

THE EFFECTS OF THE USE OF VIDEO CLIPS AND ACADEMIC  
CONVERSATION ON STUDENT ENGAGEMENT AND ACHIEVEMENT IN  
EIGHTH GRADE SCIENCE

by

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A professional paper submitted in partial fulfillment  
of the requirements for the degree

of

Master of Science

in

Science Education

MONTANA STATE UNIVERSITY  
Bozeman, Montana

July 2013

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July 9, 2013

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## ABSTRACT

In this investigation, video clips were coupled with academic conversations with the purpose of improving student engagement and achievement in an eighth grade science class. Students were shown video clips from popular media sources to encourage interest in basic chemistry, then academic conversations were conducted based on what was shown in the clips. Though performance on summative assessments did not show that students who participated in the study had greater basic chemistry content knowledge than the comparison group, students expressed positive attitudes toward learning when video clips were incorporated into science lessons.

## INTRODUCTION AND BACKGROUND

Riverside Meadows Intermediate is located in Plumas Lake, California, and is a somewhat unique school. It is in a very isolated suburb, located about ten miles from the nearest town which means that there is essentially nothing for students to do outside of school. Student life is very focused around the school which puts pressure on the staff to provide an environment where students feel safe, nurtured and challenged all at the same time.

The population of the district has had some changes in the last several years. There has been a school district in Plumas Lake since the 1970s, but the number of students went from around one hundred and fifty in the year 2000 to over one thousand students when Riverside Meadows opened in 2006. Each year there are approximately one hundred students enrolled in the eighth grade. Many families from the larger Sacramento area moved to Plumas Lake to buy less expensive homes in a safe community that is a commutable distance to Sacramento for work. Many of these students came from larger schools in rougher communities and do not have the same level of science exposure that students who have gone through this district possess.

Despite the flux, the community of Plumas Lake is not very diverse. The largest sub-groups are Hispanics and the socio-economically disadvantaged. Even though it is almost entirely new homes, there are some people who live in multi-generational situations or who come from the surrounding area which is extremely socio-economically disadvantaged.

I have been teaching eighth grade science for seven years in this community and it has always bothered me that certain students never seem interested in what is going on in

the classroom. We could be shooting balloons across the room to demonstrate Newton's Third Law of Motion, and in every class there are a few students who are just warming their seats, waiting for the bell to ring. I started noticing anecdotally that those seat warmers would always seem to come alive when I showed a video. I do not like to show videos that were made for science classrooms because jaded middle school students can always see right through someone who is trying to act "cool" on film. A lot of those videos simply miss the mark. Last year I showed a Bill Nye video on density and was horrified to find a music video at the end where Bill Nye sings "I like big boats" to the tune of Sir Mix-A-Lot's 1992 single "Baby's Got Back." The kids groaned and all of the actual science content in the song was lost on the audience. I started showing clips from movies that they actually wanted to watch to teach them content. I showed a clip from the Universal Pictures film "Despicable Me" to teach the definition of a vector. Even the seat warmers perked up and could tell me the definition. Every day that week I was inundated with requests to show the clip again. I started to wonder if this strategy could be used on a larger scale in order to improve student engagement in my classroom.

### Focus Question

A small percentage of eighth grade students at Riverside Meadows Intermediate are not actively engaged in their science classroom. I suspect that this level of engagement is hindering students from realizing the level of academic achievement that I think is possible. Ideally all students would be actively engaged while in the science classroom in order to improve student achievement. In order to meet this goal, I started adding video clips to existing science lessons and teaching the students how to have

academic conversations about the clips in order to develop student content knowledge. The focus of my research study was to determine whether improved student engagement through the use of video clips, coupled with strategic academic conversations in the science classroom would lead to improvements in student achievement. I also looked at whether the use of video clips in lessons actually increased student engagement, how incorporating the clips affected student attitudes towards science and if the impact of using video clips as hooks improved student understanding of basic chemistry concepts.

### CONCEPTUAL FRAMEWORK

Middle school is a time of great change in the life of adolescents. They are subjected to dramatic physical and emotional changes while expected to learn increasingly complex topics in school. In California, there are forty-six standards that students are expected to learn in eighth grade science alone (California Standards, 2004). There is a great amount of pressure to succeed, but due to a variety of factors it has been observed that there is actually a decrease in student motivation to learn science during this time (Vedder-Weiss & Fortus, 2010).

#### Importance of Engagement in the Classroom

Researchers have found that an increase in student motivation correlates to an increase in students' perceived competence and actual knowledge of content material (Liu, Horton, Olmanson & Toprac, 2011). Students who are highly engaged in their studies have been found to demonstrate increased understanding of the content matter (Hug, Krajcik & Marx, 2005). But what, exactly, constitutes being "engaged?"

Engagement can be defined as, “Psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote” (Newmann, Wehlage, & Lamborn, 1992, p.12). When students care about learning, they put effort into understanding the information. Another aspect of engagement is that if students feel their learning is relevant to the world outside the classroom their interest level in the learning increases dramatically (Harmer & Cates, 2007). This leads to one of the most enigmatic questions in education: What motivates students to learn?

### Increasing Student Engagement Through Video Clips and Discussions

Student motivation to learn varies widely from individual to individual. However, in general, student engagement has been shown to increase when students are presented with materials or techniques that they find interesting. The more students enjoy an activity (which can be quantified using questions posed to students regarding their experience at the end of the unit as well as observations of students during class) the more their content knowledge increases (Liu, et al, 2011). One area of interest to students is entertainment, particularly in the form of movies. Americans spent over 10 billion dollars on movies in 2011 ([www.boxofficemojo.com](http://www.boxofficemojo.com), 2011), showing that there is a huge interest in watching movies in the United States. Research done in the 1970s and 1980s showed that text illustrations, in the form of drawings or photographs used to help clarify the text, enhanced the performance of learners, and more recent research (from the 1990s through the present) shows that this is still the case and applies to other forms of pictures in media and technology as well (Carney, 2002).

Video clips from sources including popular movies can provide a multitude of different learning opportunities in the classroom. The article, “Teaching Evolution with the Aid of Science Fiction” (Bixler, 2007) identified three ways that videos could be utilized. First, they can be used to address and correct misconceptions about science concepts. Teachers could show a clip from a video that has errors in scientific facts and use that video to discuss with the class where the errors lie and what would need to be changed in order to make it correct. Second, they can be used to provide illustrations of science topics in entertaining and easy-to-understand ways. Sometimes a concept that may be difficult for a teacher to describe may be easily shown with a video clip. Third, video clips could be used to spark higher level learning, such as analysis and evaluation, in order to reinforce student comprehension of material. Teachers can use clips to ask questions beyond the simple facts presented and get students to use their content knowledge to answer “what if” type questions.

There is evidence that students are more confident in the subject matter after they have watched video clips pertaining to the subject matter and have discussed them in class (Mayo, Sharma and Muller, 2009). This confidence then has a direct effect on student engagement, as well as achievement in the classroom. Once students have been exposed to video clips in the science classroom, in order for the experience to be valuable, the teacher must create opportunities for discussion to occur.

It is important to distinguish between just talking about a topic and having an academic conversation. Zwiers and Crawford (2011) define academic conversations as “sustained and purposeful conversations about school topics.” When designing a classroom discussion, there are several important factors to keep in mind. First, the

discussion topic should be something that is actually arguable. There should be different perspectives that could be argued by different members of the class. Second, the topic for discussion must be within the students' realm of understanding. It must have at least some basis in their existing knowledge base so that they can make informed arguments. Third, the discussion should further student knowledge, and get the students to think beyond what they have already learned in class (Henning et al., 2008).

A discussion is not simply a teacher asking questions and students answering them. In order to design an actual classroom discussion that can be used to further knowledge, the teacher must ask questions that ask for new information, not the simple recitation of facts (Wilén, 2004). Through classroom observation and careful analysis, Zwiers and Crawford found that there are five core conversation skills that students need to possess in order to have true academic conversations. These skills are the ability to elaborate and clarify; support ideas with examples; build on and/or challenge a partner's ideas; paraphrase; and synthesize conversation points (Zwiers & Crawford, 2011). These skills can be used to get students talking about what they have seen in the video clips in order to further their knowledge of the subject matter by connecting their prior knowledge with new ideas.

## METHODOLOGY

Studies have shown that students who are engaged in the classroom show increased understanding of content matter (Hug, Krajcik & Marx, 2005). In order to engage the students in my class, and consequently improve understanding of science content, I plan to teach by adding video clips of varying lengths to my lessons. Different

clips will be used as “hooks” to grab student attention at the beginning of a lesson, to teach new content, and to review content that has already been covered in class.

However, just showing videos that students find interesting will not be sufficient to improve student learning. Each clip will be specifically chosen with a learning objective in mind. For example, if the objective is for students to understand ions, then I will provide a clip that specifically addresses the content and I will use that clip as a way to spark classroom discussion by designing discussion prompts that match the learning objectives.

### Participants

The treatment was implemented with one class of eighth grade physical science at Riverside Meadows Intermediate school during the 2012-2013 school year (25 students), and the results were compared to a similar period of twenty-four eighth grade students at the same school. The 8<sup>th</sup> grade population this year was 64% Caucasian, 25% Latino, 6% Asian-American, and 5% African-American. Table 1 shows some basic demographics for the treatment and comparison groups of 8<sup>th</sup> grade science students at Riverside Meadows.

Table 1  
*Demographics by Class*

Class Period	# of Students	Male	Female	Caucasian	Latino	Asian-American	African-American
4 <sup>th</sup> (treatment group)	25	16	9	11	7	4	3
6 <sup>th</sup> (comparison group)	24	8	16	19	4	0	1

### Intervention

My project was carried out over a four week period starting mid-January 2013, and concluding at the beginning of March, 2012, and consisted of a pre-treatment phase, a treatment phase and a post-treatment phase. The treatment was implemented using the textbook “Focus on Physical Sciences” by McDougal Litell, published in 2007. The unit focuses on the Periodic Table of Elements and was broken down into three parts.

In the pre-treatment phase of the study, student interest and attitudes toward science were assessed using student surveys (Appendix A). I wanted to find out what students were interested in studying and if they had previously enjoyed being part of a science class.

During the treatment phase of my project I gave a brief pre-test on the content at the beginning of each of the four weeks using personal response system clickers. I then showed video clips to help illustrate science content and directed discussion groups using different academic conversation strategies. Student engagement during these activities was quantified through observation using a classroom seating chart (Appendix B). After

the clips were shown and the content was discussed in groups, I gave another brief content assessment using the clickers.

During Part 1 of the treatment phase students were taught how to use the academic conversation skill known as “elaborate and clarify.” Students were taught that when they elaborate and clarify they must be able to explain a topic with enough detail in order to help someone else understand that topic. Often, examples can be used to help illustrate a concept and can be used with this conversation skill (Appendix M). Students were then shown a video clip from a 1950s scientific cartoon that illustrated the difference between isotopes and ions. After the video clip, they were separated into pairs and were instructed to create a Venn Diagram (Appendix D) in order to show the differences between isotopes and ions. Students were instructed that the point of this activity was to have a good conversation, not just complete the diagram. For each piece of information added, students either had to agree to add it, or if there was not agreement, they had to use their conversation skills to decide if the information should or should not be added to the diagram. After five minutes, each pair had a completed Venn diagram and there was a classroom discussion about the information they added and why they added it to their diagram.

During Part 2 of the treatment phase, students were taught how to use the academic conversation skill known as “Support Ideas with Examples.” This strategy is used to help students acquire the ability to generate useful examples in order to support their ideas. Students were shown a short video clip from the movie “Home Alone 2” where the character “Marv” receives an electric shock when he touches a sink handle attached by wire to a generator. After the clip, students were broken into pairs and given

a table of possible elements that the wire could be made up of (Appendix G). For each element that was listed they had to give at least one piece of evidence as to why the wire might have been made of that element. Once every group added their elements, the class discussed whether or not each element should have been added based on the evidence provided.

During Part 3 of the treatment phase students were taught how to use the academic conversation skill known as “Build On and/or Challenge a Partner’s Ideas”. This skill is used to get students thinking about a topic and how it relates to what other students think about that topic. The idea is to get them to build on the ideas of other students they are having a discussion with in class, not just randomly throw out ideas (Appendix M). Students were then shown a clip from the cartoon “Futurama” where a fictional atom “Jumbonium” is shown. After the video clip, students were broken into pairs where every group had a student “A” and a student “B”. I read the following statement to the class: “Think to yourself why the structure of the atom shown could not be correct.” The “A” students were instructed to tell their partners why or why not the structure of “Jumbonium” could be plausible. After all of the “A” partners were given their minute to justify their ideas to their partners, the “B” partners were given a minute to either explain why they agree or disagree with partner “A”. They were instructed that their position had to be based on evidence, not just “because that is what I think.” After each student was given a chance to share their ideas with their partner, there was a classroom discussion to share the class findings.

The last phase of my treatment was the post-treatment phase. During that week I gave the students in the treatment group the “Student Interest in Video Clips Survey”

(Appendix K) in order to determine if they enjoyed watching each particular video clip. After the survey I chose six students to interview and asked them questions related to what students are interested in during science class (Appendix L). Three girls and three boys were chosen. In order to represent the diversity of the class, each of the boy and girl groups included a high, middle and lower achieving student. The class grades of the students were analyzed at the time of the study and students were then randomly chosen for interviews from each of the different achievement groups. Students were chosen who represent the diversity present in the classroom and by their ability to answer interview questions and provide as much data as possible, based on previous interaction in the classroom.

By implementing these strategies in my classroom, students were able to have academic conversations with their peers sparked by stimulating video clips. By showing video clips that students were interested in watching I was able to grab their attention and then use the clips to illustrate science concepts in a way that was easy for middle school students to understand. Once the science content was delivered, students were able to have meaningful conversations about the content with their peers using directed academic conversation prompts. My research plan was reviewed and approved by the Montana State University Institutional Review Board for research involving human subjects and is outlined in Table 2.

Table 2  
*Research Plan*

Phase	Evidence
Pre- Treatment Phase 01/14/13	-Student Attitudes and Interest in Science Survey (treatment and comparison)
Treatment Phase – Part I Atoms/Isotopes/Ions 01/15/13-01/18/13	-Students given pre-assessment of content knowledge (treatment and comparison) -Students shown retro science video “A is for Atom” (treatment) -Student engagement during video is observed using Student Observation Form (treatment) -Students participate in discussion groups using the academic conversation skill “Elaborate and Clarify” (treatment) -Students given post-assessment of content knowledge (treatment and comparison)
Treatment Phase – Part II Periodic Table Trends 02/04/13-02/08/13	-Students given pre-assessment of content knowledge (treatment and comparison) -Students shown video clip from the movie “Home Alone 2” (treatment) -Student engagement during video is observed using Student Observation Form (treatment) -Students participate in discussion groups using the academic conversation skill “Support Ideas with Examples” (treatment) -Students given post-assessment of content knowledge (treatment and comparison)
Treatment Phase – Part III Atomic Structure Review 02/14/13	-Students shown video clip from the television show “Futurama” (treatment) -Student engagement during video is observed using Student Observation Form (treatment) -Students participate in discussion groups using the academic conversation skill “Build On and/or Challenge a Partner’s Ideas” (treatment) -Students given informal post-assessment of content knowledge using white boards (treatment and comparison)
Post- Treatment Phase 03/08/13	-Post treatment Student Attitudes and Interest in Science interviews (6 students from treatment group)

### Data Collection

To determine whether or not the use of video clips coupled with academic conversation results in an increase in student achievement, summative assessments of the content were given to both the treatment and comparison groups. Brief pre-assessments (Appendices C & F) were compared to assessments given after the treatment (Appendices E & I) to see if there was any improvement in student understanding of the chemistry concepts covered. The practice quizzes were given at the beginning of each week of Phases I and II of the treatment period. After the video clips were shown and academic conversations were held in class, the same questions from the practice quizzes were given to the students again. For the actual quizzes the questions were all the same, but the answers were shuffled to prevent students from simply memorizing the letter answers from the practice test. Quiz data from the treatment group was also compared to quiz data from the comparison group, which was given the same assessments. Student understanding of content matter was also measured in both the treatment and comparison groups using an informal white board review (Appendix J).

Classroom seating charts were used as Student Observation Forms (Appendix B) to record the level of engagement of each student while watching the video clips. The level of engagement of students during the observation period was assessed on a scale of 1 to 3, 1 meaning completely unengaged, 2 somewhat engaged, and 3 completely engaged.

Brief student interviews consisting of five questions (see Appendix L) were conducted in order to determine how students felt about their own engagement as well as their interest in science class. These interviews were conducted individually on six

students from the treatment class. Each student was taken aside during class to be interviewed while the rest of the class was working on another assignment. Their responses were recorded on printed copies of the Student Interview Questions sheet.

Student interest in science was measured using a pre-treatment survey (Appendix A) that was given to all students from both the treatment group (Period 6) and the comparison group (Period 4). Student attitudes about science were also assessed using the post-treatment interviews (Appendix L) conducted with a sampling of six students. The sources used to triangulate data for my focus and subquestions are summarized in Table 3 below.

Table 3  
Triangulation Matrix

Focus Questions	Data Source 1	Data Source 2	Data Source 3
<i>Primary Question:</i>	practice quiz	quiz	quiz
1. Does improved student engagement through the use of video clips coupled with strategic academic conversations in the science classroom lead to improvements in student achievement?	(given each week before video clip and discussion) -treatment group	(given each week after video clip and discussion) -treatment group	-comparison group
<i>Secondary Questions:</i>	student surveys	student interviews	Observation using classroom seating charts
2. Does the use of video clips in science lessons increase student engagement?			
3. How does incorporating video clips into science lessons affect student attitudes about science?	student surveys	student interviews	Classroom teacher observation
4. Does the use of academic conversations started with the use of video clips have a measurable impact on student understanding of basic chemistry concepts?	practice quiz (given each week before video clip and discussion) -treatment group	quiz (given each week after video clip and discussion) -treatment group	quiz -comparison group

## DATA AND ANALYSIS

In order to determine whether the use of video clips to start academic conversations has a measurable impact on student understanding of basic chemistry concepts, two groups of students had to be compared: one group who did not engage in academic conversations sparked by video clips, and one group that did. These two groups had to be determined from the four class periods of eighth grade science at

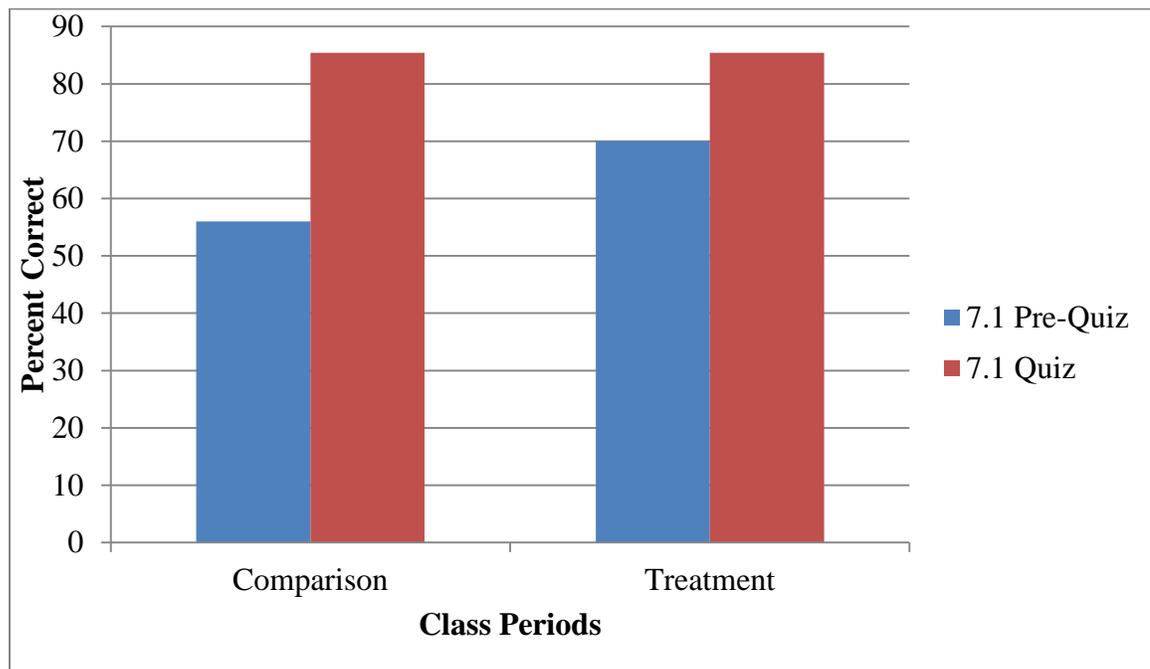
Riverside Meadows Intermediate School during the 2012-2013 school-year. Of those four classes, Periods 4 and 6 appeared to perform similarly on assessments prior to the beginning of the treatment phase. A t-test was performed on the last assessment given to both classes before the treatment phase began. Period 4 ( $M=14.50$ ,  $SD=2.38$ ) was compared to Period 6 ( $M=14.27$ ,  $SD=2.57$ ) and their results were found not to be statistically significant,  $t(44)=0.31$ ,  $p=0.76$ . Once it was determined that these two classes performed similarly on assessments, a coin was flipped to choose which class period would participate in the treatment. Period 6 was chosen as the class that would participate in the treatment as a result of the coin flip.

During Phase I of treatment, students in both the treatment group (Period 6) and the comparison group (Period 4), were taught about isotopes and ions (Chapter 7.1 in the textbook). Both groups were presented with the content in the same way that content had been presented to the class throughout the course of the year (reading the text, class discussion, notes, online computer simulations, etc.). Both groups were then given the 7.1 Pre-Quiz (Appendix C) to assess their level of understanding after the content had been presented. After the pre-quiz, the treatment group was shown a short video called “A is for Atom” an educational cartoon film from the 1950s that was found on YouTube. (<http://youtu.be/T6UujimddEc>). The video explained both ions and isotopes.

After the video clip was shown, students were instructed that they would be using the academic conversation skill “elaborate and clarify” (Appendix M) to create a Venn Diagram (Appendix D) with a partner comparing and contrasting ions and isotopes. They were instructed that “elaborating and clarifying” meant that they needed to include enough detail in their diagram to help someone else understand the content. They were

given five minutes to complete the diagram and each pair then shared what they had written with the class.

The day after the video and discussion both groups were given the 7.1 Quiz (Appendix E). The comparison group had an average score of 56% on the 7.1 Pre-Quiz and an 85% on the 7.1 Quiz. The treatment group had an average score of 70% on the Pre-Quiz and an 85% on the 7.1 Quiz (Figure 1). Both groups showed improvement, but the one that was not shown the clips actually improved more than the group that was shown the clips. Both groups scored exactly the same on the 7.1 Quiz, so there was no measurable increase in achievement on the quiz that could be attributed to watching the video clips and participating in academic conversations sparked by the video.

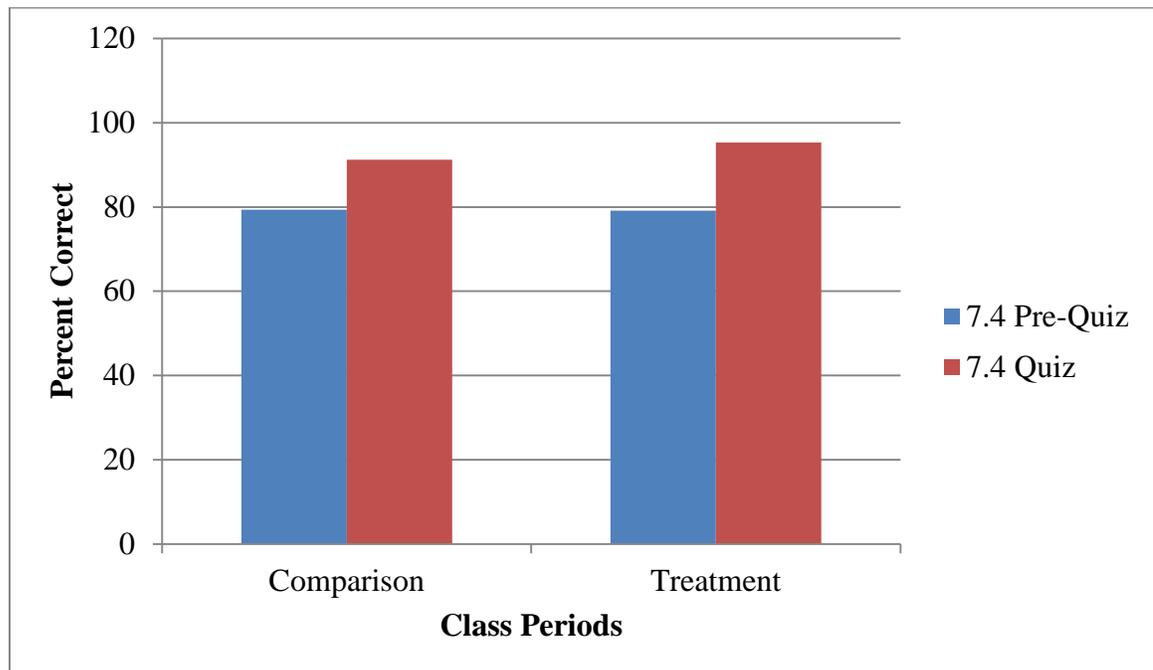


*Figure 1.* Average scores for Chapter 7.1 assessments, (comparison  $N=24$ , treatment  $N=25$ ).

During Phase II of the treatment, students in both the treatment and comparison groups were taught about trends on the Periodic Table (Chapter 7.4 in the textbook). Once again, both groups were taught the content in the same way that it had been presented all year, and after the content was covered both classes were given the 7.4 Pre-Quiz (Appendix F). After the pre-quiz, the treatment group was shown a short clip from the movie “Home Alone 2.” They were shown the clip where the character “Marv” grabs two metal handles on a sink that have been attached with wire to a generator. The character “Kevin” then turns the generator on shocking “Marv”. It is a very short, thirty second clip. After the clip was shown, the class was put into pairs and instructed how to use the academic conversation skill known as “Support Ideas with Examples” (Appendix M). Each pair was given a worksheet to complete (Appendix G). The worksheet was a table where six different elements were listed. For each element the pairs had to determine if the handles of the sink could have been made from that element. In addition to a simple “yes” or “no” answer, they had to support their claim with evidence based on what they knew about Periodic Table Trends.

The day after the video and discussion both the treatment and comparison groups were given the 7.4 Quiz (Appendix I). The comparison group had an average score of 79% on the 7.4 Pre-Quiz and a 91% on the 7.4 Quiz. The treatment group had an average score of 79% on the Pre-Quiz and a 95% on the 7.4 Quiz (Figure 2). Both groups showed improvement, but this time the class that was shown the video clips improved more than the class that was not shown the clips. The treatment group had an increase of 16% on the assessment, while the comparison group had only a 12% increase. A t-test was run to compare the results of the 7.4 Quiz. The comparison group ( $M=10.95$ ,  $SD=1.36$ ) was

compared to the treatment group ( $M=11.42$ ,  $SD=1.10$ ) and even though it initially appeared that the class that had watched the video clip performed better on the assessment, the results were found not to be statistically significant,  $t(43)=1.27$ ,  $p=0.21$ .



*Figure 2.* Average scores for Chapter 7.4 assessments, (comparison  $N=21$ , treatment  $N=24$ ).

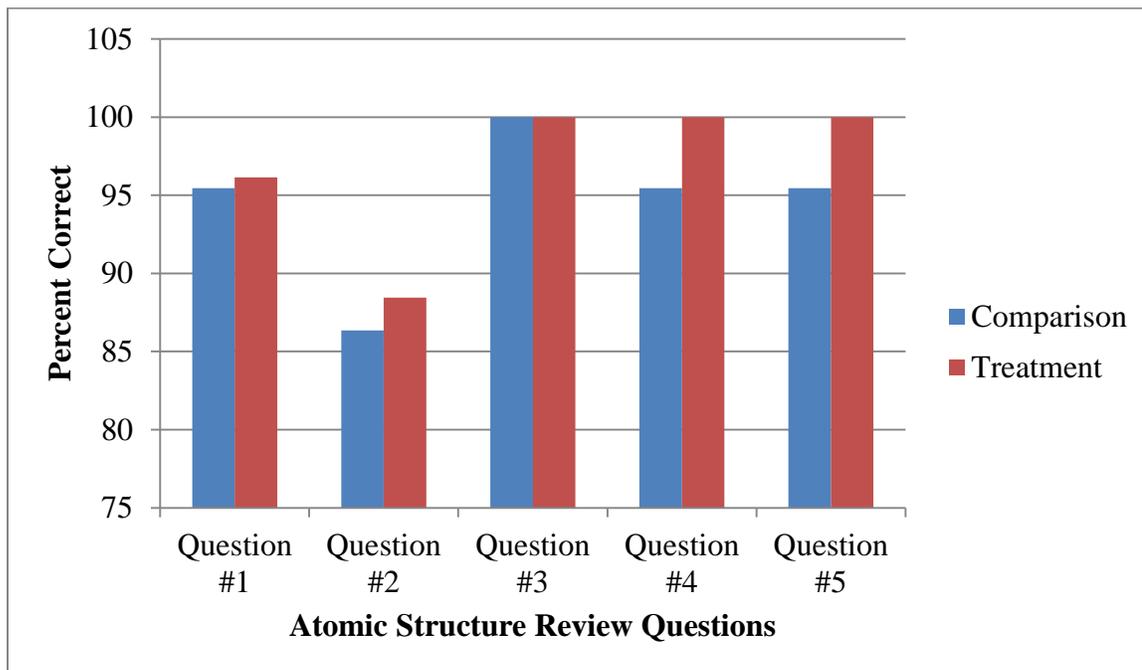
During Phase III of the treatment, students in the treatment group were shown a clip from an episode of the television show “Futurama”. In the clip the characters are talking about a fictional atom called “Jumbonium” (Figure 3). The students were shown the short clip, then they were instructed to think about whether the structure of “Jumbonium” could be plausible based on what they knew about the structure of an atom. After the thinking time was over, students used the academic conversation skill known as “Build On and/or Challenge a Partner’s Ideas” (Appendix M). Each pair had a student labeled “A” and a student labeled “B.” The “A” students were instructed to tell their

partners why or why not the structure of “Jumbonium” could be plausible. After all of the “A” partners were given their minute to justify their ideas to their partner, the “B” partners were given a minute to either explain why they agreed or disagreed with partner “A”. They were instructed that their position had to be based on evidence, not just “because that is what I think.” After each partner was given a chance to share their ideas with their partner, there was a classroom discussion to share the findings of the class.



*Figure 3:* Photo of the fictional element of “Jumbonium” from the television series “Futurama”(http://theinfosphere.org/Jumbonium).

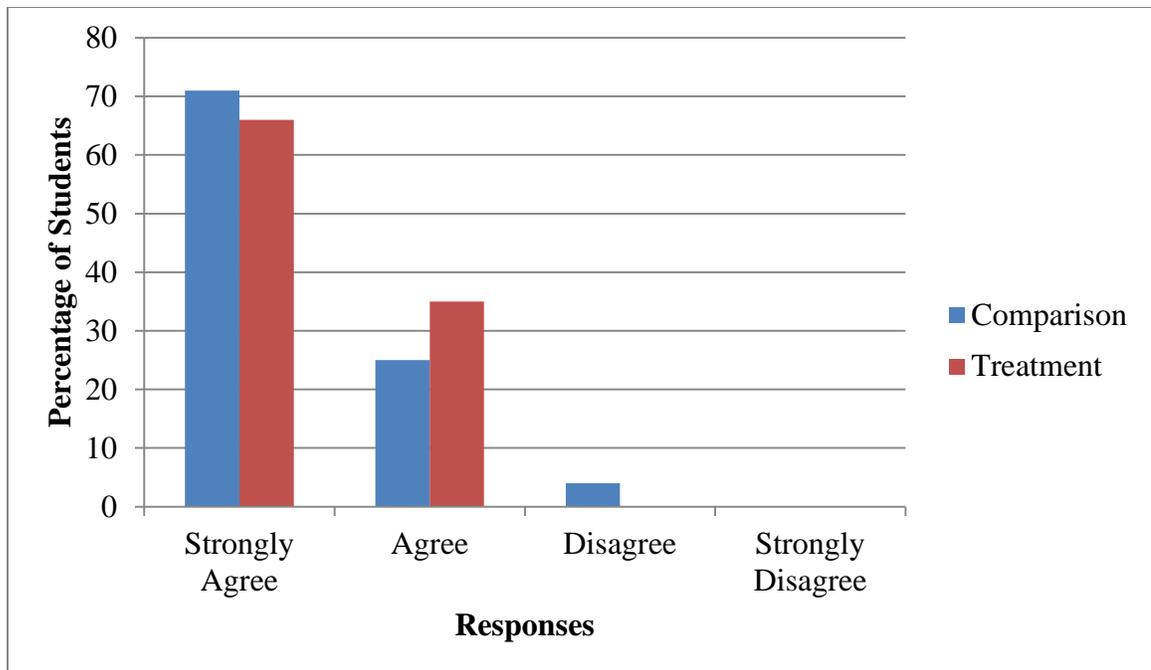
In order to assess whether or not this video clip and academic conversation actually improved student achievement, a short white board review was conducted with both the treatment and comparison groups (Appendix J). Five different questions were posed and the results of the questions were recorded on a copy of the Student Observation Form (Appendix B). The results of the two groups were compared: comparison group ( $M=4.73$ ,  $SD=.55$ ) and treatment group ( $M=4.85$ ,  $SD=.37$ ), and although it appeared that the treatment group performed better on the review (Figure 4), the results were found to not be statistically significant ( $t(46)=.89$ ,  $p=.38$ ).



*Figure 4.* Results of “Atomic Structure Review Questions” given via white boards, (comparison  $N=22$ , treatment  $N=26$ ).

### Student Engagement

Evidence from this study strongly suggests that students who watch video clips as part of science lessons are highly engaged in class. The pre-treatment phase of this study consisted of a survey given to each student in both the treatment and comparison groups (Appendix A). The survey was designed to measure whether students enjoy their science class, and specifically whether or not they enjoy watching video clips in science class and engaging in academic conversations about the video clips. The survey showed overwhelmingly that students enjoy watching video clips in class (Figure 5).



*Figure 5.* Responses to student interest in science survey Question #4: “I like when video clips are used in class to explain science concepts,” (comparison  $N=24$ , treatment  $N=26$ ).

While students who were shown video clips in order to begin academic conversations may not have shown a measurable increase in content knowledge there was a definite increase in student engagement. Each time the treatment group was shown a video clip as part of a lesson, the level of student engagement was measured using a classroom seating chart with a 1-3 scale, with “1” indicating a student was not at all engaged and a “3” indicating that a student was highly engaged. Students who exhibited a “1” level of engagement did not show any interest in the video. They might have been trying to talk to a neighbor, or playing with their pencil, etc. A “2” level of engagement would have been a student who spent part of the time watching the video, but didn’t pay attention for the entire time, and a “3” level of engagement would have been if a student was completely engaged in the video, watching and paying attention to the entire clip.

For the video clip “A is for Atom” there was a high level of student engagement, with eighteen students who were completely engaged (69%). Approximately seven students were not completely engaged (27%), and would talk or whisper from time to time, and one student (4%) was not paying any attention to the video at all (Figure 6). However, the one student who was not paying any attention often has difficulty focusing and can be seen staring at the ceiling or trying to talk to anyone who will listen most of the time. For the other two clips (“Home Alone 2” and “Futurama”) one hundred percent of the treatment group was fully engaged during the clips.

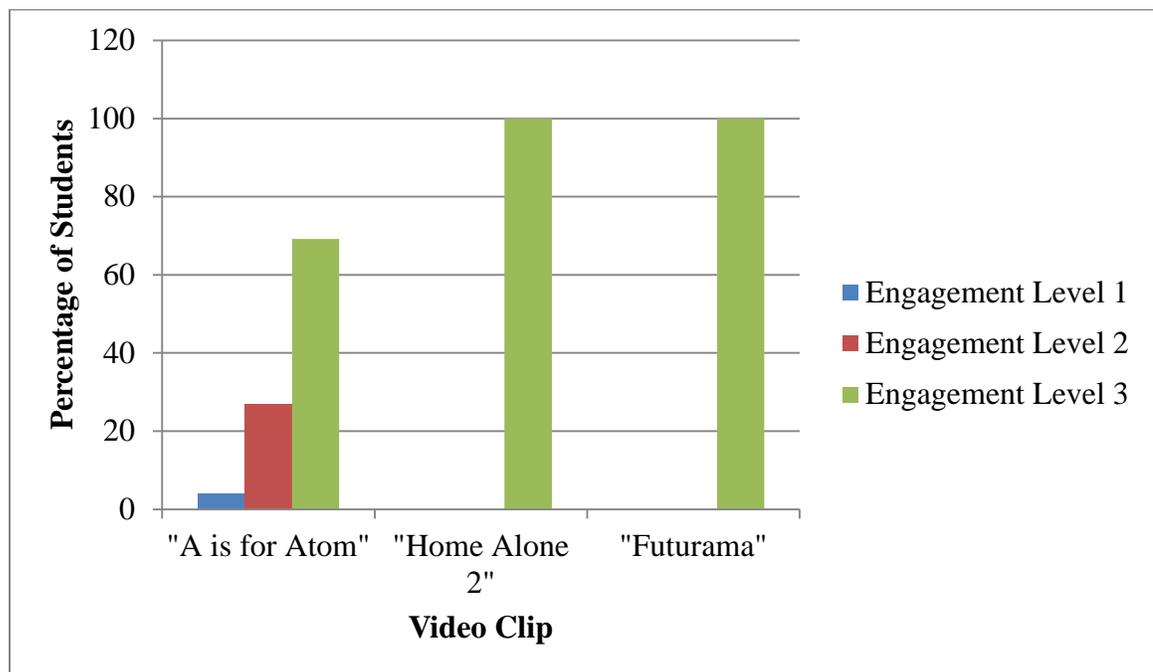
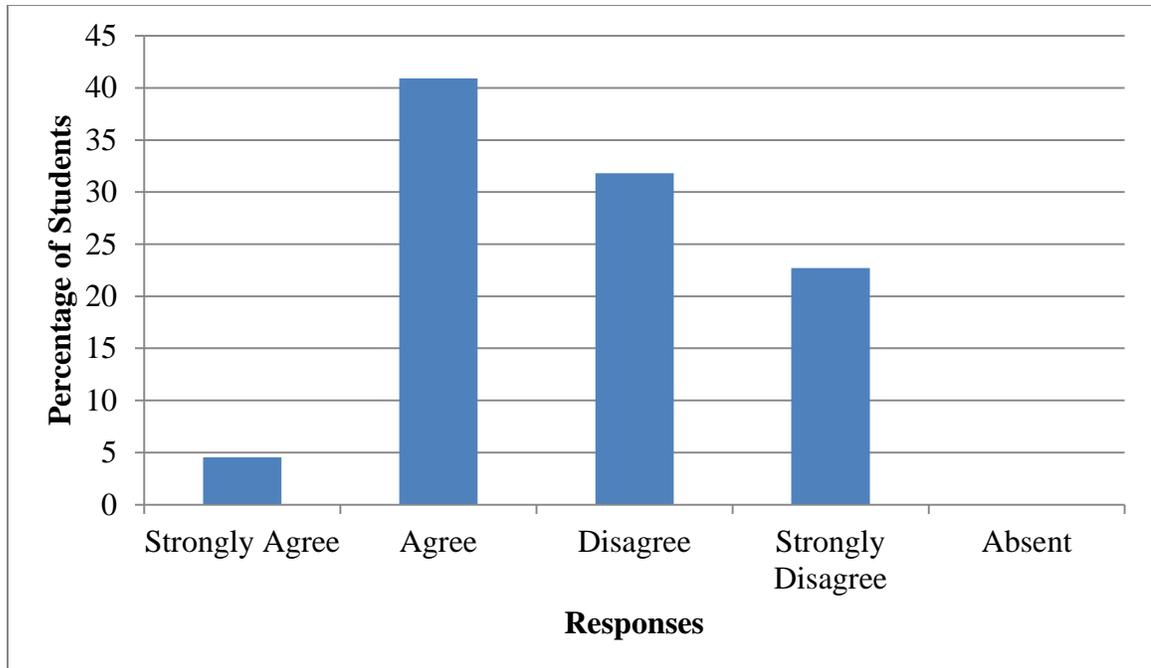


Figure 6. Student levels of engagement during video clips, ( $N=26$ ).

Six students from the treatment group were also interviewed as the post-treatment phase of the study. Students were chosen who were likely to state their opinions. Three boys of varying skill levels were chosen as well as three girls of varying skill levels.

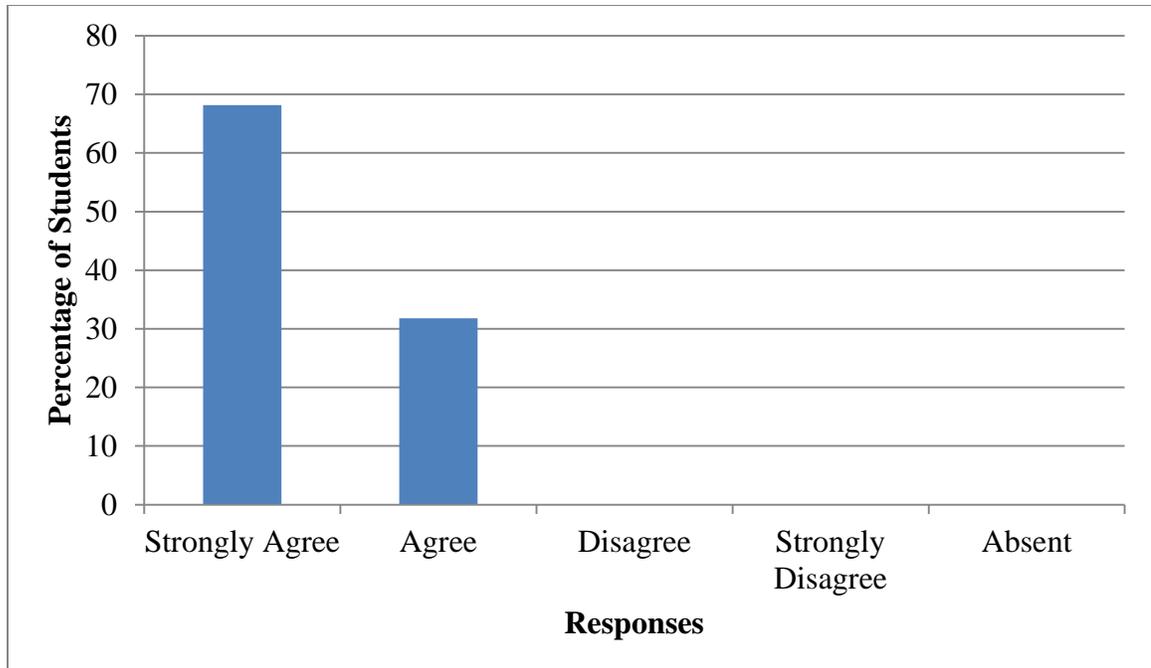
When asked the survey question “Do you enjoy watching video clips in your science class?” five of the students responded “Yes” while one student responded “Heck yeah!” When asked the question “What do you enjoy about watching videos in class?” a variety of answers were recorded. One student responded: “We’re not working, and they are interesting” while another stated: “We are just sitting and watching and learning. It is easy.” The theme from the interview responses seemed to be that the students enjoyed watching the videos because they didn’t view them as “work.”

In order to understand why there was not complete student engagement during one of the clips, a survey was given to the students in order to gauge their level of interest in each of the clips (Appendix K). The first statement on the survey was “I enjoyed watching the video from the 1950s on isotopes.” Of the twenty two students surveyed, 45% said that they enjoyed the video, while 55% said that they did not enjoy the video (Figure 7).



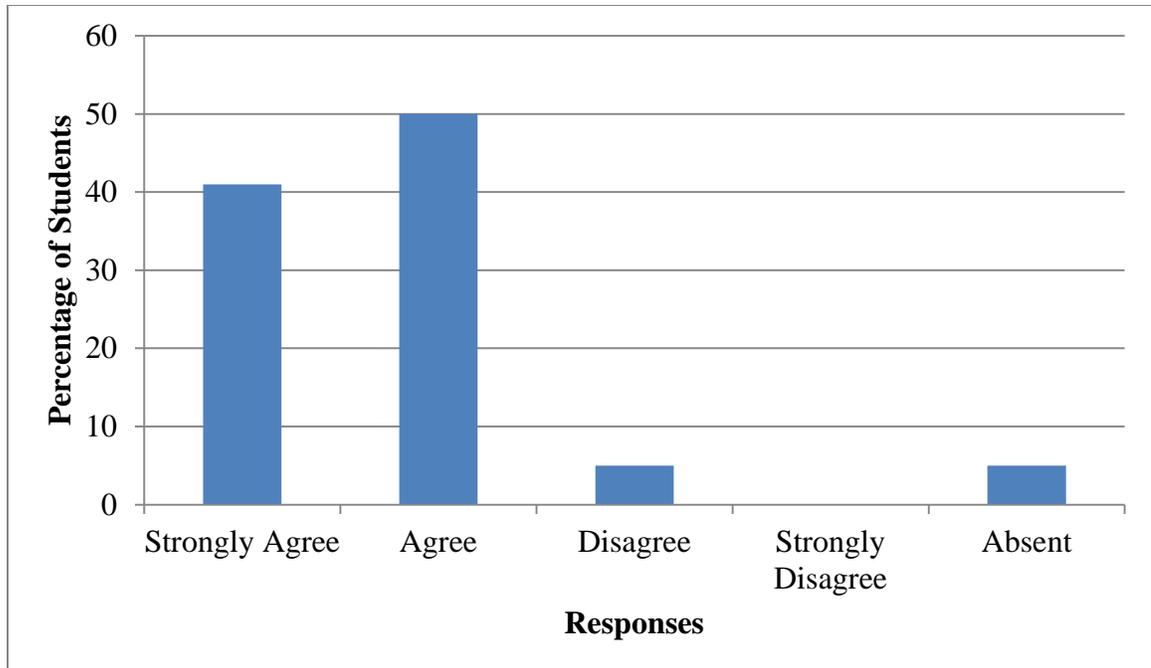
*Figure 7.* Student responses to the survey statement “I enjoyed watching the video from the 1950s on isotopes,” ( $N=22$ ).

The second statement on the survey was “I enjoyed watching the video clip from ‘Home Alone 2’ where ‘Marv’ was electrocuted to learn about electrical conductivity.” Of the twenty two students surveyed, 100% of the students said that they enjoyed watching the video (Figure 8).



*Figure 8.* Student responses to the survey statement “I enjoyed watching the video clip from “Home Alone 2” where “Marv” was electrocuted to learn about electrical conductivity,” ( $N=22$ ).

The third statement on the survey was “I enjoyed watching the video clip from ‘Futurama’ about the element ‘Jumbonium’ in order to review the structure of the atom.” Of the twenty two students surveyed, 91% said that they enjoyed watching the video. Five percent, or one student did not enjoy the video, and another five percent, or one student was absent the day the video was shown (Figure 9).



*Figure 9.* Student responses to the survey statement “I enjoyed watching the video clip from ‘Futurama’ about the element ‘Jumbonium’ in order to review the structure of the atom,” ( $N=22$ ).

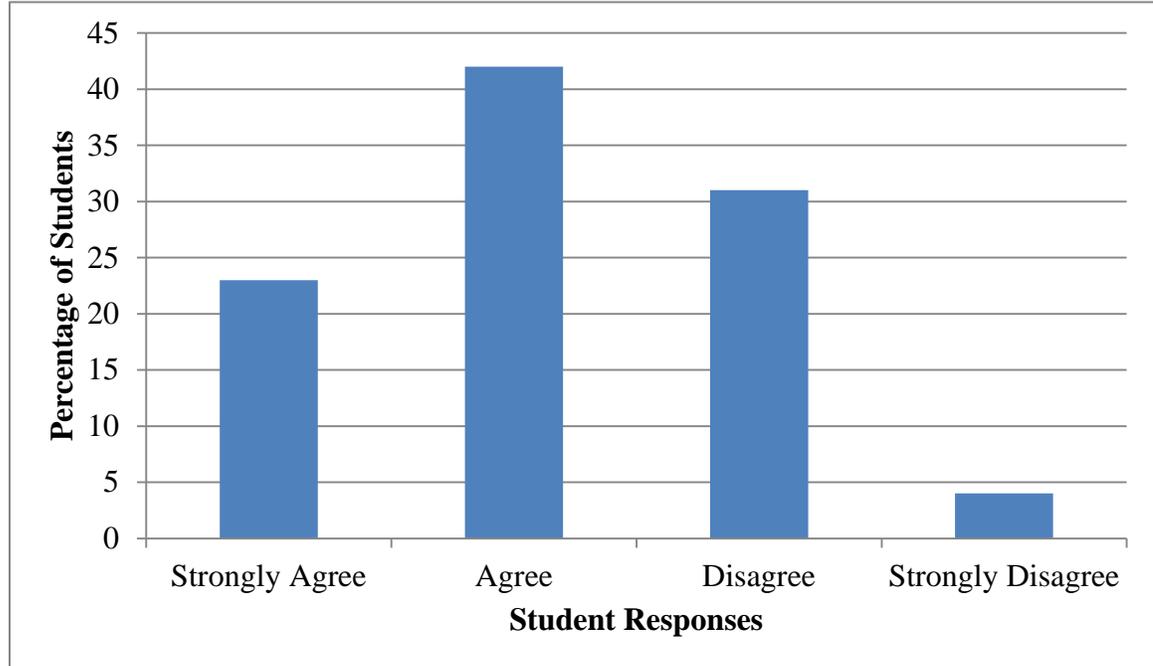
The data showed that there was a definite correlation between the level of observed student engagement and the level of actual student interest in the video clips. For the video “A is for Atom” only 69% of the students were highly engaged when the video was playing in class. This correlated to 54% of the class indicating that they did not enjoy watching that video. On the other hand, 100% of the students were highly engaged while watching the clip from “Home Alone 2” and 100% of the students surveyed indicated that they enjoyed watching that video clip. The same correlation existed for the clip from “Futurama” as well because 100% of the treatment group was highly engaged while watching the clip, and only one student in the class indicated on the survey that they didn’t enjoy watching it.

### Student Attitudes

The premise of this study is that if students are engaged by watching videos in their science class which causes them to enjoy class, then ultimately they will perform better academically. Student attitudes toward science were measured in a variety of ways. Overall, attitudes were shown to be positive from data collected in the treatment. In the Student Interest in Science Survey (Appendix A) a majority of the treatment group students surveyed (96%) reported that they enjoyed their science class. From the same survey it was found that a majority of students felt that watching video clips helped them to better understand science concepts (92%). This attitude was further explained in responses from the Student Interviews (Appendix L). When asked the question “Do you think it is easier to understand content when you see a video clip?” one student said “Yes, because it is easier to understand than the textbook. They show you how it works instead of just reading about it.” Another student said “Yes, I learn more stuff when I see it happening than when another person is explaining it.” All of the responses indicated that the students thought that they were better able to understand the content as a result of watching the video clips.

However, students were not as interested in engaging in academic conversations with their peers in order to process the information that they watched in the videos (Figure 10). A large percentage (35%) of the class did not feel that engaging in academic conversations with their peers helped them to understand the science concepts that were

presented in the videos.



*Figure 10.* Student responses to the survey question “Talking with other students about what we learned in class helps me to understand science concepts,” ( $N= 26$ ).

### INTERPRETATION AND CONCLUSION

This study provides evidence that incorporating video clips into science lessons can contribute to a positive learning experience. Several students who stated that they did not like science in the Student Interest in Science Survey indicated that they did enjoy watching videos in their science class. After the videos were shown to the treatment group as part of several science lessons, students overwhelmingly indicated that they enjoyed the videos that they watched.

While the students indicated a definite interest in the videos, there was less interest in engaging in academic conversations with their peers, as indicated in the results of the Student Interest in Science Survey. This was surprising, as I had expected that

students would relish any opportunity to talk to each other. Even though many students indicated that they would rather just watch videos but not have academic conversations about them afterwards, I believe that the pairing of the two led to a deeper understanding of the content based on my observations of student conversations after the videos. Often the partners would start their conversations with a basic understanding of what was shown in the video, and would develop a deeper understanding of the content by the end of the conversation. Just showing the video clips would not have made the connections to the content that I wanted students to make if it were not for the academic conversations.

The results of this study did not show a marked increase in student achievement due to the viewing of the video clips coupled with academic conversation. However, this may have been due to a disparity between the thinking levels required in the activities and the assessments. The academic conversation activities required higher-level thinking, but the assessments were quizzes and reviews that mostly measured lower-level thinking. I inadvertently caused this problem in my research. Ordinarily my classroom assessments consist of several multiple choice questions followed by a higher-level thinking question that must be answered in a paragraph. For the purposes of data collection for this study, I thought it would be easier to re-write the assessments as multiple-choice only. By doing this, I only assessed lower-level thinking skills and excluded the higher-level thinking skills which I had been developing during the treatment phase of this study.

## VALUE

I have always had an avid interest in television and after I became a science teacher I realized that there were countless scenes in movies and television shows that

could be used to teach science content. I had noticed anecdotally that students seemed to respond positively each time I used a video or video clip in a lesson. Thinking that video clips are useful is one thing, but planning and executing this capstone project gave me the opportunity to find out if the video clips were actually benefitting my students in any measurable way.

Although the data collected during this project did not show a measurable increase in student academic performance as a result of watching video clips and engaging in academic conversations, it showed definite high levels of student engagement. Through teacher observation a high level of student engagement was documented each time a video was shown and students reported via survey that they enjoyed watching the clips. Before the capstone project I assumed that they enjoyed watching the videos, but now I have actual data to back up that assumption.

The one thing that really caught my attention from the data was that student engagement is highly dependent on how much the students enjoy the video. I chose three video clips to use during my study, and it was apparent that students did not care for one of them. This piece of information is really valuable since I want to improve student interest in my science class. What it tells me is that I need to make sure to choose clips that the students will find entertaining, and not just any clip that explains content. One strategy that I came up with is to ask the students next year to come up with video clips that they would use to teach the content. Perhaps if I leave it as an ongoing assignment during the year I will be able to amass a large number of clips to use in the future. If the students have a hand in choosing the clips there may be higher student buy-in as well, which will only add to the positive learning environment.

Once new clips are chosen I will need to come up with strong high-level thinking strategies for academic conversations (Zwiers & Crawford, 2011). When I first began my project this was the part that I dreaded the most. I have always been concerned that if I put students together in pairs or groups and tell them to talk, that I will then lose control of the class, which will lead to behavior problems. I found I really had nothing to be concerned about. While the students reported that they did not enjoy talking about the videos with one another, they were on task when they were expected to discuss the clips. I believe that this discussion was the key to making the connection between the video clips and the content, so even though in the survey many students stated that they would rather not participate in academic conversations, I think it was vital to the activity. As I observed students participating in the discussions I don't think it harmed the positive learning environment either.

While I am disappointed that the data did not show an increase in academic achievement as a result of incorporating video clips and academic conversations into my science lessons, I am encouraged by the fact that the research supported my assumption that watching video clips from popular media leads to a positive learning environment. I have always felt that student enjoyment of their classes is one of the most important components in developing a love of learning in students. By making a few changes next year in my teaching strategies, particularly in how I assess student learning, I believe that there will be a measurable increase in academic achievement as a result of incorporating video clips and academic conversation into my science lessons.

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APPENDICES

APPENDIX A

STUDENT INTEREST IN SCIENCE SURVEY

## Student Interest in Science Survey

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

*Circle your response*

SA= strongly agree, A= agree, D= disagree, SD= strongly disagree

1. I often enjoy my science class.    **SA   A   D   SD**
  
2. There are parts of each science lesson that I do not enjoy.    **SA   A   D   SD**
  
3. Talking with other students about what we learned in class helps me to understand science concepts.  
  
**SA   A   D   SD**
  
4. I like when video clips are used in class to explain science concepts.  
  
**SA   A   D   SD**
  
5. It helps me to better understand a science concept when we watch a science video clip about that concept.  
  
**SA   A   D   SD**
  
6. I am better able to understand a video clip shown in science when we talk about it after we watch it.  
  
**SA   A   D   SD**
  
7. I am able to better learn science concepts when I am interested in what we are doing in class.  
  
**SA   A   D   SD**

APPENDIX B

STUDENT OBSERVATION FORM

### Student Observation Form

**Scale: 1-3**

1= not engaged (not paying any attention to what is going on in class)

2= somewhat engaged (sometimes paying attention to what is going on in class)

3=completely engaged (paying attention to what is going on in class the entire time)

APPENDIX C

7.1 PRACTICE QUIZ

**7.1 Practice Quiz**

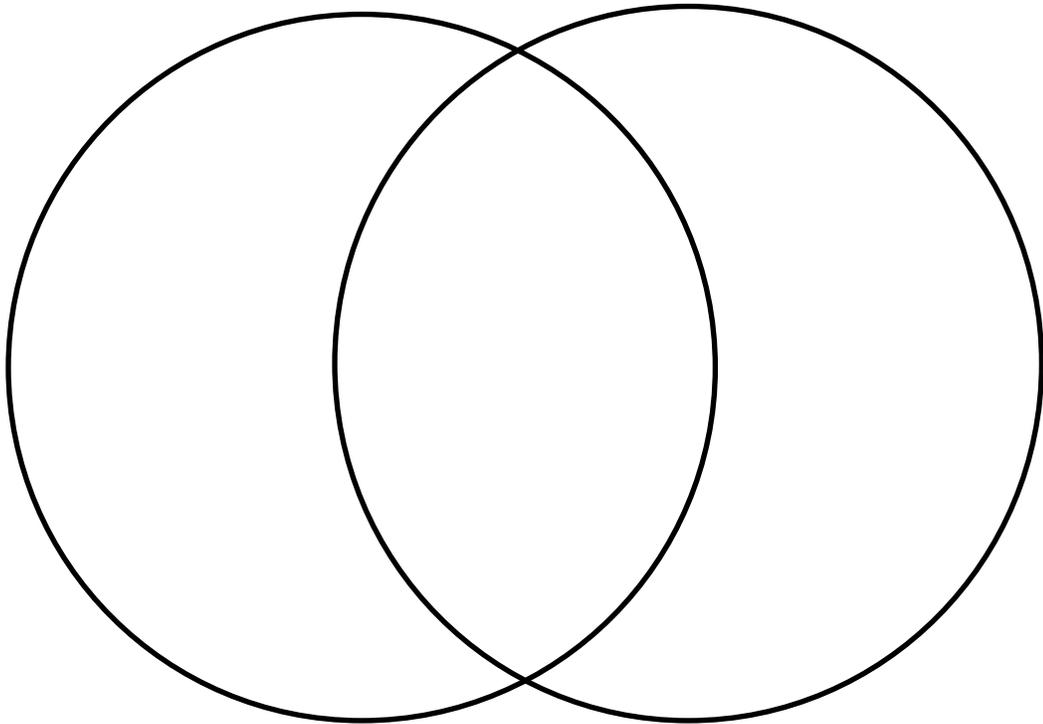
- Electrons
  - have a positive charge
  - move around outside the nucleus
  - determine the atomic number of an element
  - have more mass than the other parts of an atom
- One kind of uranium atom has 92 protons and 143 neutrons. Another atom of uranium has 92 protons and 146 neutrons. The two uranium atoms are different
  - ions
  - elements
  - electrons
  - isotopes
- $\text{Mg}^{2+}$  is a magnesium ion that has
  - two fewer electrons than a neutral magnesium atom
  - two fewer neutrons than a neutral magnesium atom
  - two more protons than a neutral magnesium atom
  - an atomic mass greater than that of a neutral magnesium atom
- Isotopes are atoms of the same element with different numbers of
  - protons
  - neutrons
  - electrons
  - ions
- Subatomic particles with a positive charge:
  - protons
  - neutrons
  - electrons
  - ions
- Found in the nucleus of an atom:
  - neutrons and electrons
  - protons and neutrons
  - electrons
  - electrons and protons

APPENDIX D

IONS AND ISOTOPES VENN DIAGRAM

Ions

Isotopes



APPENDIX E

7.1 QUIZ

**7.1 Quiz**

1. Electrons
  - e. have a positive charge
  - f. determine the atomic number of an element
  - g. have more mass than the other parts of an atom
  - h. move around outside the nucleus
  
2. One kind of uranium atom has 92 protons and 143 neutrons. Another atom of uranium has 92 protons and 146 neutrons. The two uranium atoms are different
  - e. ions
  - f. isotopes
  - g. electrons
  - h. elements
  
3.  $\text{Mg}^{2+}$  is a magnesium ion that has
  - e. an atomic mass greater than that of a neutral magnesium atom
  - f. two fewer neutrons than a neutral magnesium atom
  - g. two fewer electrons than a neutral magnesium atom
  - h. two more protons than a neutral magnesium atom
  
4. Isotopes are atoms of the same element with different numbers of
  - e. electrons
  - f. ions
  - g. protons
  - h. neutrons
  
5. Subatomic particles with a positive charge:
  - e. ions
  - f. protons
  - g. electrons
  - h. neutrons
  
6. Found in the nucleus of an atom:
  - e. protons and neutrons
  - f. neutrons and electrons
  - g. electrons and protons
  - h. electrons

APPENDIX F

7.4 PRACTICE QUIZ

**7.4 Practice Quiz**

1. Within a group in the periodic table, atomic size
  - a. increases from left to right
  - b. decreases from right to left
  - c. increases from top to bottom
  - d. decreases from top to bottom
2. What gives the atoms of some elements similar chemical properties?
  - a. the size of their nuclei
  - b. the number of electrons in their outer energy shell
  - c. the same number of neutrons
  - d. the temperature they are at
3. How does density vary among elements in the periodic table?
  - a. Within each group, density increases from top to bottom.
  - b. Within each group, density decreases from top to bottom.
  - c. Within each period, density decreases from left to right.
  - d. Within each period, density decreases from right to left.
4. In general, which elements are the best conductors of electric charge?
  - a. Those on the left and in the middle of the table are good conductors.
  - b. Those on the left and in the middle of the table are poor conductors.
  - c. Those along the top of the table are very good conductors.
  - d. Those along the bottom of the table are good conductors.
5. Metals have good
  - a. insulating ability
  - b. thermal conductivity
  - c. colors
  - d. smells

APPENDIX G

PERIODIC TABLE TRENDS WORKSHEET

<b>Element</b>	<b>Could the wire have been made of this element? (Yes/No)</b>	<b>Support With Evidence</b>
<b>Copper (Cu)</b>		
<b>Neon (Ne)</b>		
<b>Tungsten (W)</b>		
<b>Mercury (Hg)</b>		
<b>Chlorine (Cl)</b>		
<b>Nickel (Ni)</b>		

APPENDIX H

EXAMPLES OF STUDENT WORK

Ryan

2-9-13 P6

Nadin

Element	Could the wire have been made of this element? (Yes/No)	Support With Evidence
Copper (Cu)	Yes	Metal. Used in wires.
Neon (Ne)	No	Gas can't conduct electricity
Tungsten (W)	Yes	Metal. conductive
Mercury (Hg)	No	Liquid at room temp.
Chlorine (Cl)	No	Liquid. Halogen.
Nickel (Ni)	Yes	Metal. conductive

Lucky

APK

Element	Could the wire have been made of this element? (Yes/No)	Support With Evidence
Copper (Cu)	Yes	Copper because it is in the metals
Neon (Ne)	No	no because it is a noble gas
Tungsten (W)	Yes	yes because it is a metal
Mercury (Hg)	No	no because it is a gas
Chlorine (Cl)	No	no because it is a halogen
Nickel (Ni)	Yes	yes because it is a metal

APPENDIX I

7.4 QUIZ

**7.4 Quiz**

1. Within a group in the periodic table, atomic size
  - e. increases from left to right
  - f. increases from top to bottom
  - g. decreases from top to bottom
  - h. decreases from right to left
  
2. What gives the atoms of some elements similar chemical properties?
  - e. the same number of neutrons
  - f. the size of their nuclei
  - g. the temperature they are at
  - h. the number of electrons in their outer energy shell
  
3. How does density vary among elements in the periodic table?
  - e. Within each group, density decreases from top to bottom.
  - f. Within each group, density increases from top to bottom.
  - g. Within each period, density decreases from right to left.
  - h. Within each period, density decreases from left to right.
  
4. In general, which elements are the best conductors of electric charge?
  - e. Those on the left and in the middle of the table are poor conductors.
  - f. Those on the left and in the middle of the table are good conductors.
  - g. Those along the bottom of the table are good conductors.
  - h. Those along the top of the table are very good conductors.
  
5. Metals have good
  - e. thermal conductivity
  - f. insulating ability
  - g. smells
  - h. colors

APPENDIX J

ATOMIC STRUCTURE REVIEW QUESTIONS

Atomic Structure Review Questions

1. Which subatomic particles have a negative charge?
2. Where are the negatively charged subatomic particles located?
3. Which subatomic particles are located in the nucleus?
4. What are the individual charges of the subatomic particles located in the nucleus?
5. What is the overall charge of the nucleus?

APPENDIX K

STUDENT INTEREST IN VIDEO CLIPS SURVEY

### Student Interest in Video Clips Survey

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

*Circle your response*

SA=strongly agree, A=agree, D=disagree, SD=strongly disagree AB=absent and did not watch video

1. I enjoyed watching the video from the 1950s on isotopes.

**SA   A   D   SD   AB**

2. I enjoyed watching the video clip from Home Alone 2 where Marv was electrocuted to learn about electrical conductivity.

**SA   A   D   SD   AB**

3. I enjoyed watching the video clip from Futurama about the element "Jumbonium" in order to review the structure of the atom.

**SA   A   D   SD   AB**

APPENDIX L

STUDENT INTERVIEW QUESTIONS

### Student Interview Questions

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

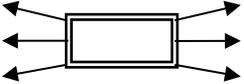
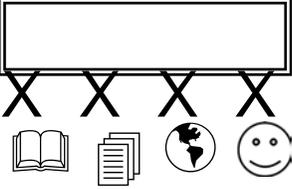
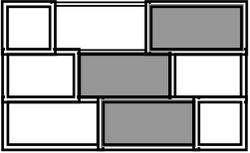
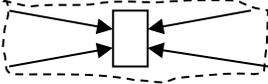
1. What part of science class do you find interesting?
2. Do you enjoy watching video clips in your science class?
3. If the answer to #1 was yes: What do you enjoy about watching videos in class?
4. Do you think it is easier to understand content when you see a video clip?  
Explain.
5. Do you think you are able to do better on tests and quizzes as a result of watching the video clips in science? Explain.

APPENDIX M

ACADEMIC CONVERSATION SKILLS AND PROMPTS\*

*\*Based on Zwiers, 2011, pgs. 32-33*

## Academic Conversation Skills and Prompts

Features/moves/skills of Conversations <i>(with symbols &amp; hand motions)</i>	Stems for prompting the feature	Stems for responding
Elaborate and clarify  <i>(Pull hands apart)</i>	Can you elaborate? What do you mean by...? Can you tell me more about...? What makes you think that? Can you justify that? Can you be more specific?	I think it means that... In other words,...
Support ideas with examples from this text, other texts, the world, & one's own life  <i>(Index finger on pinky of other hand, palm up)</i>	Can you give an example from the text? Can you show me where it says that? What are examples from other texts? What is a real world example? What is an example from your life? Are there any cases of that?	For example,... In the text it said that... One case showed that... An example from my life is
Build on or challenge another's idea  <i>(Layer hands on each other and build up)</i>	What do you think about my point that ...? Can you add to this idea? Do you agree? What might be other points of view?	I would add that... 5 I want to expand on your point about...  Then again, I think that... I see it another way... Yet I wonder also if...
Paraphrase  <i>(Put thumb and index finger together)</i>	Is that clear? Do you see what I'm saying?	So, what you are saying is that Let me see if I understand you...is that right?
Synthesize whole conversation  <i>(Cup both hands into a ball)</i>	What have we discussed so far? How should we synthesize what we talked about? How can we bring this all together?	We can say that... The main theme/point of the text seems to be... As a result of talking, we think that we should...