Running head: FEMALES ATTITUDES TOWARDS SCIENCE MULTIMEDIA PRESENTATIONS

Science Multimedia Presentations' Effects on Female Students' Achievement and Attitudes toward Science

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Abstract

Society's bias towards science being for males rather than females has affected how students view science. The purpose of this study was to show that multimedia presentations cause female students to learn while creating a more positive attitude about science and ecosystems. The participants in this study were 14 female students in an all female science class. Students researched ecosystems and created an iMovie presentation about a specific ecosystem of the group's choice, persuading others to protect the ecosystem. The researcher surveyed the students on likability of science and ecosystems before and after the unit, and the students took a pre-assessment and post-assessment on ecosystems. The results showed that most students' attitudes changed positively, and students' scores went up.

Science Multimedia Presentations' Effects on Female Students' Achievement and Attitudes toward Science

Society's gender roles and expectations of genders hinder males and females from pursuing topics, classes, and careers without bias (Berube & Glanz, 2008). Society in general has a preconceived notion that males are more successful in math and science classes while females are more successful in language arts, foreign languages, arts, and humanities classes. Kerr & Robinson Kurpius (2004) found that fewer females than males enroll as science and mathematical majors in college, and the National Center for Education Statistics (2000) found that more males are employed in science and mathematical careers (as cited in Mitchel & Hoff, 2006, p.10). There has been a focus in recent years towards encouraging females to participate in science and math in hopes that more females will major in science and math topics in college and pursue careers in math and science fields.

Some females may believe they are incapable of succeeding in science and math because science and math are believed to be "male" subjects. Breaking down the barriers that prevent females from succeeding in science, and changing females' negative attitudes towards science is important for the future of females in society. Many female students have a negative attitude towards science. Younger females in elementary school do not lack interest or confidence in science, but as the females reach adolescence, the students are not as interested in science and do not believe they can do as well in science. Sixth grade students are at the age where researchers begin to see a decrease in interest and confidence.

As an educator, it is important to find ways to keep the interest and confidence in all subject areas of all students, no matter the gender. With the increase of new teaching approaches

and new tools for teaching, perhaps modifying how science is taught will affect the interest and confidence of female students in the adolescence stage.

Presentation software is a tool that can be used that is different than traditional methods of teaching. Presentation software is capable of being used to present the information in various ways to enhance learning for every student no matter the learning style of the student. Enhancing learning and appealing to multiple learning styles may encourage students to have a more positive attitude towards the content, and the students may be excited to create their own presentations further improving their attitude towards the content.

The research question for this study was will increasing the integration of presentation software in science class improve female students' science assessment scores and increase female students' likability of science? Integrating presentation software into the science unit instead of teaching through discussion, lectures, books, and paper and pencil methods is a different approach to science that will be an effective tool for learning, but also improve the female attitude towards science. The hypothesis for this study was that female students, after participating in technology applications that allow the students to create and delve deeper into science research, will learn more, increasing science scores, and students will like science topics more.

A relevant term is presentation software, which is computer programs used to create presentations about various topics. Presentation software includes PowerPoints, PhotoStory, iMovie, and other software. Presentation software can be used in all subject areas to present information in the form of a slideshow or video with pictures, narration, text, background music, or video. Another relevant term is gender roles, which are specific expectations placed upon males or females based on gender alone.

The purpose of this study was to observe female students' achievement and change in attitude toward science with the integration of science multimedia presentations. This research study is limited to one class of sixth grade females in one particular class. Other female students at other schools and other grades may not display the same achievements or attitudes. Because of time constraints and available subjects, the researcher chose one small question for this study.

Literature review

Over the last few decades, males have scored better on science achievement tests than females, however, "there is clear evidence that girls have virtually closed the previous achievement gap in science" (Mitchell & Hoff, 2006, p.11). According to Heilbronner (2009), "women are making progress in many areas of science, but a gender gap still remains, especially in physics, computer science, and engineering, and at advanced levels of academic and career achievement" (p. 53). If achievement scores are similar, then why is there a gender gap? According to Dentith (2008), females lack confidence in their abilities (p. 155). According to American Association of University Women (1995) and Sanders & Nelson (2004), "Research seems to show that girls lose confidence first, then start to withdraw from the more advanced math and science classes, thereby losing interest and motivation in math and science" (as cited by Berube & Glanz, 2008, p. 31). Mitchell & Hoff (2008) stated that lack of confidence can result in "negative consequences for learning and career pursuit" (p. 18).

In order to change females' attitudes, Heilbronner (2009) asserts that teachers must have a positive influence on students' attitude towards science and help the students realize their abilities in science through moving "away from traditional classroom practice and incorporate some new ways of teaching" (p. 53). One way to incorporate new ways of teaching is with production software as a tool for instruction and as an assessment product.

According to Chang (2004), multimedia presentations in instruction improve students' attitudes toward the subject matter (p. 9). Chang's study gives no indication that the improved attitudes toward the subject matter related only to male subjects, therefore the assumption can be made that females' attitudes would also improve with multimedia presentations.

While one focus of this study is on female students' attitudes towards science, it is also important that the students learn the science material through multimedia presentations. According to Weinraub (1998), "the most important measure of classroom effectiveness is whether the ability of students to learn the material is increased," and Weinraub's study showed considerable progress in students who used multimedia software (p. 91).

According to Willett (2007), educators are aware of how multimedia presentations "meet different learning styles, motivate students, and address important social and cultural aspects of children's and young people's learning" (p. 167). Students learn in many different ways. In order to ensure that all students learn, modifying instruction and assessment to address differences is important. Addressing student diversity increases student achievement by reaching every student. Differentiating for students also can potentially improve student attitudes because students are being taught in a way that is appropriate for them.

According to Wang & Chan (1995), some researchers were concerned that multimedia presentations would limit student interaction (as cited by Chang, 2004, p. 9). According to Chang (2004), the multimedia study he conducted was "fully interactive" (p. 9). If Chang's multimedia study did not limit student interaction, then it is probable that multimedia presentations do not affect student interaction, but rather the teacher's plan affects how much interaction is allowed. According to Siegle & Foster (2001), "multimedia and presentation applications promote a constructivist approach to learning by encouraging complex interactions between learners and

content" (p. 29). The constructivist approach entails the learning through context through experiences.

Multimedia presentations contain many advantages for learners. According to Thorsen (1998), using presentation software makes students into active learners (as cited by Siegle & Foster, 2001, p. 29-30). According to Sharp (1996), multimedia presentations foster research skills, cooperative learning, and problem solving (as cited by Siegle & Foster, 2001, p. 30). Multimedia presentation advantages lead to more in depth learning which increases knowledge, which increases achievement.

While there is much research promoting the use of multimedia presentations in education, Siegle & Foster (2001) & Weinraub (1998) believe more research is needed. According to Jonassen, Peck, & Wilson (1999), students who create technological products are engaged in more meaningful learning than students who receive technological instruction without creating a technological product (as cited by Siegle & Foster, 2001, p. 30). Creating a product with technology rather than merely receiving the instruction through technology appears to be more beneficial for learners. According to Mayer (2003), multimedia presentations are less effective when irrelevant words and pictures are included in the presentation because the words and pictures distract the learner from the main points (as cited by Muller, Bewes, Sharma, & Reimannt, 2008, p. 146-147). To ensure effective multimedia presentations, it is important to take into account if the characteristics of the multimedia presentation are useful.

Methodology

Subjects

The participants involved in this study were female sixth graders ranging in ages from 11-13 years of age. There were 14 female students who participated in this study. These students

are the only students in the sixth grade science class at this school. The ability levels and interest levels are very diverse. Almost half of the students went to the local university's "Girls in Science" day, so there is some interest in science among the class. Six students are in Gifted and Talented (GT), though none are labeled GT in science. Two other students have IEPs. One student is an English as a Second Language student who is allowed a reader and paraphraser.

Instrumentation

The female 6th grade students will take a pre-assessment on ecosystems and a survey relating to the likability of science and ecosystems. Upon completion of the unit, students will take a post-assessment and the same survey they took at the beginning of the Unit. The researcher designed the assessment based on the KY Core Content to determine what the students learned in the Unit. The researcher designed the survey to determine the attitudes of the female students' towards science before the science unit compared to after the science unit.

Research design

The dependent variable was the change in student science achievement signified by the pre-assessment and post-assessment and the change in attitude towards science signified by the survey. The independent variable was the use of multimedia presentations in science as a teaching tool and student product. The subjects were chosen because they are a female only science class.

Procedures

The students were given a pre-assessment on ecosystems content and a survey about personal attitudes towards ecosystems and science. After looking at the pre-assessment results, the teacher determined what the students knew about ecosystems and what needed to be taught.

The teacher introduced ecosystems to the students explaining the basics of ecosystems through discussion, Promethean Flipcharts, and United Streaming videos. The teacher led a discussion on how ecosystems are harmed and ways ecosystems are protected. The teacher used PowerPoint, Photo Story, and a Google Earth application to present various ecosystems around the world.

After in depth discussion of ecosystems, the students were divided into groups based on pre-assessment scores, ability levels, and technology experience. The students chose an ecosystem to research and create their own multimedia presentation. The teacher showed a tutorial on how to create an iMovie and provided feedback for the students. During a two-week period, the students researched their ecosystem to explain why the ecosystem they chose is an ecosystem, ways that the particular ecosystem is harmed, how the ecosystem could be protected, and why people should protect ecosystems. The teacher monitored and supported students with technology issues and content questions throughout the Unit.

To begin creating the iMovie, students used their research of ecosystems to create a script that would narrate the iMovie. After narrating the iMovie, students created a storyboard to plan what pictures and videos would best persuade the audience to protect ecosystems. After creating a storyboard and obtaining photos and videos, students revised the script and storyboard. Once revisions were made, students began creating the iMovie by putting the photos and videos in sequence, adding text, narration, transitions, and background music.

After completing the multimedia presentation, students presented the presentation to the class answering any questions other classmates had. When all presentations were completed, the students took a post-assessment about ecosystems and a survey pertaining to their attitude towards science and ecosystems.

Limitations of the study include the small sample size and short time frame. There are only 14 female students in the sixth grade at this school, so there were no other female students to expand this study at this school. In addition, with only a couple of weeks to do research, the research is limited to a small time frame. Given more time, the students may have had more significant changes in achievement and attitudes.

The study is also limited because the attitude survey involves a degree of subjectivity. Also, the students may not have answered the survey honestly, but instead answered how they felt the teacher would want them to answer.

Results

Prior to the unit, a pre-assessment was given to determine prior knowledge of ecosystems and to group students according to knowledge of ecosystems fairly to create an iMovie presentation. The pre-assessment results ranged from 0% to 33%. After the unit, the post-assessment results showed significant increase from 67% to 100% with nine students scoring 80% or above.

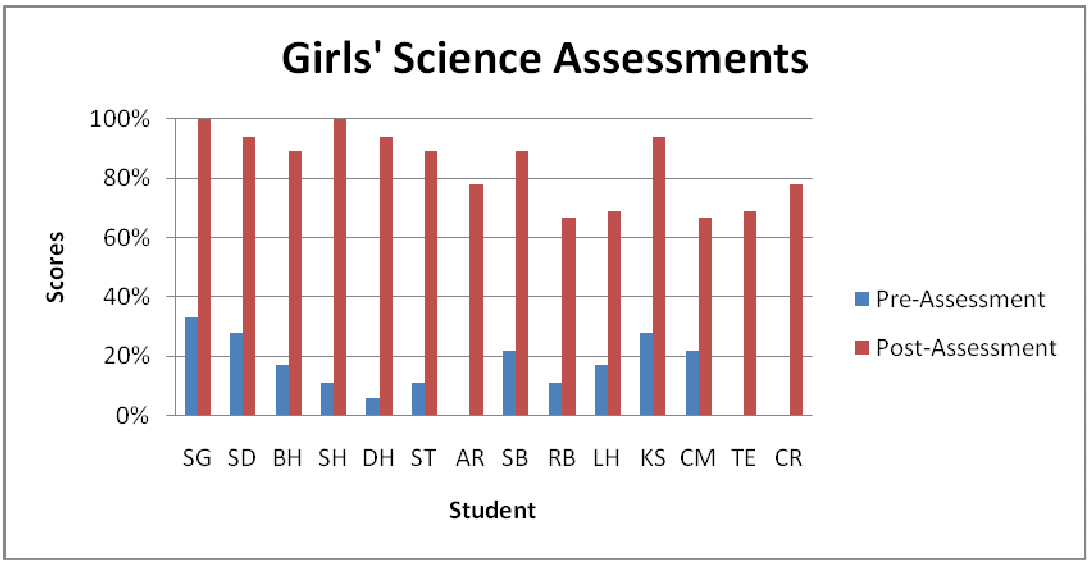


Figure 1: Individual students' pre-assessment and post-assessment scores

Students' post-assessment scores increased from the pre-assessment scores.

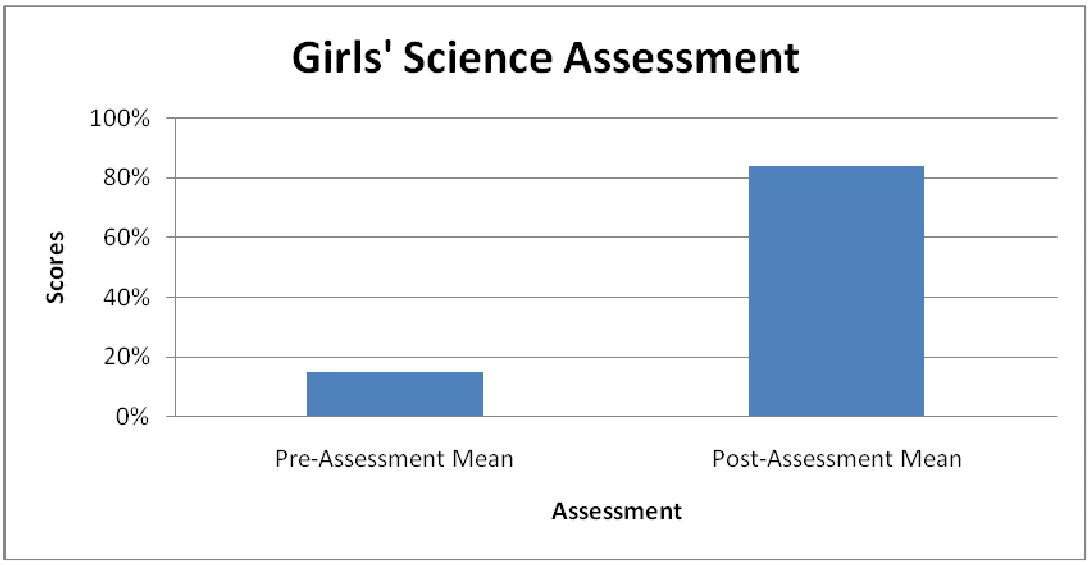
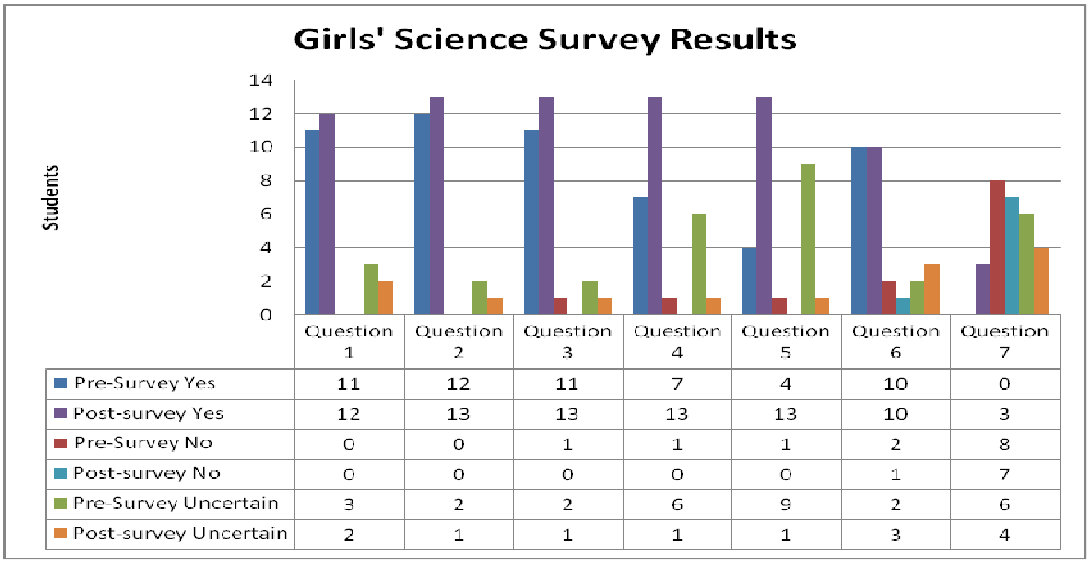


Figure 2: The class mean of the pre-assessment and post-assessment

The mean of the pre-assessment score was 15% and the mean of the post-assessment score was 84% showing an increase of 69%. This data shows that the students improved their content knowledge of ecosystems.

Prior to the unit, a survey was given to the students to determine how well the students liked science and ecosystems. The survey indicates that the students' attitudes were more positive at the end of the unit with fewer "No" responses to each survey question and more "Yes" responses to each survey question with the exception of question six where the "Yes" response stayed the same. Students answered "Uncertain" if they were in between "No" and "Yes," or were unsure of how they felt.



	Question 1	Question 2	Question 3	Question 4	Question 5	Question 6	Question 7
Pre-Survey Yes	11	12	11	7	4	10	0
Post-survey Yes	12	13	13	13	13	10	3
Pre-Survey No	0	0	1	1	1	2	8
Post-survey No	0	0	0	0	0	1	7
Pre-Survey Uncertain	3	2	2	6	9	2	6
Post-survey Uncertain	2	1	1	1	1	3	4

Figure 3: Student Survey Responses

"Uncertain" responses increased in question six, but the increase was from a pre-survey "No" response. The "Uncertain" response is less negative than a "No" response, even though it is not a "Yes" response.

The survey questions are below with a break-down of each question:

1. Do you like Science?

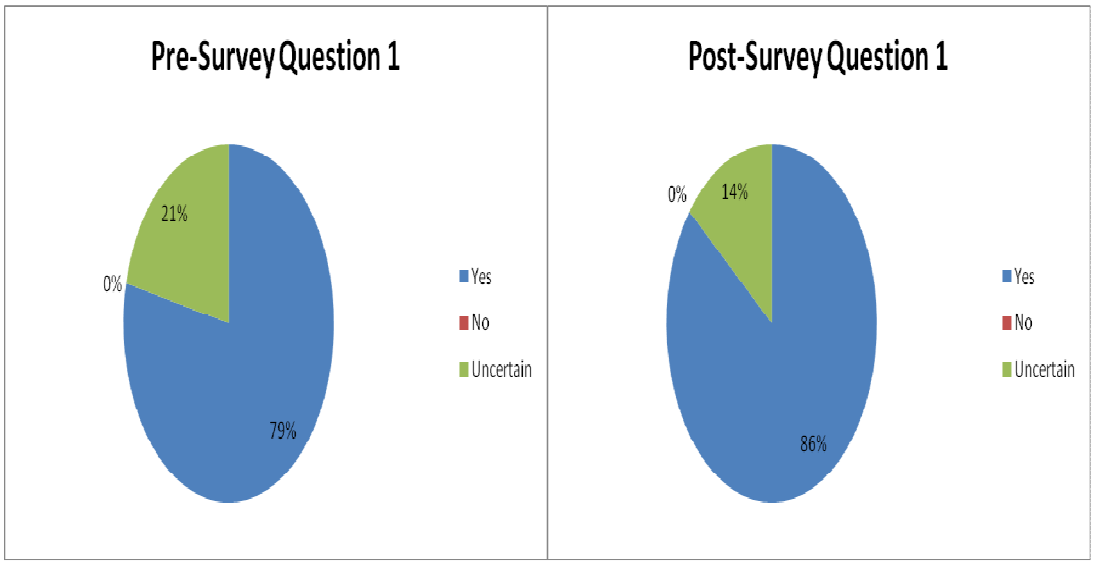


Figure 4: Survey comparison for question 1 before the unit and after the unit.

Overall the students' attitude increased from 79% stating they liked science before the unit to 86% of students stating they liked science after the unit. The other portion of the students replied with an "Uncertain" answer about liking science.

2. Do you think Science is interesting?

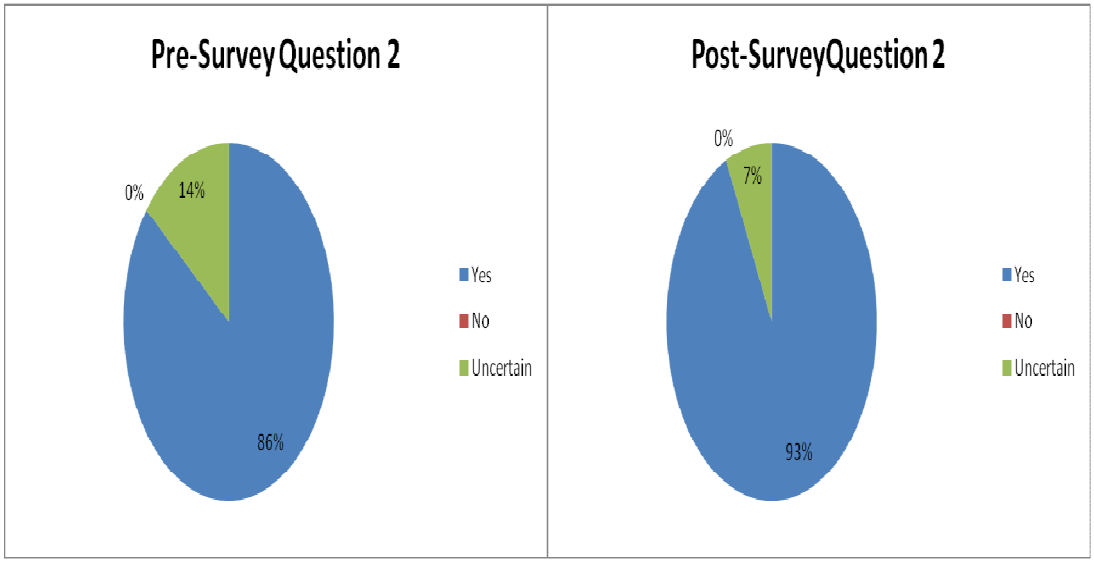


Figure 5: Survey comparison for survey question 2 before the unit and after the unit.

Overall the students' attitude increased from 86% stating they thought science was interesting before the unit to 93% of students stating they thought science was interesting after the unit. The other portion of the students replied with an "Uncertain" answer about thinking science was interesting.

3. Do you want to know more about Science?

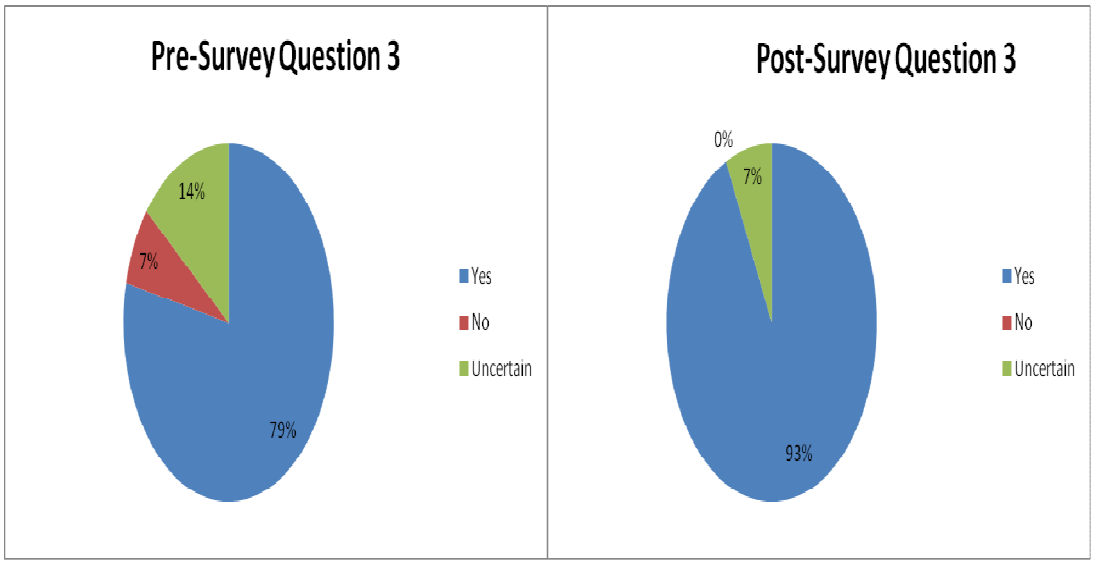


Figure 6: Survey comparison for question 3 before the unit and after the unit.

Overall the students' attitude increased from 79% stating they would like to learn more about science before the unit to 93% of students stating they would like to learn more about science after the unit. Before the unit, seven percent of the students stated they did not want to learn more about science. After the unit, zero percent stated they did not want to learn more about science. Seven percent of the students were "uncertain" about if they were interested in science after the unit.

4. Do you like ecosystems?

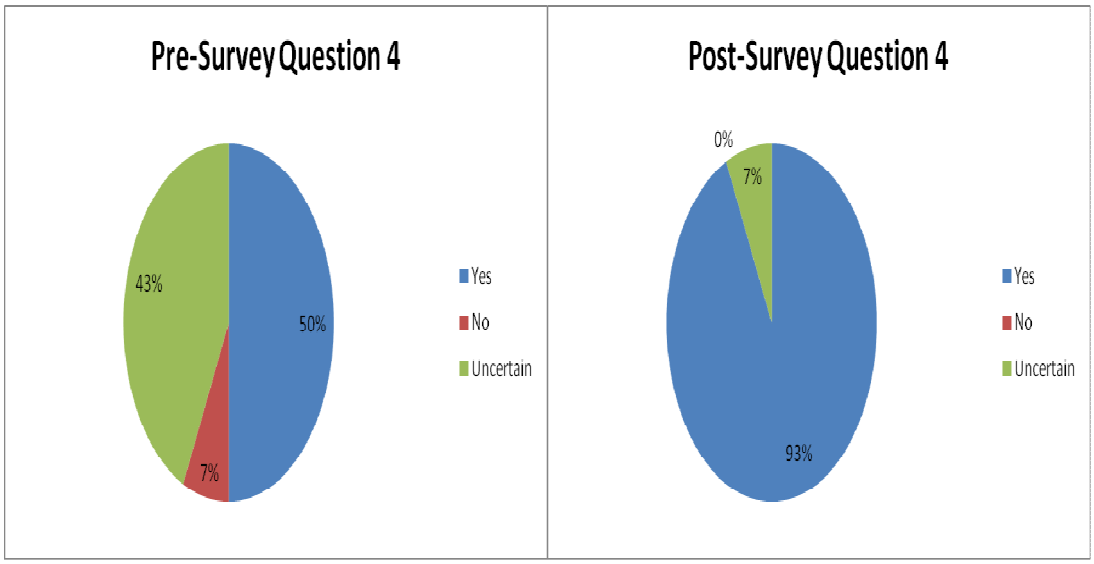


Figure 7: Survey comparison for question 4 before the unit and after the unit.

Overall the students' attitude increased from 50% stating they liked ecosystems before the unit to 93% of students stating they liked ecosystems after the unit. Before the unit, 43% of the students were uncertain about how they felt about ecosystems and seven percent did not like ecosystems. After the unit, only seven percent were uncertain about ecosystems with zero percent stating they did not like ecosystems.

5. Do you think ecosystems are interesting?

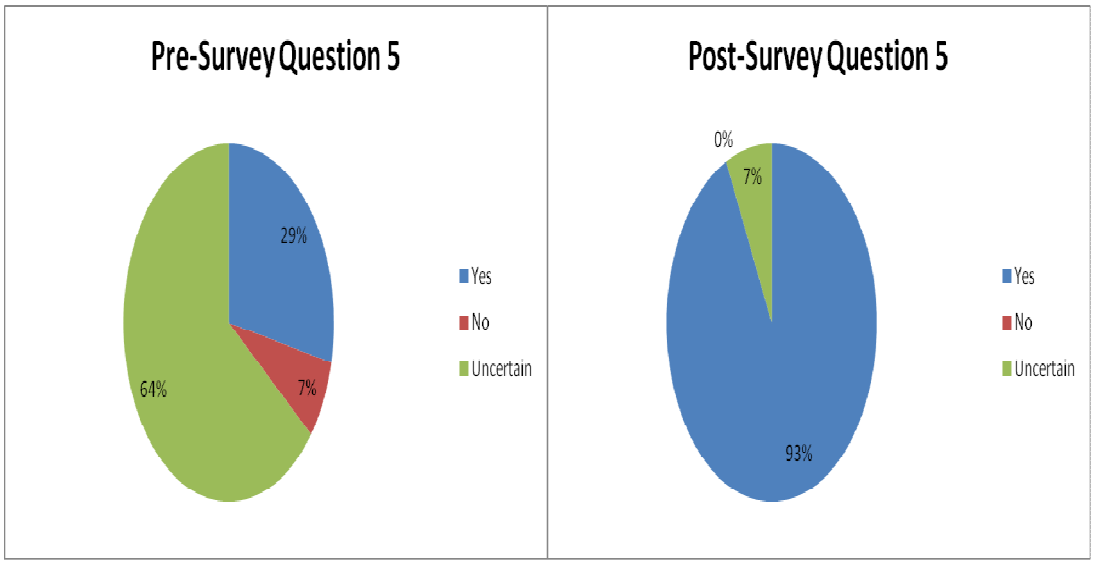


Figure 8: Survey comparison for question 5 before the unit and after the unit.

Overall the students' attitude increased from 29% stating they found ecosystems interesting before the unit to 93% of students stating they found ecosystems interesting after the unit. Before the unit, 64% of the students were uncertain about how they felt about ecosystems and seven percent did not like ecosystems. After the unit, only seven percent were uncertain about ecosystems with zero percent stating they did not like ecosystems.

6. Do you want to know more about ecosystems?

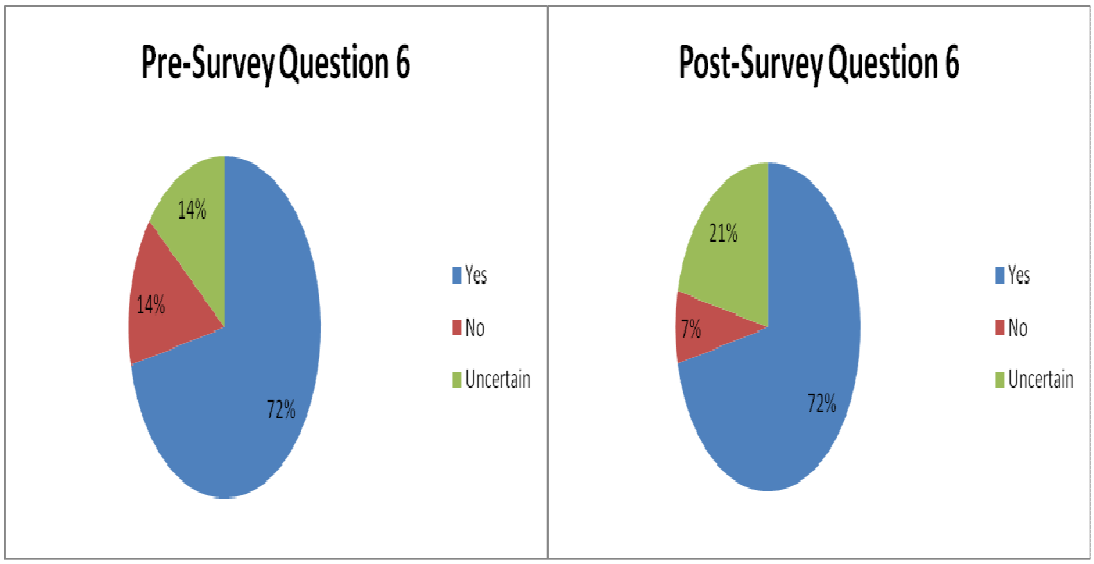


Figure 9: Survey comparison for question 6 before the unit and after the unit.

Overall, the students' attitude decreased from 14% stating they did not want to learn more about ecosystems before the unit to only seven percent of students stating they did not want to learn more about ecosystems after the unit. Before the unit, 14% of the students were uncertain if they wanted to learn more about ecosystems and 72% wanted to learn more about ecosystems. After the unit, the same amount of students still wanted to learn more about ecosystems, while the percentage of those uncertain if they wanted to learn more about ecosystems increased from 14% to 21%.

7. Do you think you know a lot about Science?

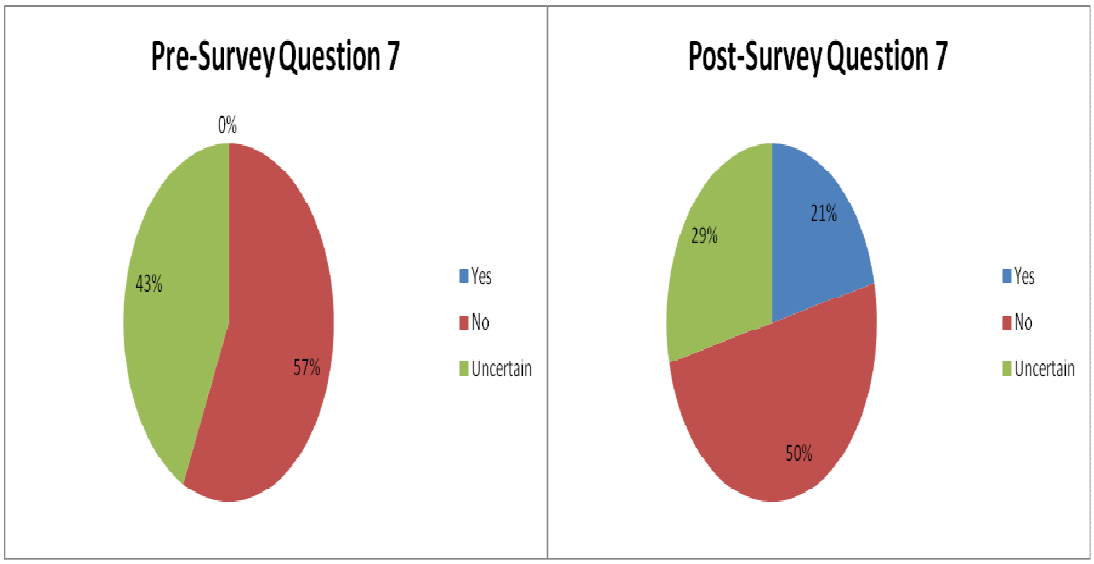


Figure 10: Survey comparison for question 7 before the unit and after the unit.

Overall, the students' attitude increased from zero percent stating they did not feel like they knew a lot about science before the unit to 21% of students stating they did not feel like they knew a lot about science after the unit. Before the unit, 43% of the students were uncertain if they knew a lot about science while 57% felt they did not know a lot about science. After the unit, more students felt they knew a lot about science, 29% still were uncertain about how they felt about science, and half the class still felt they did not know a lot about science.

Discussion

After reviewing the data, the researcher has concluded that integrating technology through multimedia presentations increased the overall attitude of students towards science and learned about science in the process. The research conducted clearly supports this conclusion with no decrease in attitude in any area, and all students' post-assessment results increasing. The research shows that providing an interesting way to teach science makes the students more likely to enjoy the content. The hypotheses were accepted because according to the post-assessment,

students' achievement in science increased, and according to the post-survey, students' attitudes towards science became more positive.

Future Research

Future research in increasing females' attitudes of science in response to integrating multimedia presentations would be beneficial with an added control group who does not get to use multimedia presentations in science class over a longer period of time. Also, while the students seemed to enjoy science more, many of the students still lacked confidence in their science knowledge even though most students did very well on the post-assessment and created an iMovie using in-depth knowledge of ecosystems. From the post-assessment and prior experience with the students, the students are more knowledgeable in science than they believe. A longer study may show that the students' confidence will increase, or the research may show another way to boost confidence.

Social Action

This study affects social actions because society views science as a male subject. Society does not encourage female students to pursue science careers as much as society encourages males to pursue science careers. Beginning in elementary school making female students have more positive attitudes towards science and increasing their confidence can affect the future of female careers and opportunities.

Female students are just as capable of achieving in science as male students, and many female students are interested in science, but believe they are not as capable as males. Finding a way to promote better attitudes while teaching knowledge of science content is an area that should continue to be studied to find a solution. Integrating multimedia presentations into science content has shown to be one way to increase attitudes and achievement. If more teachers use this

method in the classroom, this will affect female students' attitudes increasing females' likelihood of achieving and presenting more future opportunities for females in the science field.

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Appendix

Project Reflection: Part 1

To complete this project, I started with a broad topic. As I researched and focused my topic, I began to understand my research project better. I developed lessons that related to my topic, taught myself to use iMovie technology, discussed the research with other educators, gave the students a pre-assessment and survey, then began teaching my lesson. While teaching the lessons, I observed student behaviors taking mental notes that related to my research. After the post-assessment and final survey, I analyzed the data to see how technology affected the female students' attitudes and achievement.

I learned many things during the research project. I learned how to use iMovie software. I learned that getting students excited about projects greatly increases their willingness to work, but not all students will have the same reaction.

I collaborated with a classroom teacher, LMS, and school technology director on this research. The LMS and school technology director gave advice on the technology aspects of the lesson, such as how to tricks to using iMovie, how to use the mobile unit, and prior technology knowledge of the students. The classroom teacher helped monitor and support the lesson, and she discussed the research with me to help us both understand on a deeper level.

Possible professional development for research projects would be in implementing and assessing the research. Finding more complex ways of implementing the research and gathering data would be beneficial because my data was very simple. Assessing and analyzing the data would also be beneficial as my analysis was basic. I have a basis for analyzing research, but I have a lot to learn.

I considered the diversity of my students when planning the lesson that I taught and conducted research around. I placed my ELL student in a group with a high student who speaks the same native language. I also monitored her in case she needed language support. I placed my IEP students in groups with helpful students who would allow them to contribute, help them understand, and be encouraging. I also monitored these students within the groups and discussed the content with the students. I divided the groups up as balanced as possible based on different learning styles, achievement levels, and other factors. Since all the students were females, there was not a gender difference.

I assessed myself during the research project by looking at previous ARP examples to see how I compared to other students. I also followed the ARP rubric to assess my progress. It took me 2 weeks to plan the project, 2 weeks to conduct the research, and 1 week to analyze the research data.

During the action research I demonstrated disposition statement 1.2. a Approaches challenges with a "can-do" attitude. I had never used iMovie, and my students had never used iMovie. I told the students that we would learn together, and learning how to use iMovie would be fun. Students believed they could make an iMovie and also showed a "can-do" attitude.

Another disposition statement I demonstrated was 2.2.a Exudes enthusiasm for teaching and learning. I told the students we were going to be learning new concepts that would be a lot of fun. I went into each day with an enthusiastic attitude, and the students were excited to have class. On days that class was shorter or postponed, students were unhappy.

I also demonstrated disposition statement 1.3.a Demonstrates willingness to utilize technology to enhance teaching and learning. I used multimedia presentations to teach students about the concept, and I allowed students to create their own presentations to learn about the

concepts and share with peers. Technology was used to enhance learning. Technology was not used just to say technology was used.