions were already made. Again

they discussed that because they have so little time after school they were happy they did not have to waste the time to make study guides and then have to spend more time studying. They could simply go straight to studying through the website resources. These responses made me concerned that by providing too many resources for students, they would not have the opportunity to learn to make their own resources such as flashcards or study guides. So I followed-up by asking, "Do you feel like I am coddling you by having the resources already made? Do you feel like you are missing out on a part of the process by not having to make it yourselves?" All of the students adamantly replied, "NO!" One student added, "It's not babying us to have it made for us because it is more accurate and more focused so we don't feel like we are guessing about what is right to study. You also have the correct definitions or answers so we do not have to worry about studying something that is incorrect." These comments show that students feel a sense of academic independence because of the class website.

During the second interview of ten 7th grade life science students I again asked, "Do you think you have more control of your learning because you have a place to go [the website] to help you learn?" Immediately a couple of students said, "no" but then students began to add, "maybe," and "sort of." One male student said, "It [having the website] makes learning more accessible." Then a female student added, "It doesn't make me feel more in control of my learning, but it makes the time between classes easier because you do not have to second guess yourself about stuff like 'did we have homework' because you can just check the website." One of the students who originally answered yes to the question, described how she liked the website because it helped her remember stuff from throughout the year. She went on to say that in other classes it is

hard to remember stuff long-term because you learn a unit, take a test, and then forget the material. However with the website, learning is more continuous because you can always go back and reference material from any unit. To follow up on the answers that were generated from the original question, I then asked, "Does having the website make you feel more independent in your learning?" To this question about half the class immediately responded positively (with "yes," "uh huh," or affirmative head nods). A student then described how he felt that it made him more independent because he could chose when he wanted to learn the material. He said, "I am not always focused enough in class to learn when the teacher is telling me something but with the website I can choose to go over the stuff when I am ready to learn it." I then asked if students would be willing to discuss if and how the website does not make them feel more independent in their learning. Immediately they all said "yes" but then when asked to give details most students ended up saying that the website does make them feel more independent. There were only two students that ended up confirming that the website did not make them more independent learners and it was the two students who said they barely ever went to the website unless it was specifically required. This is strong evidence that having a class website gives students a sense of autonomy.

In addition to interview data concerning the effect of the websites on learner autonomy, I also periodically had students answer a starter question relating to this study question. In the middle of February when both classes were focusing on science fair I posed the question, "Do you like having science fair resources on the website to be able to reference independently or would you rather go over that material during class?" Out of the 22 students in my study, 19 students responded to this question. Out of the 19

students that responded, 8 students answered positively, 7 students answered that they would like the resources to be both on the website and discussed in class, and 4 students answered that they would rather have the resources given/discussed in class. One of the students who responded that they would rather not have to look at the website for the science fair resources said, "It is more work to have to look it up myself. It would be better for you to just tell me what to do." The other students that would rather have science fair resources given/discussed in class described a lack of time after school to have to "search through the website," to find what they need. The majority of the students that said they liked having the resources on the website described that they would rather have class time to work on their science fair project and go over the other stuff at their own pace. One of those students wrote, "I think some kids need more help than others so having the stuff on the websites makes that difference ok, because then if you want to go over that stuff more you can or if you do not need to look at it then you do not waste the time in class." The student's responses to the starter question indicate that in general students like being able to look at the resources at their own pace. This gives them the autonomy to choose the amount of time they spend on the various aspects required for completing their science fair projects.

As part of the parent survey, I asked parents about their involvement with their student completing schoolwork. I asked the following two questions related to how much parents do schoolwork with their student, "I monitor my student while he/she is doing homework" and "I help my student do his/her homework." On a scale in which one indicates strongly disagree and five indicates strongly agree, the ten parents that answered the survey, responded to these statements with an average rating of 2.0 (SD

1.1) and 2.2 (SD 1.2) respectively. This indicates that parents generally do not monitor or help their student with homework. Given that all 22 students in the study received above an 80% for their homework grade in the first semester and above 85% for their homework grade by the end of the treatment period, the data suggest students were autonomous in completing work out of the classroom.

From my observations throughout the treatment period students became aware of the ways in which the website could be used and this gave them more autonomy to delve deeper into topics. In the beginning of the study period, students' questions asked in class and during study hall were relatively simple and did not often demonstrate higher order thinking. After having the class websites available for students to check basic information, I noticed students' questions becoming more complex towards the end of the treatment period. For example, in the beginning of the year students were asking direct questions such as "what is the difference between the definition of a population versus a community," which could be easily found on the website. Towards the end of the study period students asked more integrative questions that revealed a higher level of understanding. Following lessons on meiosis and evolution, a student asked whether diploid cells with different amounts of chromosomes are produced when animals of different species hybridize. This question revealed an attempt to integrate two pieces of knowledge: 1) that different species can have different numbers of chromosomes and 2) that different species (e.g., a horse and a donkey) can sometimes produce hybrid offspring that may or may not be themselves reproductively viable (e.g., a mule). While such development in thinking could be partially associated with a student simply developing academically over the course of the school year, the particular student that

asked this question stated that she thought of this after reviewing some of the evolution

material on the website now that we had learned more about genetics and cells. I recorded

five additional observations in my teacher journal throughout March that referred to

students asking pointed questions based on what they learned or reviewed via the

website. In contrast, I only recorded one such observation in January, one in February,

and none in October through December.

<u>Data to understand website effect on attitude towards homework</u>

From the student survey I also wanted to gain an understanding of student's initial

opinion of homework. When asked to agree or disagree with the statement: "I hate

homework," students' answers were mostly neutral, erring slightly towards disagree

(scores in table 6). Given the average rating a student gave this statement (2.9; SD 1.29)

and student comments on this question, I believe that students understand the purpose of

homework, but that students feel they spend too much time on homework. One 8th grade

female student stated, "I don't hate homework but sometimes it can be overwhelming

when you have lots of homework in other classes too." A 7th grade male wrote, "I realize

that homework is important, but to be honest I would rather be climbing or painting in the

time that I spend doing homework." I asked students to rate this statement again towards

the end of the study period and the average rating was 3.5 (SD 1.1). The p value from a

Fisher's exact test comparing the initial and final responses was a 0.03 (Statement 5, table

6).

Table 6
Student Survey Data Regarding Student Opinion of Homework

Statement (number)	Initial response rating (mean, SD)	Final response rating (mean, SD)	Fisher's p
Homework helps me learn (4)	4.1, 0.89	3.4, 1.12	0.09
I hate homework (5)	2.9, 1.29	3.4, 1.12	0.03

On the same survey students were also asked their opinion of the statement, "homework helps me learn." Students agreed with this statement (rating = 4.05 [0.89]; *n*=19). However, in the comment section related to this statement five students alluded to exceptions. A seventh-grade female who rated the statement a 4 (agree) commented, "If its good homework! But busywork... not so much." Another student who rated the statement a 3 (neutral) wrote, "Sometimes i [sic] really could use practice and homework is helpful and other times it is pretty useless." This highlights that students recognize that homework is theoretically helpful but a waste of time if they have a clear understanding of the information from the class. At the end of the treatment period, students tended to rate this statement neutrally (3.5 [1.1]). The p value from a Fisher's exact test comparing the initial and final responses was a 0.09 (Statement 4, table 5).

To better understand students' reaction to a particular assignment (the RAS assignment), I posted a starter question that asked, "Are you excited to do another RAS second semester?" Out of the 19 students from both classes that completed this starter question, 11 responded positively, 3 responded neutrally, and the remaining 5 students responded negatively. Of the five students that responded negatively, three described that they were just too busy and overwhelmed with schoolwork to be excited about doing anything outside of class time, suggesting negative reactions to the assignment were a product of overwhelming schedules rather than the actual assignment. Only one student

wrote negatively about the actual assignment. That student was frustrated that her first RAS was not interesting to her and she was therefore not inspired to try again. As stated previously over half of the students responded positively (58%). Many of the students commented that it was fun to look at whatever videos or read whatever articles they chose (which also has implications on learner autonomy). One of the students that replied positively wrote, "I am more excited b/c [sic] the last one was very fun and I was not expecting it to be fun."

During the first interview of 8th graders, I asked the group whether or not they had a negative, positive, or neutral attitude towards homework. All of the students very quickly and emphatically answered "negative." Then I asked whether they felt differently about homework in science class because of how the website can be used to facilitate homework or offer options for homework. Initially, three students answered a definite, "NO!" Then after a moment of thought, one of the students who did not reply immediately said, "Well sort of, it depends on what it is. Like I like the videos but if it is just a worksheet [that we download from the website] then it's the same." The other student who did not immediately reply with "no" then said, "It's better homework, but still homework." The students then discussed how the problem with homework in general is that it takes up a lot of time after school that they could be doing other things including going to bed at a reasonable hour. After considering that the issue with homework is the time it takes, the students then commented on how the website makes homework more palatable because they can better gauge the time it will take to complete it. For example, the videos have the time length so students know that they will only be spending that certain amount of time (usually 10-20 minutes) watching the video. The male student

said, "The videos are more interesting than worksheets. Also, most of the videos you can just listen to so you can do other stuff while you are listening to the video which makes it a better use of our time."

During the second interview of 7th graders I asked the same questions: "Do you have a generally positive or negative association with homework," and "Is your perception of homework different in this class because so much of the homework is through the website." Similar to the 8th grade students from the first interview, the 7th grades students stated that they have a negative association towards homework but understood the underlying purpose. Students discussed that some homework is helpful in advancing their understanding of a subject, but they still do not really like doing homework. One student then commented that she does not feel like the stuff on the website is homework even though she works on it at home. Another student added to this by describing that he defines homework as "something I have to do to get a specific grade, whereas stuff on the website is there to help better understand the stuff we are learning and I can choose whether or not to look at it depending on how well I get what we are doing in class." A third student then described that she prefers the videos or interactive website material such as flash cards or practice quizzes because they are not "as boring as worksheets." A different student agreed with this comment and added that, "I understand homework is for practice but a lot of homework feels like busy work to me if I already kind of know the stuff. But with the website I can pick to look at the flashcards once or I can look at them a million times depending on me." Given the students' comments from both interviews, I feel that students preferred working on school material through the website afterschool compared to more traditional homework.

So even though students maintained they did not like homework, the website allowed students to continue learning outside the class without feeling like they were doing homework.

Another piece of data suggesting that the students can feel like they are not doing homework (to which they have a negative connotation) when working through the website comes from the Random Act of Science (RAS) assignment. On multiple occasions over the study period I asked students for their perception of the purpose of certain paper based assignments (both in my class and in their other classes), to which they would often respond, "To give us homework." I would then ask those students if they thought the assignment might be so that they could practice a skill or concept, to which the students would often reply, "nope, it is to put a grade on our report cards." When I queried students regarding the purpose of the RAS assignment via a starter question in early February, most students suggested the purpose of the assignment was to provide something they could do for fun. For example, one student wrote, "to just learn about cool science that is random and give us a break from the day to day life." Another student wrote, "to share cool things about science." Not one student referred to this assignment as homework or just a way to be graded.

When surveying parents, I asked them to rate their agreement with the following two statements concerning students' attitude towards homework: "I feel my student is more engaged while doing homework because of the format of the homework on the website" and "I feel my student's attitude towards homework is positive because of the format of homework on the website." The ten parents that responded to the survey answered with average scores of 4.4 (SD 0.84) and 4.3 (SD 0.82) respectively.

Data to understand website effect on teacher

Every week, I recorded five pieces of information: 1. Time spent on developing the website, 2. Time spent researching and prepping lessons, 3. Time spent reviewing lesson plans before teaching, 4. Time saved in class because of website resources, and 5. General feeling of effectiveness of website (Appendix F). Over the 18 weeks of the study period, the time spent on developing the website decreased (Figure 2). In the first six weeks I spent between four to eight hours developing the website, but after week six I never spent more than four hours on website development. The mode of time spent on website development after week six was two hours. Time spent researching and prepping lessons did not change much over the span of the study period (4–6.5 hours per week; Figure 2). The amount of time spent reviewing lesson plans before teaching decreased over the study period (Figure 2). In the first 11 weeks, I spent approximately one hour reviewing for each class, but after week 11, I spent closer to 30 minutes reviewing for each class.
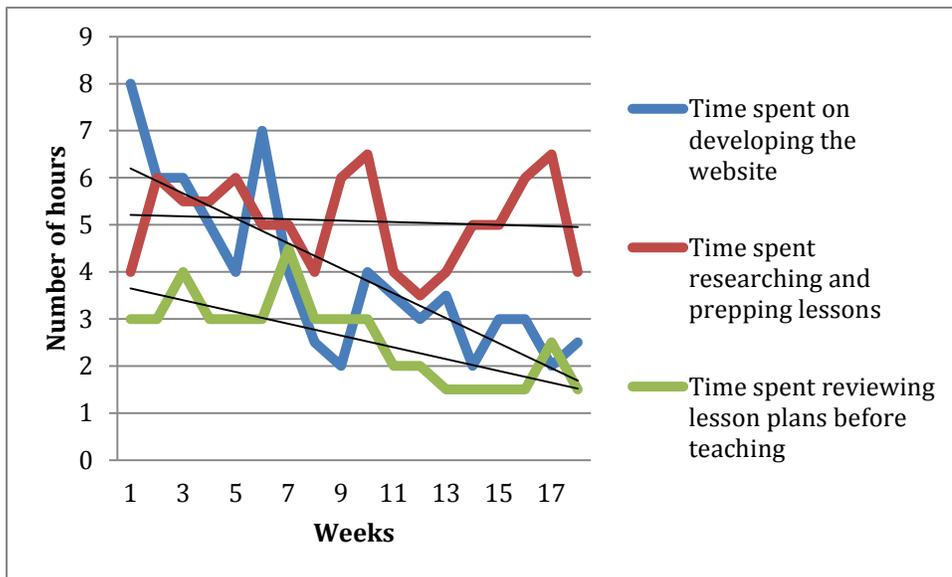
Figure 2: Effect of Websites on Teacher Time Spent Developing, Planning, and Reviewing Lessons.

For questions 4, 5, and 6 of the teacher survey, I simply wrote down my observations, impression, and feelings each week. During most weeks, I identified at least one or two ways in which time was saved by using website resources. During weeks four and five, I did not have to print or grade written homework because students watched recorded lectures or relevant videos linked through the website. Additionally, students could use interactive flashcards posted on the websites to study for tests instead of spending their own time making these tools or class time studying. Consequently, students were left with more opportunity to develop a deeper understanding of concepts through class discussions. Over the 18-week study period, there were only five weeks (~30% of the time) during which I was not able to identify a way in which the website saved time for me or my students.

I recorded comments on the effectiveness of the websites each week, which I classified as positive, negative, or neutral. The majority of the time, I recorded positive feelings related to the effectiveness of the website (Figure 3).
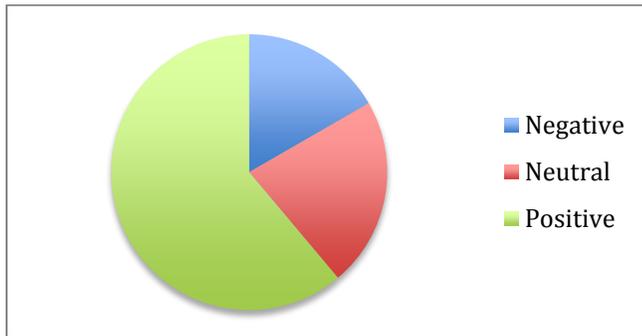
Figure 3: Distribution of Teacher Attitude Towards Class Websites.

An example of a positive comment is from week 15 when I wrote, "Students giving lots of input as to what website content is most helpful and interesting to them." An example of a negative comment is from week two when I wrote, "Students do not seem to be using the website at all. Whenever I ask if they have seen specific content they look at me blankly or say no." All negative comments were recorded in the first five weeks, whereas after week five, all comments were either neutral or positive.

Each week I rated how much I liked using the websites as a teaching tool on a scale from 1-5 (1 = I hate it and 5 = I love it). The average rating on the attitude scale from the entire study period was a 3.6 (SD 0.71). While this implies a neutral to slightly positive attitude towards the website overall, the mode of the ratings = 4. I only rated my attitude towards the websites negatively (2) once over the entire project and extremely positive (5) once as well.

The teacher journal was an incredibly helpful tool in documenting the process of my AR project. While I did not write in it everyday and often wrote very little, the

journal was helpful for looking back over the span of the project to see what struck me as important.

INTERPRETATION AND CONCLUSION

The purpose of this action research project was to better understand the impact of using class websites on student engagement in science class. I wanted to know if use of a class website to extend classroom opportunities beyond the allotted class time would affect student autonomy, student opinion of homework, overall engagement, and my teaching style. To understand these questions, I observed my 7th and 8th grade science classes (life science and Earth science respectively) over a period of approximately four months (from late October 2013 to end of March 2014). My observations allowed me to examine how the students used the websites to aid with learning a variety of class topics and completion of various tasks. The study period was of a sufficient length to allow students a chance to become familiar with the websites and for me to incorporate student input into the content and function of the class websites.

Overview of Results

From this project, I was unable to clearly discern an impact of the websites on overall student engagement. In general, students had positive views of the websites, but I did not find compelling enough evidence that the websites changed student engagement with the subject matter. However, students did feel more empowered and autonomous in science class as a result of the class websites. Students therefore more confidently spent time learning independently, which is an important skill for high school and college. Class websites did not change students' perceptions of homework but did provide them with more control over how they allotted their time towards homework. Given their

major complaint regarding homework, the websites therefore provided an opportunity to make homework less onerous. I am also confident that class websites had a positive impact on my teaching style. The websites provided an organizational tool, allowing me to better tailor lessons to individual students. I also felt much more connected to students and therefore able to guide them more effectively through their course of their study.

<div align="center">Impact of websites on student engagement</div>

When questioned in the early stages of the study, students generally conveyed a positive attitude towards science. Most students conveyed an interest in science and some even considered a career in science. These sentiments remained in place from the beginning to end of the study period.

This generally positive outlook on science made understanding the effect of the websites on engagement difficult to gauge. With a baseline interest in science, I expected students would participate in class and utilize the website in addition to performing well academically. I am uncertain whether the website impacted student engagement or if students would have been equally involved and performed equally well academically without class websites.

Student responses to interview questions indicated class websites did not positively impact students' attitude towards science. When directly asked during interviews whether they felt the class websites increased their excitement towards science or science class, both 7th and 8th grades students responded that they do not feel more excited about science or science class because of what is available on the websites. In connection to this interview question, students explained that they did appreciate the resources available but that the websites to did not change their opinion of the topic. The

marginal increases in scores rating interest in science from the beginning to the end of the study suggest websites did not affect engagement.

In contrast to data from student surveys and interviews, data from parent surveys suggested websites did impact student engagement. Parents generally indicated that students were more engaged in learning because of the websites. Over half "strongly agreed" with this statement. In the comment section of the survey, parents mentioned that they do not help their student with school work and have not looked much or at all at the website themselves but often hear about the resources at dinner or in the background while their student is using the website at home. Students may not be completely aware of their own levels of engagement, in which case parental perspectives may be critical for understanding website effects. Alternatively, students may be in a better position to disentangle the various motivations for their own behavior (e.g., website utility versus effects on their interest). A key factor likely governing the impact of websites on my own students' engagement is that they began with a favorable view of science. Studying website effects on students who are initially disengaged would be of further interest.

Regardless of effects on engagement, students often viewed websites without being asked to do so for a variety of reasons. Students explained during interviews that sometimes they viewed websites to look for extra credit options, to study for a test or quiz, or to get resources for a project. Some students mentioned in the interviews that websites provided ways to explore topics in science and become more excited about science, although this did not represent the majority viewpoint. Additionally, one could make the argument that websites were beneficial even if they only helped a couple of students as long as they did not detract from learning for other students. In my case, I

received no indication from interviews, surveys, class starter questions, or my own observations of any negative impacts of the websites. Therefore, while I cannot be certain that websites promote engagement for all students, I would be inclined to continue using class websites for the few students for which the websites did increase engagement.

Data tracking the frequency of student use of websites also suggested websites were useful even if they did not affect engagement. Students accessed websites almost everyday even though they only had class three times a week, suggesting websites were helpful to the students in some way. Additionally, students often accessed websites without being asked to do so, especially when website resources were directly connected to a class lesson (i.e., spikes in website in Figure 1). One student mentioned checking the website on her phone every morning before class which indicates that she is integrating her personal life with school using current technology. I wondered if students that brought Internet compatible devices to class used the websites more. Students might be more inclined to use the website if they see a direct link between website resources and classroom material, which may occur more often if students can view websites while receiving instruction in class. This occurred to me when I noticed students using their own technology in class to check the website in reference to science fair resources on a day they were working on their science fair board and then I saw a spike in number of page views (figure 1). I am not sure if it would have made a difference if students were required to bring a device to class that could access the Internet. With my student population, such a request would have been possible. All but two students owned their own device, and the school had four laptops available for students to check out. The impact of websites while requiring computers or smart phones in class could be an area

of future investigation especially given that Headwaters Academy is moving to a "bring your own device" model next school year.

Impact of websites on student autonomy

Given my data, I am very confident that the websites do encourage learner autonomy. This corroborates Chandra & Fisher's study that found students felt more autonomous with the integrated use of teacher-made websites (Chandra & Fisher, 2009). From the student interviews it was very clear that students felt a sense of control by having access to the websites as a tool for learning. One of my favorite comments from an 8th grade student during the interview was "you don't have to wait for the teacher to tell you stuff because you can just go online and get it yourself." During the interviews and from my observations throughout the study period, students felt empowered and respected by being able to take control of their education. Students sometimes expressed frustration that they could not fall back on the excuse that, "you never told me that," because I could always point out where "that" was on the website. Such frustrations suggest websites contributed to an environment that encouraged them to take responsibility for their education.

Another way that websites improved student autonomy was by providing a template and examples of how to harness online web resources to study and learn. For example, I usually posted flashcards on the websites made using Study Stack (another website) but one of my students preferred the format provided by Quizlet. She took the initiative to make her own set of flashcards on Quizlet, which facilitates online review games that help with understanding vocabulary. She was then willing to let me post her Quizlet set online to share with the other students. This incident exemplifies how students

incorporated strategies for studying and learning from the websites while adjusting them to suit their own needs. This incident also exemplifies how class websites do not only encourage independence but also encourages development of a learning community by allowing students to share resources with each other. Development of a learning community could help encourage collaboration among students, which could alleviate negativity sometimes incurred by competition among students.

I was also impressed with how self-aware students were when asked about learning independently. A student in the seventh grade was able to identify that he was not always able to focus during class so having the opportunity to review class materials at home was helpful to him. The independence students gained from being able to learn through the website will help them in future classes that may not be as supportive and that may require more independence. It allowed students to learn about themselves as learners (i.e., develop meta-cognition) while also learning science. When given the choice (asked on a starter question) of how students wanted information conveyed, the majority of students (15 of 19) wanted resources to be available on the website as well as discussed in class. The students who preferred to have information given only in class also told me that they rarely, unless required, used the websites. To accommodate these students, I know to always cover the most important elements of a curriculum in class while using websites to support student learning.

Websites contributed to learner autonomy by allowing independent review, which enhanced mastery of the content. Classroom time is limited. Therefore, students expressed gratitude for having the websites because they felt supported in studying even when at home. One student told me that in other classes she often felt discouraged when

studying for tests at home because she had no "official" confirmation that what she is studying was correct. With the websites, because I supplied the definitions on the flashcards or reviewed a particular concept in a video review, she could focus on studying without worrying about which materials to focus on. Also because resources are posted on the websites, students had the opportunity to revise their work on their own time to further their own understanding of the topic at hand. For example, on a take home test that was given on a Google form made available through the website, students could resubmit answers to questions that they initially got incorrect or did not fully answer for partial credit. This format gave students an incentive to learn from their mistakes and to do so at their convenience. I did not have to coordinate with students outside of class or waste paper resources by reprinting tests to allow these opportunities. I found that students were more likely to make up work when it was convenient for them.

<u>Impact of websites on student attitude towards homework</u>

I found no evidence for websites affecting student's attitude towards homework. Students understood the value of homework in helping them practice a skill or concept, but students on average did not express positive impressions of homework and these impressions did not change over the course of this study. In the student survey the average response to the statement, "I hate homework," was neutral, but students generally agreed with the statement, "Homework helps me learn." Students often noted in the comment section of the survey that homework took time away from their life after school, and given that they spend seven hours in school, it was frustrating to spend so much time after school on homework.

While websites did not change students' feelings about homework, students were appreciative that the websites allowed them more control over how they allocated time towards homework. For example, when students were assigned to watch a video, they would know ahead of time how long the video was and therefore allocate their time accordingly. One student said she often watched assigned videos in the car on her phone on the way to school so they would be fresh in her mind when she got to class (science was her first class of the day). In this case, science homework did not take time away from her other activities or homework from other classes

One specific assignment designed to investigate potential website effects on student's attitude towards homework was the random act of science (RAS) assignment (assignment and student sample in Appendices C and D, respectively). The website represented a key tool for this assignment by providing students with a portal to explore information on the Internet and a space to post their discoveries. By providing students the opportunity to explore topics of interest to them, I anticipated students would become more excited about doing homework. As with the class website in general, this assignment did not apparently influence attitude towards homework. Students liked aspects of the assignment but did not like that they had to do homework. In a starter question, I asked what would improve the RAS assignment, to which they suggested presentation of their assignments in class. So beginning in March, I had two to three students present their RAS every Friday in class. Students have given me positive feedback about being able to present in class. They felt the assignment stimulated "cool discussion" in class, which made them more likely to comment on the RAS on the website having been first exposed to the topic in class. After hearing this I asked if they

engage in this activity if it was not assigned, to which all 17 students responded, "No." Three students then told me they watch science videos all the time but would not write about them or give presentations without getting credit. While students would not choose to engage in the homework on their own, they enjoy the homework on the website more than paper based assignments. In future classroom-based action research I would be interested in understanding how enjoyment on website-based assignments compare to paper-based assignments.

Although the websites did not apparently improve students' attitude towards homework, they did improve the connection between activity conducted inside versus outside the classroom. By using websites to communicate and convey information, instruction was no longer confined to the classroom. Websites also allowed me to present content in many different ways and thus accommodate different learning styles. After teaching diffusion and osmosis through a potato lab, many of the students were still really confused about how osmosis occurs. I responded by posting lots of resources, such as a Khan Academy video, picture examples, and a video of an osmosis egg lab that they could do at home. Students were thereby given additional opportunities to learn and re-evaluate these concepts on their own time using alternative resources to what I could provide in class. While I am a big proponent of re-teaching, in this case I was not sure how to present the material differently in the classroom to help students. Posting resources on the website allowed me to offer options to the students but did not force students to sit through any particular lesson that was not helpful to them. After allowing students time to work with website resources, I revisited the topic of osmosis in class to clear up any lingering confusion, which was very helpful and effective. Finally, I could

tell which resources from the website certain students used based on their answer to subsequent test questions, which will shape both classroom and website-based instruction in the future.

<div align="center">Impact of websites on teacher</div>

I found class websites to be helpful for staying organized and on track. Working for a private school, I had complete freedom to create my curriculum. While I love this aspect of my job, it would have been easy to get side tracked on the details of a lesson without keeping the scope of the entire unit and year in mind. Having the website laid out with tabs denoting the units we had covered helped me stay focused on what needed to be accomplished by the end of the year. Although I had the freedom to spend more time on what the students are interested in, I still needed to keep students on track to be prepared for their future education. In my teacher journal I repeatedly noted throughout the study period (especially in the last eight weeks) that I relied heavily on the website to review content of lessons before teaching.

Although websites required a large initial time investment, in the end I spent very little time adjusting and adding to the websites, whereas websites reduced the amount of time spent reviewing material prior to a lesson. Initially, I spent between four to eight hours per week developing the websites, but after week six I never spent more than four hours (typically two hours) a week on website development, adjustments, and posting of materials. By contrast, in the first 11 weeks I spent approximately one hour reviewing for each class using my old methods of looking through my written lesson plans and trying to organize printed materials, but after becoming familiar with the websites, I spent closer to 30 minutes reviewing for each class. Instead of rummaging through my computer or

textbooks to find what I need to print and give students, I simply went to the websites to remind myself of the goals of the lessons and to remember what I wanted to show or demonstrate for the coming lesson.

Websites also saved time by not having to print or hand-grade practice questions Having practice flashcards and automatically graded practice questions on the website also saved me time, giving me more time to work with students on higher order thinking components of the lesson.

The teacher attitude data documented that class websites generally contributed positively to my teaching experience. From a weekly rating of my attitude towards the effectiveness of the websites, I found that I had positive or neutral feelings 83% of the time. It was also interesting to see that it was only in the first five weeks of the study that I had negative feelings towards the effectiveness of the websites. To me this indicates that websites become more beneficial with experience, which bodes well for the coming school year.

From entries in my teacher journal, I am confident that I am better able to support a variety of levels, learning abilities, and interest in science by using class websites. On numerous occasions I noted in my teacher journal that students either told me or I overheard students talking amongst themselves about something "cool" or "awesome" or "crazy" they saw on the websites or looked up as result of information on the websites. I did not once record negative student experiences with websites in my journal. In the beginning of the study, I did note students mentioning how website organization or aesthetics could be improved. After incorporating these suggestions, however, students generally commented that they could effectively utilize the websites for learning.

Students mentioned that some types of resources were more helpful than others but were happy for the variety of resources provided.

Lastly, I found that class websites improved my connection to the students. For example, I wrote in my journal that I was having trouble keeping students engaged with the conventional lecture notes and practice problem worksheets. In contrast, I found students thrived on lively discussion-based classes. To inspire productive discussion in class, students needed access to relevant information to review at home or on their own time to prepare for the discussion. Websites provided a venue for posting such information in the form of lecture videos, YouTube videos, or informational links, allowing students to gather information and formulate their own questions prior to class. At first, this format made me anxious because I had to let go of some control enforced by traditional classroom methods and allow students the freedom to learn in their own way. However, I found that simply offering resources on the website motivated students to use them. I wrote in my journal that, "Students seem to hate the textbook even though it has good easy to understand material. However if I scan a copy of a picture from the textbook and put it on the website they seem much more willing to learn the concepts." This leads me to believe that the way textbooks are formatted are not the way my students want to learn.

VALUE

From this study, I discovered a number of reasons for continuing to use class websites. First, class websites had no discernible negative impacts, so there apparently no harm in using them. Second, class websites provided an avenue for students to develop

and exercise autonomy, i.e., the ability to learn on their own. Third, class websites can provide student's flexibility in how they complete homework and facilitate more integration of homework with classroom activities. Thus, class websites reduce the negative aspects of homework while improving its effectiveness.

Along with the continued use of class websites, I would also continue investigating their effectiveness for improving student learning and development. In the future, I would like to implement additional approaches for examining website impacts on student engagement. Specifically, I would compare engagement generated by assignments that utilize the websites to assignments that do not involve the websites. Additionally, I would survey student attitudes via polls, starter questions, and exit cards more regularly than I did in this study. The school is adopting a bring-your-own-device policy next year, so I will be more able to implement these methods. I will also continue investigating the effect of websites parental involvement. In so far as websites improve parental involvement, they could strengthen the learning community and reduce separtion of school from other parts of students' lives.

I hope other teachers can also benefit from the findings of this study. I would advise educator considering the use of class websites to constantly ask students for feedback and incorporate their feedback into the website. Additionally, for websites to be effective, educators need to actively use them and integrate them into their curriculum. I began this study with minimal information-technology background and very little spare time and energy. However, I found class websites worth the time and effort required to establish them.

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APPENDICES

APPENDIX A

IRB APPROVAL

INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
FWA 00000165

MONTANA STATE UNIVERSITY

960 Technology Blvd. Room 127
c/o Immunology & Infectious Diseases
Montana State University
Bozeman, MT 59718
Telephone: 406-994-6783
FAX: 406-994-4303
E-mail: cherylj@montana.edu

Chair: Mark Quinn
406-994-5721
mquinn@montana.edu
Administrator:
Cheryl Johnson
406-994-6783
cherylj@montana.edu

M E M O R A N D U M

TO: Marka Latif and Walt Woolbaugh

FROM: Mark Quinn, Chair *Mark Quinn cq*

DATE: January 21, 2014

RE: *"Effect of Using Class Websites on Student Engagement in Middle School Science Class"* [ML012114-EX]

The above research, described in your submission of January 21, 2014, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

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

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

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

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

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

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

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

APPENDIX B

STUDENT SURVEY

<u>Student Survey</u>
Please complete the survey by reading each statement and deciding how much you agree
with the statement.

Name:

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

1. I think science is interesting.
        Strongly Disagree 1 2 3 4 5 Strongly Agree
Clarification statement (please add any additional information to clarify the above statement):
2. Science is boring.
        Strongly Disagree 1 2 3 4 5 Strongly Agree
Clarification statement (please add any additional information to clarify the above statement):
3. I would enjoy being a scientist.
        Strongly Disagree 1 2 3 4 5 Strongly Agree
Clarification statement (please add any additional information to clarify the above statement):
4. I hate homework.
        Strongly Disagree 1 2 3 4 5 Strongly Agree
Clarification statement (please add any additional information to clarify the above statement):
5. Homework helps me learn.
        Strongly Disagree 1 2 3 4 5 Strongly Agree
Clarification statement (please add any additional information to clarify the above statement):
6. I always have access to the Internet at home for school purposes.
        Strongly Disagree 1 2 3 4 5 Strongly Agree
Clarification statement (please add any additional information to clarify the above statement):

APPENDIX C

RANDOM ACT OF SCIENCE ASSIGNMENT

Random Act of Science

Assignment:
Every week I will feature something that a student finds interesting in the field of science on the website. Every student will be responsible for one post throughout the semester. To earn a perfect grade for this you need to email me a copy of your info or a link to your info. You also will need to write a paragraph that includes the following: a brief summary of the interesting info, why you think the info is cool, and a couple reasons why others would also think this is cool (broader implications).

RAS Rubric
Research a topic
The topic/content needs to be appropriate and relevant. The link/source needs to be clearly provided. (5 points)
Summary
The summary should be written in full sentences in paragraph form. The summary needs to clearly restate the content presented in the article. (5 points)
Describe why you find it interesting
Concise but valid reason for why you find the topic interesting (5 points)
Describe why we should find it interesting
Clear reasoning for why the general public should care about the topic (5 points)
Presentation
Clarity and organization of project (5 points)

APPENDIX D

EXAMPLE RAS

ROBOTS TEACH ABOUT CELLS

By 7th grade student

Summary: George Zaiden and Charles Morton have created a fascinating video (Ted-Talk) about how our cells work (What we are learning about in class but with a bit more information) They use the metaphor of robots to put the idea in your head.

Why I find this interesting: I find this video very interesting because it is exactly what we are learning in class but puts a different, equally exciting spin on the "how to" of genetics. Plus, I think that this topic is one of my favorites so, I thought it was quite cool.

Why you should find this interesting: This paragraph focuses on 2 groups, those who do know what a cell is made of and those who don't. For the ones who have never heard of this before, or know pretty much nothing about it, this video makes an easy image that makes understanding genetics/what a cell is made out of a lot simpler. For those people that do understand this topic, it's cool because it puts a totally new spin on something, which we already know. Plus, cells are cool!

URL of Ted Talk video: https://www.youtube.com/watch?v=JufLDxmCwB0

APPENDIX E

INTERVIEW QUESTIONS

<u>Student Interview Questions</u>

Students were informed prior to being involved in the interviews that participation in this research is voluntary and participation or non-participation will not affect a student's grade or class standing in any way.

1. How often do you access the class website without being asked to do so?
        Follow-up: Does this change based on what happens in class?
2. Do you feel more involved in the class because you can access information whenever you want through the website?
        Follow-up: N/A
3. Do you feel like you have more control over your learning because of the resources available on the websites?
Follow-up: Do you feel more in charge of your learning? Do you feel like the resources available coddle you by giving you the "answers"?
4. Does the websites resources change your opinion of homework?
Follow-up: In what ways is your opinion of homework changed because of the website? What is your opinion of homework?

APPENDIX F

PARENT SURVEY

Parent Survey

Please complete the survey by reading each statement and deciding how much you agree with the statement.

1. I help my student do his/her homework.

       Strongly Disagree 1 2 3 4 5 Strongly Agree

Clarification statement (please add any additional information to clarify the above statement):

2. I monitor my student while he/she is doing homework.

       Strongly Disagree 1 2 3 4 5 Strongly Agree

Clarification statement (please add any additional information to clarify the above statement):

3. I check the class website to know what my student is learning in science class.

       Strongly Disagree 1 2 3 4 5 Strongly Agree

Clarification statement (please add any additional information to clarify the above statement):

4. I use the class website for forms/downloadable items (such as science fair form/permission slips)

       Strongly Disagree 1 2 3 4 5 Strongly Agree

Clarification statement (please add any additional information to clarify the above statement):

5. I watch homework videos with my student to know what is going on in science class.

       Strongly Disagree 1 2 3 4 5 Strongly Agree

Clarification statement (please add any additional information to clarify the above statement):

6. I feel my student is more engaged in learning science because of the resources on the website.

       Strongly Disagree 1 2 3 4 5 Strongly Agree

Clarification statement (please add any additional information to clarify the above statement):

7. I feel my student is more engaged while doing homework because of the format of the homework on the website.

       Strongly Disagree 1 2 3 4 5 Strongly Agree

Clarification statement (please add any additional information to clarify the above statement):

8. I feel my student's attitude towards homework is positive because of the format of homework on the website.

       Strongly Disagree 1 2 3 4 5 Strongly Agree

Clarification statement (please add any additional information to clarify the above statement):

APPENDIX G

TEACHER SURVEY AND ATTITUDE SCALE

Teacher Survey Questions

Date:

1. Time spent on developing the website.

2. Time spent researching and prepping lessons.
3. Time spent reviewing lesson plans before teaching.
4. Time saved in class because of website resources.
5. General feeling of effectiveness of websites.

Teacher Attitude Scale
Date:
I like using the website
"Hate it" 1 2 3 4 5 "Love it"
Clarification statement: