

IMPLEMENTING FREQUENT ASSESSMENTS TO INCREASE STUDENT  
PERFORMANCE LEVELS IN A HIGH SCHOOL CHEMISTRY CLASS

by

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July 2011

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## ABSTRACT

My students struggle in my regular chemistry class, even with rudimentary concepts that are conceptual and mathematical. Over the past several years I have seen a steady decline in student performance and I have contributed this to their unwillingness to complete homework assignments. This practice is not only detrimental to learning conceptual information in my class; it hinders overall performance in chemistry. I needed to think of a creative way to convince my students that homework is beneficial and is an important part of the learning process. Quizzes have been used in the past at my school to motivate students to complete and understand their homework assignments. This action research project investigates the impact that frequent assessments have on increasing student performance levels in a high school chemistry classroom.

Homework quizzes, tests, surveys, interviews and tracking procedures were used to evaluate the effectiveness of the treatment. The level of conceptual understanding was assessed and students' progress was evaluated. The attitudes towards homework were also assessed pre and post treatment to see if the use of frequent assessments increased the quantity of homework that was completed by students in my three regular chemistry classes. In addition, each student's progress on summative assessments was evaluated to see if the treatment could have caused a positive improvement in their performance.

Overall, students that adequately completed their homework assignments showed a measurable improvement in their frequent assessment scores. Student's performance on summative assessments did show a measurable improvement for those same students following the treatment. Students also expressed a positive attitude to changes the treatment brought about. The results had a positive impact on my teaching and although there were outliers, the implementation of frequent assessments increased homework completion and improved student performance on summative assessments.

## INTRODUCTION AND BACKGROUND

Over the past five years I have had the privilege to teach hundreds of students chemistry. I have constantly modified and transformed my teaching to meet the needs of my students so they have a positive and successful experience in my class. I try to make new topics interesting by incorporating technology, demonstrations, and laboratories that are not only informative, but also engaging. In this timeframe I have noticed a steady decline in student performance in my class on formative and summative assessments despite my best efforts. My frustration was at its peak in the spring of 2010 when I submitted my third quarter progress report grades. To my surprise, and I can not believe that I did not notice this occurrence earlier, out of 93 students in my regular chemistry class I had 39 students with a below average grade or worse. After looking deeper into this situation I noticed that most of the students that were performing poorly in the class did not consistently complete homework assignments or only completed a small portion of the assignments. My frustration is what guided and shaped the focus and purpose of my action research project.

The purpose of my action research project is to improve student performance on summative assessments in my high school chemistry classes by combining homework assignments with use of frequent assessments (quizzes). The frequent assessments will be administered after each major concept and work in conjunction with homework assignments given to my students. I have observed over the past five years at Wentzville Holt High School a steady decline in student willingness to complete homework and this

is a growing problem. This problem has to be addressed for a variety of reasons and the significance impacts the entire school structure.

Policies that teachers implement in their classrooms affect the whole dynamic of how a course is run and ultimately the outcome and performance of students. For the first five years I had a homework policy that is similar to other chemistry teachers in my department. The policy consists of assigning homework for students to complete outside of class and bring it in the next day. From there two things can occur. Either I can collect the homework, grade it for completion or accuracy and hand it back, or as a class, we go over the homework answering any questions that the students might have over the assignment.

I have noticed that when I assign homework and do not collect it the students become complacent. Over the course of the year they choose not to do the assignments at all since the majority of the time I do not collect it. This sends a message to the students that the homework is not important, that I do not value their hard work and they make the decision not to complete it. When I do collect an assignment, the students that gambled that I would not collect it score poorly on the work. My policies have essentially created a problem causing students not to complete their homework; therefore they perform poorly on formative assessments, and ultimately perform poorly on summative assessments. One of my goals as a teacher is to encourage students to understand that homework is very important to the learning process.

I am not the only one that can benefit from a change in my homework policies. Students will benefit as well. Chemistry is a difficult course that requires a significant time commitment both inside and outside the classroom to ensure success, especially for



sophomore students. After completing an initial probative interview of my students inquiring about my homework policy one student said, “All I want teachers to do is to look at my work. It upsets me when I spend an hour on a homework assignment and a teacher doesn’t collect it.” This statement personifies the feelings of majority of the students that I interviewed about homework. Students would benefit from a change in the policy.

Homework needs to be seen by the students as something that is valuable, important, not just busy work. By implementing a structured, consistent, frequent assessment format in my classroom, both the students and I win. Since most students seek help from a variety of different sources, homework is not a formal assessment of knowledge. By implementing these mini-assessments I can truly assess student knowledge and the students should see the value of completing homework. By completing the assignments, students will be prepared for the mini-assessments (quizzes). Hopefully, this will increase the amount of students that complete their homework and their quizzes will translate into a higher performance level on summative assessments. The results from my action research project will not only benefit my teaching, but can potentially help other teachers and our administration.

As a part of our districts professional development program, teachers at our school have read and discussed a book written by Dr. Ken O’Connor, *How to Grade for Learning, K12*. In this book O’Connor describes that a school must consider implementing a “no zeros policy”. He proclaims that giving students zeros for assignments that they “fail to turn in or for incomplete assignments is not true assessment of learning” (O’Connor, 2009, p.128). In the text there is a situation that is described

where student's grades do not actually reflect their knowledge of the subject matter due to zeros for failing to complete required work. Our administration is not implementing a policy that eliminates zeros from teacher's grade books, but they do want us to think of creative ways to assess student's knowledge and not punish them for work ethic.

My action research project will address the issue of zero credit given to students for incomplete or absent homework assignments and this is in accordance with our school districts professional development plan of incorporating differentiated assessment techniques. By sharing results from my action research plan with my administrators and other teachers within my department, possibly a new discussion could begin about the best ways to truly assess student understanding. I do not know exactly how our administration would handle the results from my research, but doing nothing about it will just perpetuate the status quo. Grade inflation and failing performance are two potential problems that can be addressed school-wide so my action research project results could impact many other areas within our school and other schools as well.

My action research project is designed to address several questions from observations in my teaching experience. The specific research questions I answered throughout my action research project are:

1. What impact do frequent assessments (homework quizzes), combined with a non-punitive homework policy, have on summative assessment scores in a high school chemistry class.
2. What is the impact of the use of frequent assessments on the quantity of homework that is being completed by students?
3. What affect do these policy changes and frequent assessments have on

student's perceptions of the value of homework and student confidence levels before summative assessments?

4. What impact did the frequent assessment have on my teaching and teaching strategies?

My support team consists of three colleagues at Wentzville Holt High School and one of my closest friends, my wife. Each of these individuals played an important role in of my action research project. They all have unique abilities that I utilized and they all were very supportive in my efforts to improve performance in my chemistry classes.

David Brothers is the science department chairperson at Holt High School where I teach. He has been teaching for a total of 14 years. He started out his career teaching math at a neighboring alternative high school for troubled children. He moved to Wentzville eight years ago and currently teaches Honors Chemistry, AP Chemistry, and AP Environmental Science. David won district teacher of the year in 2008 and he was in the running for Missouri's state teacher of the year. I chose David because he is a leader, a high quality teacher, and a positive influence in our department. He also has a background in both science and math. He has experience in statistics which proved to be invaluable in the analysis portion of my project.

Dr. Aaron Gwin is the Assistant Principal and Administrator to the science department at my high school. He taught English at the middle school level before moving up to high school. He is a very supportive administrator that values action research projects. He encourages teachers to adapt and change their teaching to meet the needs of their students. He offered suggestions to improve the treatment implementation

and assisted in trend recognition. Lastly I utilized his English background to aid in the proofing process.

Kecia Cortrecht is a special education teacher at my high school. She has been a colleague and friend of mine for the past five years. She has extensive training with students that have individualized education plans and she provided valuable input to help me modify my formative and summative assessments for those students that require such modifications. Kecia was helpful in creating surveys and strong interview questions. She is an extremely positive, energetic, and caring person that proved to be a great addition to my support team. I met with Kecia during the creation of the surveys and interviews.

Jennifer Ernst is the Marketing Manager for HDA Incorporated based out of St. Louis, Missouri. She is also my loving wife and best friend. She was one of the biggest supporters of my action research project. She offered a perspective that is not associated with teaching which happened to be invaluable to my project. Jen's background is in graphic design and marketing. She has extensive experience obtaining data, analyzing data for trends, and creating graphics that more than adequately represent data in a clear and concise fashion. She helped with the creation of data tables, graphs, charts, trend sheets, and also helped with the proofing process. She offered a perspective that is not closely associated with education and she did not hesitate to offer her opinion.

## CONCEPTUAL FRAMEWORK

Merlin Olsen, a famous National League Football player, once said, “One of life’s most painful moments comes when we must admit that we didn’t do our homework, that we are not prepared” (Olsen, M, 2011.) This quote resonated with me personally, not because I am a football fan, but because I am a teacher. I am also a student and when you think about the meaning of these words one can only remember the feelings that we felt the first time we did not do what we were asked to do. Guilt sets in and the overwhelming feeling of unpreparedness takes over. This is a powerful situation students put themselves in. They will choose to change their behavior so they do not feel this guilt, or they will become numb to the feeling and their long-term performance will suffer.

Webster’s Dictionary (2001) defines homework as “work done at home, especially school assignments” (p.107). My action research project is going to address the on-going problem of homework particularly in a high school chemistry classroom. Chemistry is a tough subject that requires a significant time commitment both inside and outside of the classroom. Homework is supposed to help students understand the conceptual and mathematical aspects of chemistry. Over the past five years I have seen a steady decline in homework completion. This, in my opinion, has translated into a decrease in student performance on summative assessments.

A wide range of studies have been completed that became instrumental in framework development for my action research project. Studying in depth analysis of attitudes and perceptions of teachers, parents and students with regards to homework was my main focus. Several of these reports provided direction in my action research, and

also supported my choice to use creative homework strategies to improve performance in my chemistry classes. “Homework is a fact of life for most students and teachers” (Harris Int., 2007, p.11) and this common practice used by teachers “is directed at benefiting students’ current schoolwork and also life skills beyond the classroom” (Harris Int., 2007, p.11). The “views and experiences regarding the quantity of homework assigned and completed, how and when homework is accomplished, the impact of homework, perceived goals and value of homework, the level of student engagement in learning, and the amount of time teachers spend on homework” (Harris Int., 2007, p.11).

The study concluded that students “who lack enough time for their homework are more likely to get low grades and are less likely to plan to go to college” (Harris Int., 2007, p.15). This conclusion reaffirms my own observations within my own classroom. It goes on to say “frequent failure to complete homework may be an early signal of student disengagement that can lead to truancy and dropping out” (Harris Int., 2007, p.15). Most teachers believe that homework has inherent value, but most students do not feel the same way. The study stated, “Homework is important and helps students learn more in school” (Harris Int., 2007, p.15). This is ultimately why teachers assign homework to their students. It went on to say that homework would improve “skills important to succeeding in school and to succeeding in life, such as developing a sense of responsibility and critical thinking” (Harris Int., 2007, p.16). The majority of teachers I spoke with believe the reason they give homework is so that students can practice the concepts discussed in class. I assign homework so that students can prepare for tests, ultimately leading to learning and the successful application of problem solving. Ensuring all assignments given were meaningful was also important. During my action research

project, I reviewed each problem that was assigned to make sure I did not assign “busy work” so this valuable tool is perceived by students as such.

Another valuable study focuses on in-class behaviors (such as attendance and completion of homework) and their association with student performance. Attendance, homework completion, attentiveness and active participation are essential for success within any classroom. In a Cell Biology course, outlined by this study, student’s quiz and summative assessment scores were tallied for each student. Their attendance and other in – class behaviors were also monitored so Soto and Anand (2009) could make conclusions about student success.

Soto and Anand (2009) stated “Passing the class did not depend on which quiz score category (grade)” (p.65) a student fell into. A students’ overall performance in the class as a whole was not affected by the outcome of individual quiz scores. I found this part of the study very interesting. From my own experiences, students that typically perform well on quizzes also perform at a high level on summative assessments. The difference between college level students and high school students could be the reason for this discrepancy. This study did not break down the quiz scores and reference them back to the individual tests. It is unknown if the students that performed poorly on a cluster of quizzes also performed poorly on the next test (Soto & Anand, 2009, p.68). This omission of data provided further direction in my own action research. When I performed my data analysis I found trends in the quiz scores and related them back to the summative assessment scores.

Finally, there was a relationship made by the authors of this study that related the quantity of homework that was completed by the students to their overall performance in

the class. Even though this class is at the college level, students are students. Success, and ultimately learning, occurs through practice and repetition. “All students who did not complete any homework failed the course and 97% of the students that completed 100% of the homework passed the course” (Soto & Anand, 2009, p.68). The percentage of students that passed the course significantly dropped when their homework completion percentage dropped. “42% of the students who completed 50% of the homework passed the course and all students who completed 25% of the homework passed the course with a C” (Soto & Anand, 2009, p.68). Completion of homework is a large part of my action research and this study provided guidance on how to segregate the data that I collected over the course of my treatments.

In my search for a theoretical framework to explain why students continuously fail to meet expectations within the classroom, I stumbled upon Dr. Sylvia Rimm’s book *Why Bright Kids Get Poor Grades* (1995). This particular book outlines a six-step program for parents and teachers to follow identifying and reversing underachievement. Since my action research project is designed to tackle the issue of poor performance by increasing homework completion, I only studied the chapters of Rimm’s book that focused on the homework issue. One of the first topics that addressed the lack of homework completion was a topic on organization. Rimm said “Disorganization is a frequent symptom of underachievement syndrome” and most underachievers “appear to be purposely disorganized” (Rimm, 1995, p.141). She goes on to say, “For students who lack organization skills, homework and study habits should be structured” (Rimm, 1995, p.145). Some of her suggestions included assignment notebooks, using large notebooks



instead of small ones, having a separate folder for each subject and studying or completing homework in a quiet place with minimal distractions (Rimm, 1995, p.146).

These suggestions are great, and to most educators common sense, but I cannot control how and where students study during my action research project. I do have control over how I structure my class when students are working on practice problems. During my action research I focused on providing a classroom environment that offered students a quiet place to complete work. In addition I required students to keep their homework assignments and quizzes until the end of each unit so they have these study tools before the summative assessments.

Rimm (1995) also says, “The first signs of underachievement are usually incomplete work at school or required assignments not handed in on time” and this practice by students, in conjunction with poor study habits, “results in poor grades” (Rimm, 1995, p.264). My primary action research question encompasses a non-punitive homework policy that addresses punishments that are commonly given to students when they fail to complete their work. “Teachers should reexamine some common punishments before using them with students and withdrawing privileges based on incomplete work is something to do sparingly” because this causes students to “give up” easily (Rimm, 1995, p.295). By giving students “personal attention, individual interest, persuasion, creativity, and short term activity reinforcement will be effective” at addressing the problems with underachievement within the classroom (Rimm, 1995, p.296).

I implemented a non-punitive homework policy in my classroom for the duration of my action research project. I required, monitored, and reviewed all homework assignments during my treatment and checked homework for completion. Sometimes

students lacked sufficient time to complete their work. This could have been a result of other responsibilities or sheer laziness but when a student receives a zero on an assignment it only reinforces punishment, not learning, so I stopped assigning grades for homework assignments. Instead I set up a treatment that allows students to have the choice of completing all or a portion of an assignment. This treatment rewards students for their hard work but also assesses their knowledge in accordance with state standards. By using frequent assessments I was able to truly assess their knowledge over the concepts addressed on homework assignments.

“Homework has been part of students’ lives since the beginning of formal schooling in the United States” (Paulu, Fran, & Walne, 2005, p.4). Homework “is important because it can improve children’s thinking and memory” and it “can help them to develop positive study skills and habits that will serve them well throughout their lives” (Paulu et al., 2005, p.4). This article outlines a series of proven practices that can increase student performance on homework, which can then translate into higher summative scores.

The authors suggest in “The Basics” that it is important for teachers to discuss why homework is important in the learning process and how it can benefit students. It explains the many different reasons for why homework is assigned to students as well. One statement stood out to me. “Homework also can help students to develop good study habits and positive attitudes. It can teach them to work independently and it also encourages self-discipline and responsibility” (Paulu et al., 2005, p.8). This article goes on to say, “Students who complete homework score better on standardized tests and earn better grades, on average, than students who do less homework. The difference in test

scores and grades between students who do more homework and those who do less increases as students move up through the grades” (Paulu et al., 2005, p.9). These statements are similar to the other articles. If students complete more homework, their performance in any class naturally improves.

The second section in the article *Helping your Child with Homework* (Paulu et al., 2005, p.10) offers suggestions to show that education and homework is important. The authors offer six suggestions. Setting a regular time and place for homework is essential. Since I cannot control where, how, and when a student studies at home, I will have to modify the time I give students in class to work on assignments to increase its effectiveness. The article says that after a time has been chosen to complete assignments the place should “have good lighting, fairly quiet, and possibly brightly decorated to foster a positive attitude” (Paulu et al., 2005, p.10) toward completing homework. The authors then suggest that removing all distractions is important to increasing student engagement and attentiveness on the homework that needs to be completed. Again this sounds similar to other articles on this topic. At times when I had the students complete an assignment in class it became noisy and distracted from their engagement and ultimately, their learning. Classroom management was addressed throughout my action research to ensure that time spent in class was maximized and adequately used for what it was intended.

Analysis of the data collected during my action research project was approached by modeling strategies designed for elementary students. The data collection methods can be applied to high school chemistry students with slight modifications. Surveys can be used to determine the amount of time spent on homework based upon each subject

(mathematics, reading and language arts). The surveys in one research study were given to parents and students. Each participant was given the question, “How much time do you expect children to spend on reading or mathematics homework in a typical evening?” The possible choices that they could choose from were none, ten minutes, 20 minutes, 30 minutes, and over 30 minutes. The survey had over 6,000 participants for each group (grade level). The percentages were calculated for each response and then further broken down based on the percentage of minority students found within the school. It was found that minority students (Asian, African-American, and Indian) responded that they spent more time on homework than White students (Fenster, Tomp, Walston, & Warkentien, 2008, p.3).

Surveys played a role in my qualitative analysis during my action research project. I conducted pre-treatment and post-treatment surveys measuring students’ perceptions on homework using the Likert Scale similar to this study. This study also provided guidance on how to construct homework assignments. I took into account the amount of time that I wanted students to spend outside of class working on homework. Each homework assignment did not exceed more than 20 questions and the time spent on the assignment should not exceed 30 minutes.

My action research project is designed to increase student performance on summative assessments using frequent assessments on homework as a tool. The main part of my data analysis included the student scores on quizzes and tests. The scores were then tracked for each student in the class before, during, and after the implementation of the frequent assessments to determine if the plan is working. If there is an increase in student participation in homework then there should be an increase in student

performance on summative assessments. The literature has allowed me to further refine my focus of how homework impacts student performance in the classroom. I made sure that homework I assign is carefully reviewed to ensure each problem has meaning and purpose to avoid a negative student perception. I am motivated by the fact that I am not alone in my desire to research confidence, motivation, attitudes and performance in science education and I look forward to sharing the results of the use of frequent assessments in my chemistry classroom.

## METHODOLOGY

The first treatment unit began on October 25<sup>th</sup>, 2010. I taught each lesson using the same format as previous units this year so there was familiarity with the delivery of each lesson. With each new lesson I incorporated my Smart Board and PowerPoints into a lecture/discussion style of delivery. Each unit included demonstrations, laboratories, and at times, project-based assignments. After each new topic (lesson) in which homework was assigned, students were told they will have a quiz over the information covered in the homework assignment the next class period. Students were directed to complete the homework assignment, either in class (time permitting) or at home, and bring it to class the next day.

The beginning of the next class period was our “Question and Answer” period. Students either placed the solutions to the questions on the homework up on the board as part of their warm-up assignment, or I provided the solutions to their homework assignments verbally. I used this time to observe the quantity of completed homework and documented this in my teacher journal. After the solutions were given to each student they had the opportunity to ask questions about the problems that gave them trouble. I provided feedback to the students until all issues were addressed and the majority of the students felt comfortable with the concept. I also shared with them how I would grade a typical problem, especially if a problem contains partial credit. A homework quiz followed the question and answer period. This was the format I used throughout the unit leading up to the summative assessment. I also made notes in my teacher journal of common questions that were asked.

Each quiz was either graded as a class or by me depending on the concept or difficulty of the grading. Partial credit was given during the grading process, but this was dependent on the type of questions asked on the quiz. The quizzes were uploaded into the grade book and passed back so students were given immediate feedback. If there were issues with large blocks of students that missed a question, I spent time re-teaching the concept before the next concept was delivered.

Finally, I told the students to keep track of each quiz given throughout the units. Before the summative assessments were given, students were allowed to collect, review, and ask questions about their quizzes and homework assignments. A summative assessment was composed of similar questions found on the homework and homework quizzes was at the end of each unit. This process was repeated for all units involved in the treatment period. A schedule of treatment and non-treatment units can be found in the Appendix A.

There were two treatment units spanning from the dates of October 11<sup>th</sup> through November 23<sup>rd</sup> and one non-treatment unit spanning November 24<sup>th</sup> through December 15<sup>th</sup>. At no point during this period did students receive a zero for incomplete homework assignments. Expectations were made clear to the students to complete the entire homework assignment. I stressed and suggested that if the entire assignment is completed and completed correctly, there would be a good chance they could perform at a high level on the subsequent homework quiz. The homework quizzes account for 20% of their overall grade for each quarter while the summative assessment scores account for 45%. This treatment was designed to measure the impact that frequent assessments have on

student performance in my chemistry classroom. Let's now take a look at the sampling of students.

My action research project used the students in all three of my regular chemistry classes at Wentzville Holt High School. There were 76 total students in these three classes. 35 of the students were male and 41 of the students were female. Of these 76 students, two of them were seniors, 21 of them were juniors, and the rest of the population (53) was made up of sophomores. There were three African American students, two Brazilian foreign exchange students, one Korean student, and 70 Caucasian students in the sample. Three students had individualized education plans and Wentzville Holt High School had a population of over 1,600 students. From 2006-2010 our high school's graduation rate was 89.2%. During the same time period our attendance rate was 94.7% and our student population had 18.2% of the students on the free and reduced lunch program. Students in my chemistry courses were required to have passed Algebra I with a C or better average and general Biology with a C or better average. There were 6 students that had not yet completed Biology I. These students were placed in physical science, a lower level freshman course, the year prior. There were also three students that were rollbacks from the previous year of chemistry. These students failed to complete the first semester of chemistry the year prior.

Almost every student participated in the pre-treatment student surveys. Three students were absent on October 25<sup>th</sup>, the day the pre-treatment survey was administered, so their responses were not included. The post-treatment survey was administered on November 12<sup>th</sup>. All students were required to fully participate in the frequent assessments. In the case of an absence, the students were required to make up the assessment. The six



frequent assessments (homework quizzes) during the first treatment took place over an 11 day time frame. One quiz was administered on each of the following dates: October 26<sup>th</sup>, October 27<sup>th</sup>, October 28<sup>th</sup>, November 2<sup>nd</sup>, November 3<sup>rd</sup>, and November 5<sup>th</sup>. Additional frequent assessments were given on November 15<sup>th</sup>, 17<sup>th</sup>, 19<sup>th</sup> for the second treatment unit that spanned 12 days, and the summative assessment was administered on November 11<sup>th</sup>. Journaling took place during the administration of each quiz for each class period. I took notes about the quantity of homework the students were completing using a +, /, - system. A (+) sign meant that a student completed their entire homework assignment. A (/) sign meant that a student completed at least half of their assignment and a (-) sign meant that a student completed either less than half or none of the assignment. Now let's take a look at the design of each of the data collection techniques separately.

These instruments were designed so I could gain a greater perspective on where students stand on the issue of homework and current policies within my classroom. This initial data collection technique was implemented before the treatment began on October 25<sup>th</sup>, 2010. This provided valuable baseline data on student perceptions, values, and tendencies with regards to completing homework. After this first implementation, a post-treatment survey was conducted on November 12<sup>th</sup> to determine if there were any significant improvements in student perceptions and values. A copy of the pre-treatment survey and post-treatment survey can be found under Appendix B and C respectively and a copy of the triangulation of each survey (pre and post treatment) can be found under Appendix D and E. Table 1 outlines my triangulation matrix and shows my plan to answer each of my research questions. Several data collection strategies were used to

answer the main question and each of the sub-questions associated with my action research project.

Table1  
*Triangulation Matrix*  
*Research Questions, (N=76)*

Research Questions	Formative Assessment	Summative Assessment	Student Surveys	Student Interviews	Cumulative Grade Improvement	Homework Completion Observations	Teacher Journal
I. What impact do frequent assessments (homework quizzes), combined with a non-punitive homework policy, have on summative assessment scores in a high school chemistry class?	X	X	X	X	X	X	X
II. What is the impact of the use of frequent assessments on the quantity of homework that is being completed by students?			X	X		X	X
III. What affect do these policy changes and frequent assessments have on student's perceptions of the value of homework and student confidence levels before summative assessments?		X	X	X			
IV. What impact did the treatment have on my teaching and teaching strategies?	X	X			X		X

Each homework quiz was designed to encompass the major concept covered on the homework assignment. Each quiz question was written in a similar fashion as the homework assignment. Each quiz that was administered during both treatment units was reviewed and approved through David Brothers and Kecia Cortrecht to ensure the quiz questions modeled the questions that were found in the homework assignments and that

each question on each quiz truly assessed topics and concepts from each unit. If there were mathematical calculations, I altered the numbers from each homework assignment. Each quiz was no more than ten questions. Selected response questions were not used for homework quizzes. The first treatment unit was our unit on Ionic Compounds: Nomenclature and Writing Formulas. Our second treatment unit was on Covalent Compounds and Acids: Nomenclature and Writing Formulas.

Our ionic compounds unit was very difficult for some students to master, especially when they failed to complete their homework assignments. In this unit we spent a significant amount of time learning how to name and write formulas for ionic compounds. The homework throughout this unit breaks down each of the steps necessary to write the formulas and name each compound properly.

One of the first topics discussed in the unit was determining the oxidation states of common ions for both metals and nonmetals. I explained the octet rule, gaining and losing electrons to form cations and anions, and the concept that ionic compounds are formed from electrostatic forces (positives being attracted to negatives). The first homework assignment can be found under Appendix F. This assignment asked the students to use the periodic table and the trends discussed during class to determine the oxidation states of common ions. Three main concepts were reviewed in this homework assignment: valence electrons, electrons gained or lost to satisfy the octet rule, and writing symbols for common ions.

The homework quiz was designed to model the same format of the homework assignment. Students were required to use a periodic table to determine the total number

of valence electrons, the amount of electrons that will be gained or lost to satisfy the octet rule, and finally, be able to write the symbol for common ions.

Five additional lessons and homework assignments were given to each of the students. Five subsequent question and answer periods and homework quizzes were also completed. To view a copy of each quiz given in the first treatment unit between the dates of October 26<sup>th</sup> and November 5<sup>th</sup>, see the Appendix G - L. A similar format was used for the second treatment unit. This unit spanned 12 total days with three frequent assessments given to all students on the date of November 15<sup>th</sup>, 17<sup>th</sup> and 19<sup>th</sup>.

Another data collection technique I used was student interviews. The interviews were designed to address the previously stated four research questions. Since the surveys were limited by pre-determined responses, the interview questions were designed to complement the surveys to provide a more in-depth analysis of how they feel, value, and perceive the homework issue. Again David Brothers and Kecia Cortrecht were instrumental in the development of these questions. They reviewed each of the questions that were asked during the interview process to make sure each question asked was pertinent to my action research project. The final approval of the interview questions was given by Dr. Aaron Gwin, another member of my support team.

Each of the questions for the interviews was designed to provide data from a student's perspective that refers back to my action research question and sub-questions. A copy of the interviews (pre and post treatment) can be found under Appendix M and N and a copy of the triangulation of each interview question can be found under Appendix O and P. There were similarities and differences between the interview questions and how each interview sample was selected and triangulation was conducted.

I conducted multiple interviews during both treatment and non-treatment units and interviewed at least two students for each. I also used multiple sampling strategies. The first sets of interviewees were selected at random and they received a number. Jennifer Ernst, a member of my support committee, chose two numbers between 1 and 76. The students selected were interviewed twice on an individual basis before the treatment was applied and after the treatment was completed for the first unit.

The second groups of interviewees were selected using a stratified random sampling method based on their overall performance in the course. I selected two students with an A average, two students with a C average, and two students with a D or F average. These six students were interviewed twice, pre and post-treatment but the interviews were conducted using a focus group. Each performance level was present in the focus group.

The third groups of interviewees were selected based on their performance on summative assessments. I selected students that have shown the greatest improvement on their summative assessments through the first two treatment units. I looked at previous summative assessment scores prior to the treatment to establish a baseline for each student in the class. I then compared their average test scores prior to the treatment with the test scores during and after the two treatment units. These two students were also interviewed twice (pre and post-treatment in the third treatment unit). The pre-treatment interview was conducted individually and the post treatment interviews were completed using a focus group style.

When all of the interviews were complete I had gathered a large quantity of my data from students, pre and post-treatment, using the sampling strategies previously

discussed. This increased the reliability and validity of the data and provided more than adequate data for my analysis. A copy of the pre and post treatment interview questions can be found in the appendices (Appendix M & N).

For the duration of the first two treatment units I used a teacher journal to keep track of each student's homework completion. I made notes as to the completeness of each assignment using symbols. I created a grid using Excel with columns for each assignment per student along with symbols to quickly check off each student's work. A checkmark signified that a student completed the entire assignment. I used a negative sign for an assignment that was half complete and a zero for an assignment that was incomplete. At the bottom of the journal I left space for notes about the question and answer period and recorded the amount of time needed each period. Students that were absent were not counted and I did not check to see if they completed their assignment after the fact. A copy of the completed teacher journal can be found under Appendix Q.

Each of the questions in the pre and post surveys were designed to provide me with data from a student's perspective on issues that pertain to my action research project. Each question was designed to refer back to my action research question and sub-questions. Each of the frequent assessments given to the students were designed to answer the following action research questions: *“What impact do frequent assessments and a non-punitive homework policy have on student performance on summative assessments and on student's overall performance in a high school chemistry class?”* By calculating each student's performance on the frequent assessments, relating these scores back to their summative assessments and overall performance in the class, I was able to determine if the treatment was successful. Likewise I was able to determine the impact

that the frequent assessments had on homework completion.

My teacher journal was designed to keep track of whether students were completing their homework entirely, only completing half of their homework or not completing their homework at all. By using the journal I was able to answer the action research question, “*What is the impact of the use of frequent assessments on the quantity of homework that is being completed?*” Careful planning and design, along with thorough implementation and corporative attitudes from my students allowed me to successfully complete the treatments of my action research project. The research methodology for this project received an exemption by Montana State University’s Institutional Review Board and compliance for working with human subjects was maintained. With the difficult part out of the way I was able to obtain some valuable data and there were several interesting trends that emerged.

## DATA AND ANALYSIS

Successful action research is validated by backing up predictions with meaningful data. One of the first objectives I wanted to complete was to determine the opinions and mindsets of my own students. This was achieved by conducting surveys on each of my students and interviews of pre-selected students prior to the implementation of my treatment. On October 25<sup>th</sup>, 2010, 76 students answered 16 questions on the pre-treatment Likert survey and each of the student responses were scored and tallied in an Excel spreadsheet. To measure the impact of the treatment had on my students I used the post – treatment Likert survey on November 12<sup>th</sup>. Two student interviews were conducted prior to and after the treatment for triangulation. Let's begin by taking a look at the survey responses before and after the treatment.

Figure 1 outlines the student responses on six questions that were found on both the pre-treatment and post-treatment surveys. The sample size ranges from  $N=76$  to  $N=72$  for each of these surveys.



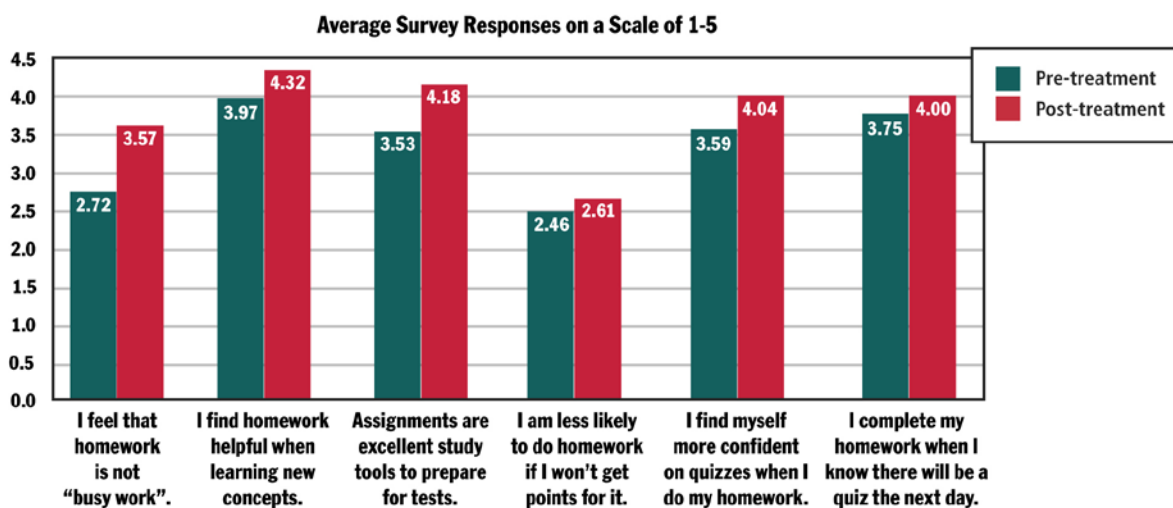


Figure 1. Survey Analysis, ( $N = 72-76$ ).

All of the students that participated in the surveys had input and their input reflected their attitudes toward homework and the treatment: frequent assessments. To observe full copies of the scores on both pre and post treatment surveys, see Appendix S and T.

For the six focus questions there was an increase in positive responses when compared pre versus post-treatment. The largest increase was the question “I feel that homework is not busy work” with an average positive increase of 0.85. After the treatment was completed for our first unit on ionic compounds, more students viewed homework as a helpful tool in the learning process. I performed a t-test to measure the significance between the pre and post survey responses. I used a two tailed test and the p-value was  $1.62 \times 10^{-7}$ , well below the acceptable value of 0.05. It is safe to say that there is a significant difference between these two values and the treatment could be a reason for the change in the student’s mind that homework is “busy work”. There were measurable changes with the data in Figure 1 and the opinions of the students that I

interviewed need to be discussed. For triangulation purposes, further analysis was completed so one can fully understand how the first treatment impacted my students.

Pre-treatment interviews were conducted on October 26<sup>th</sup>, 2010. Both of the students interviewed prior to the first treatment unit believed that homework is either often busy work or sometimes busy work. One student said, “Homework is sometimes busy work but it can be helpful, but not in huge amounts.” The other student interviewed said that homework is “busy work that teachers give us to see what we’ve learned or to practice. They think that we have nothing else better to do.” These two students were not the only ones that felt this way. I conducted an unofficial poll after the interviews in my second period class asking them how many of them felt that homework was busy work. 14 out of the 23 students in this class felt the same way as the students interviewed. The same students were interviewed after the first treatment unit and both of them had a different viewpoint on the same question. When asked if they still viewed homework as busy work one replied, “It is a tool to study for quizzes/tests and to work and try to do what you can, and if you don’t know what to do, you can ask questions.” The other student stated, “Homework is just to make sure you understand the concept that the teacher is trying to get across and if you do it, you’ll do better.”

The statements by these two randomly selected students support the change in the viewpoint that homework is busy work needlessly given to students without purpose. The treatment could have been the reason for this change but let us take a look at the other focus questions.

Students felt that the homework assignments during the treatment unit were excellent study tools in preparation for the frequent assessments and ultimately the

summative assessment. This survey question had the second highest change (+0.65) comparing pre and post treatment with a t-test p-value of  $1.82 \times 10^{-6}$ . I was glad to see that student's attitudes toward the preparation value of homework after the treatment improved and there was a significant difference in their responses. This positive increase could have been a result of students understanding and completing their homework and then ultimately performing at a high level on the frequent assessments.

The survey question with the third highest measurable change dealt with student's confidence levels before quizzes. This survey question had an average increase of +0.45 with a t-test p-value of 0.0010. In addition, students felt that the "homework assigned in the unit was helpful" when compared to their prior opinions before the treatment. The average change in their responses toward this survey question was +0.35 with a larger t-test p-value at 0.00105.

The questions "I am less likely to do my homework if I am not going to get points for it" and "I complete my homework when I know there will be a quiz the next day" were two of the survey questions analyzed in Figure 1 that had the smallest amount of increase pre versus post - treatment. These two questions had increases of +0.15 and +0.25 respectively. When I completed a two tailed t-test to check the significance the values came out to be 0.277 and 0.107 respectively. Although Figure 1 is compelling, it only shows the average change, so further desegregation of the data is needed.

Figure 2 provides a more detailed breakdown of student responses on the pre-treatment survey, clustering them based on whether their responses were positive or negative. One of the interesting trends in question 6 was the fact that 48% of the students responded positively toward this question. This could mean students believe their

homework prepares them for their assessments. In addition, no students responded very negatively toward this question, which is a great result, and 26% of the students disagreed with the statement. That means there are at least 20 out of 76 students that felt as though there is no correlation between homework completion and performance on assessments. I had a great opportunity to change the minds of a large chunk of my own students regarding the homework issue and possibly show them how homework can affect their overall performance in the classroom.

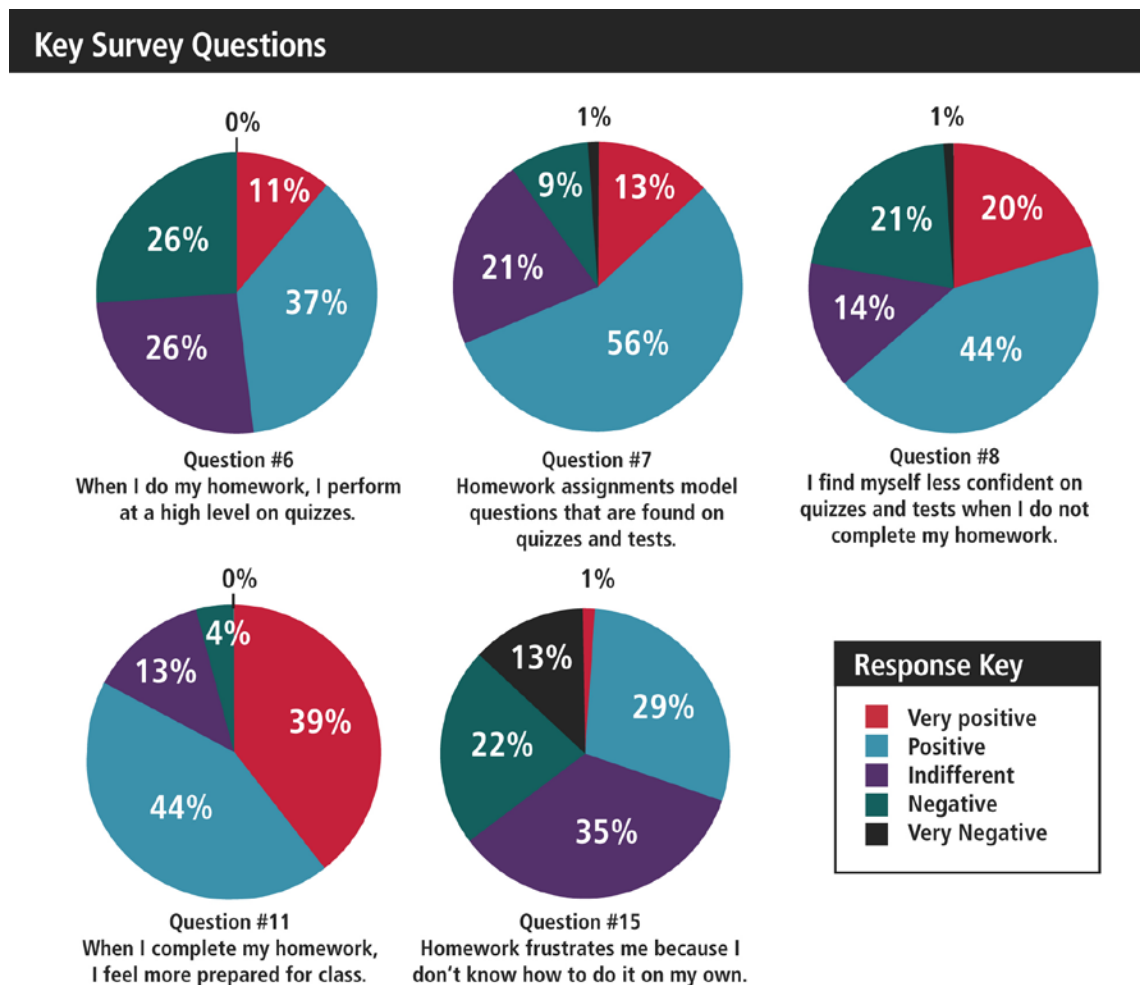


Figure 2. Percent of Student Responses, ( $N=72$ ).

One of the interesting trends in question 7 is that 69% of students surveyed responded positively. This could mean that students believe the homework assignments in my chemistry classes do model questions found on assessments. A much smaller percentage of students, 10%, responded negatively toward this question. I can infer from this information that students believe homework can prepare them for assessments. When I asked the two students I interviewed if they felt the homework that I assigned in my class prepared them for the quizzes and tests one responded, “Yes, because I can study them (homework assignments) to help prepare me for the tests and quizzes.” The other interviewee disagreed and stated, “Sometimes it helps, but sometimes it doesn’t.” This mixed review from the interviews is to be expected.

68% of the students surveyed on question 8 responded positively to the question that they feel less confident on assessments when they do not complete their homework. This could mean students realize their homework is not given to them as a punishment, but as a tool to help them learn. Most of my students believe that if they do not complete their work, they will have a more difficult time learning the material. Both of the students interviewed agreed when they do not complete their homework, their confidence level before assessments decreases.

Finally, question 15 had the largest percentage of negative responses, 35%. When students are working on assignments in class, they feel more confident, because I am guiding them through their work. This confidence could lead to a false sense of security with the assignment. When students go home to work on their homework without my guidance, some students get frustrated when they do not know how to complete their homework on their own. Again the same sentiment was stated during the interviews. One

student said “Homework is frustrating especially when I don’t understand the homework and I couldn’t go ask my teacher because they are not at home with me and my parents don’t know how to do anything that we’ve learned.” Working with the teacher allows students to ask questions when needed thus increasing their confidence on any particular assignment. Further analysis needs to be completed. For a complete picture, the data from questions found on the post-treatment survey need to be broken down in a similar format so comparisons can be made to the pre-treatment results. This breakdown will provide a clearer picture as to how the treatment affected student’s attitudes toward homework and the frequent assessments. I also broke down some compelling results from student’s responses from the post-treatment survey.

Figure 3 outlines two questions found on the post-treatment survey and how the student’s responded. These questions focused on whether they preferred the new homework structure and whether they completed more homework due to the changes related to the treatment.

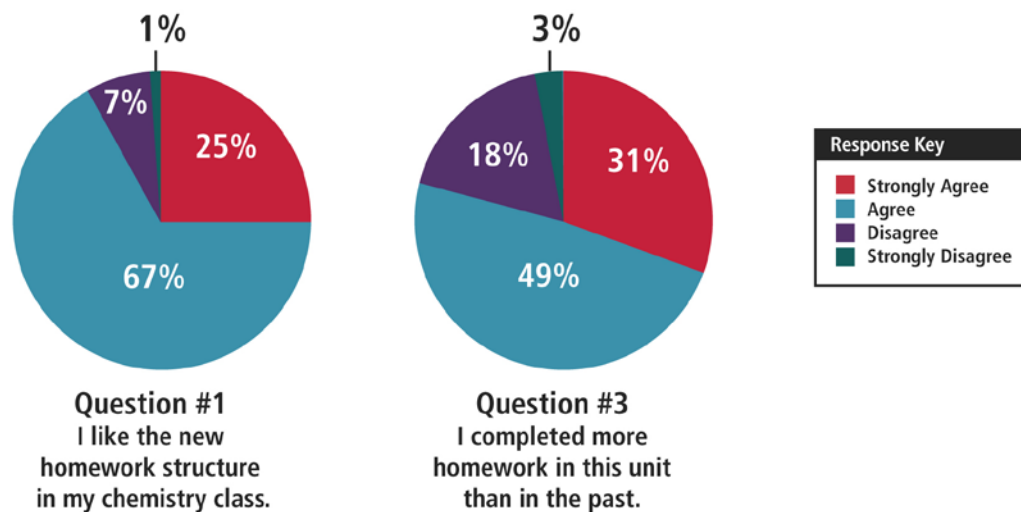


Figure 3. Post – Treatment Survey Responses, (N=72).

One of the most intriguing results from the breakdown of the student's responses is the fact that 92% of students either strongly agreed or agreed with the statement that they "liked the new homework structure" in my chemistry class. For my action research to be successful, I needed to have students on board with the changes. They needed to buy into the idea that the treatment is designed to help them be successful and the results show that. In addition, 80% of the students either strongly agreed or agreed that they "completed more homework" in the first treatment unit than they had done in previous units. This is also an important find but can be misleading. Since I did not keep track of the quantity of homework completed prior to the treatment unit, this percentage could be slightly elevated. These results guided my decision to look a little deeper into the portion of the data that dealt with students who responded strongly that they completed more homework. Did the students actually complete more homework and what impact did that have on their performance?

Survey results can be compelling but they do not fully explain the data that was collected. Analysis of the quantity of homework completed and the results of the frequent assessments (homework quizzes) are the most vital pieces of my action research project. My first treatment began on October 26<sup>th</sup>, 2010 where I began implementing homework quizzes (frequent assessments) after each homework assignment. I collected data on six different occasions throughout our unit on ionic compound nomenclature and writing formulas. The quizzes are all located under Appendix G - L for viewing. All students were required to complete the homework quiz and if they were absent the day the new information was discussed or when the homework was assigned, they were allowed to make it up. Under Appendix R there is a copy of each student's homework quiz scores

during the first treatment unit. In addition there is also a copy of the teacher journal that breaks down each student's completeness of their homework during the first treatment unit under Appendix Q. So let us take a look at whether students really completed more homework and how that affected their performance.

In all three classes there were 22 students that strongly agreed they completed more homework during the first treatment unit. Table 2 outlines the quantity of assignments completed by each of these 22 students and their subsequent frequent assessment averages. Interestingly enough, all of the students, except one, that completed 100% of their homework assignments scored an A average on the seven homework quizzes.

Table 2  
*Triangulation #1 – Survey, Homework Completion and Performance*  
*Post Survey Question #3, (N=22)*

Students (by number)	# of Fully Completed Assignments (out of 7)	Homework Quiz Average (7 total Quizzes)
2	7/7	96%
3	7/7	90%
4	7/7	98%
5	3/7	86%
9	6/7	82%
12	7/7	98%
17	5/7	67%
26	4/7	94%
32	7/7	94%
34	6/7	98%
36	6/7	65%
37	7/7	76%
45	7/7	90%
46	4/7	92%
48	7/7	100%
49	6/7	84%
53	7/7	100%
59	7/7	96%
66	6/7	84%
68	6/7	84%



72	7/7	92%
77	6/7	82%

Completing each homework assignment fully did not exclude all students from obtaining an A average on their frequent assessments. Student 46 completed four out of seven assignments and scored a 93% average. Student 34 didn't complete a single assignment and scored a 98% average and student 5 completed three out of seven assignments and still scored an 86% average. Of the 22 students that stated that they completed more assignments, only half (11) completed every assignment fully. This interpretation of the data could mean that some students, in this cluster, can still perform at a high level on the frequent assessments, without completing every problem assigned on the homework.

There were 14 students surveyed that stated the treatment did not cause them to complete more homework assignments. Table 3 compares data for these 14 students only to dig deeper into this survey.

Table 3

*Triangulation #2 – Survey, Homework Completion and Performance*  
*Post Survey Questions #3, (N=14)*

Students (by number)	# of Fully Completed Assignments (out of 7)	Homework Quiz Average (7 total Quizzes)
11	3/7	71%
20	6/7	80%
22	0/7	100%
25	0/7	35%
27	4/7	86%
28	6/7	82%
38	5/7	84%
41	2/7	71%
52	0/7	98%
56	2/7	76%
57	2/7	75%
63	1/7	84%

74	1/7	82%
79	1/7	98%

Of those 14 students who replied in this fashion to question 3 on the survey, three students did not complete a single assignment during the treatment unit and three students only completed one assignment during the treatment unit. Of these six students, half of them scored an A average on the seven homework quizzes. Student 22 did not complete a single assignment, and he still scored a 100% on each of the seven quizzes. Student 11 completed three out of the seven assignments and he tallied a 71% average on the homework quizzes and the student 20 in this category completed six out of the seven assignments with an 80% homework quiz average. Student 25 did not complete a single assignment, and she scored a 35% average on the quizzes. These students did not complete their homework entirely but several of them did complete some of the assignment. By doing so, all but one was able to perform at a C level or higher on the homework quizzes. These students still performed at a high level despite their homework completion. When I consider each student individually, these students have had a high aptitude for concepts in my class all year. They are the types of students that absorb and learn material quickly.

Another trend I noticed when looking at the data from the frequent assessments was the mean scores for each class were so high. Students were taught a lesson, given time to practice the lesson, and given time to answer questions over their homework. Most of the students scored extremely high on the frequent assessments in the beginning. The mean score for the first quiz was the highest in second period at 8.48 out of nine possible points with as only three students received a less than perfect score on the quiz.

This could be due to the fact that the quizzes were over smaller amounts of information and the information was fresh in their minds.

On the second quiz on October 27<sup>th</sup>, second period lead all of the classes with a mean score of 3.91. 21 out of 23 students received a perfect score on the quiz. That is an extremely high number and when compared to the quantity of students that completed their homework that evening, it makes sense. Only one student did not fully complete their homework that evening in that period. Seventh period had the lowest mean score at 3.75 with an increase in the amount of students that did not fully complete their assignment. It is starting to become apparent that when students complete their assigned homework prior to the frequent assessment, they are better prepared and this translated into an increase in performance. More often than not, students that make up their homework when they are absent and students that complete their homework assignments entirely are often the same students that receive higher grades. Homework acted as a filter for me to identify struggling students and those that could potentially perform poorly on assessments.

The third quiz brought about its own trends. Second period lead the way with a mean score of 5.91 (22 out of 23 students got a perfect score). Both sixth and seventh period students were close for second on this particular quiz with mean scores above 5.85. Since this particular quiz is only out of six possible points, averages this high could correlate to an increase in student performance. These high averages are very good trends to see especially when you factor in the quantity of students completing their homework. When the class as a whole has a larger number of students that complete their homework,

the mean scores are higher. The number of students who do not complete their homework increases and the mean scores on the frequent assessments decline.

Figure 4 shows the number of students that completed their homework before each frequent assessment. When you compare the number of students that fully completed their homework to the mean scores on the frequent assessments, you can clearly see a trend. I want to focus your attention to the last three frequent assessments.

### Homework Completion - 2nd Period Chemistry Class

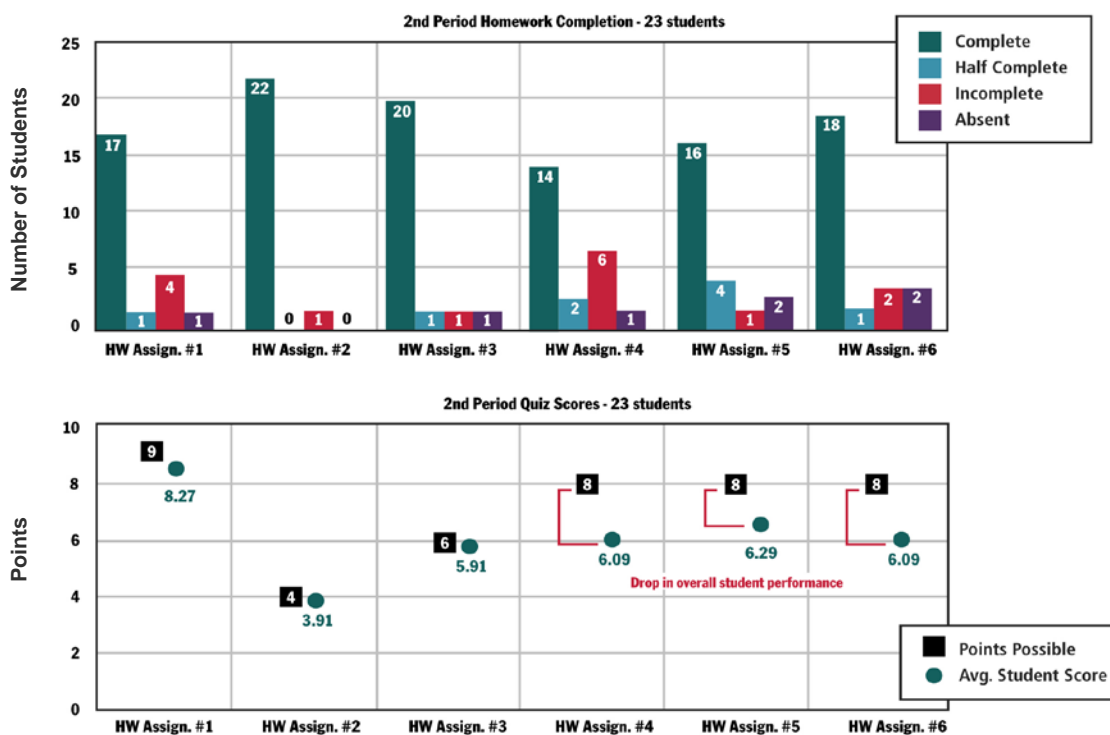


Figure 4. Homework Completion, 2<sup>nd</sup> Period, (N=24).

You can clearly see there was a greater difference between the total points possible on the frequent assessment and the mean (average) scores. There was a difference of nearly two full points on the mean score and the total points possible on the assessment. In the previous three assessments the mean score was extremely close to the

points possible on the assessment. When you compare this data to the quantity of students that fully completed their homework, it makes sense. Higher achieving students are typically very active in the discussions within the classroom. They typically have high grades and are intrinsically motivated. This is another example showing behaviors of higher achieving students this treatment help serve as a filter to find struggling students.

Prior to the first three quizzes, there were a minimal number of students that did not complete their work (over 20 out of 23) prior to the assessment. On the final three assessments there was a significant drop in the quantity of students that completed their homework in its entirety. The quantity of “incompletes” and “half completes” increased on the final three assessments.

One issue to consider was the difficulty of the assessments. As we progressed through the unit, the homework became more challenging and thus, the assessments became increasingly more difficult. The final assessment yielded more students to complete their homework when compared to the first assessment, but the mean score dropped due to the increase in difficulty. Also when you look back at the student’s scores, only 3 students received 8/8 points on the sixth assessment while 16 students received a perfect score on the first assessment. The difficulty of each assessment was drastically different.

Figure 5 outlines the same information as Figure 4, but for my 6<sup>th</sup> period class. You can clearly see that the same trend described above occurs again. 6<sup>th</sup> period started off the treatment strong with the vast majority of the students completing their assigned homework prior to the assessment. Right before the third assessment was administered there was a vast drop off of students completing their homework. 16 total students on the

third assessment did not complete their homework or only completed half of their assignment. This lack of homework completion could have contributed to the lower mean scores on the last three assessments when compared to the previous three assessments. Again, this could be due to the increasing difficulty of the homework and assessments as we progressed through the unit. Students were required to know multiple sets of rules for multiple types of ionic compounds. This drop in performance could also be due to the effect new changes bring and the change wearing off. One student, in the second interview group (D or F avg.), stated, “I just got sick of doing the homework. I know I needed to do it but I was just being lazy.” The other student interviewed had a similar viewpoint. “The homework was boring and I didn’t have time to do it.” Although these students viewed homework negatively, I was very excited about implementing the new homework structure. Students became increasingly disinterested as the newness of the new homework structure wore off.

### Homework Completion - 6th Period Chemistry Class

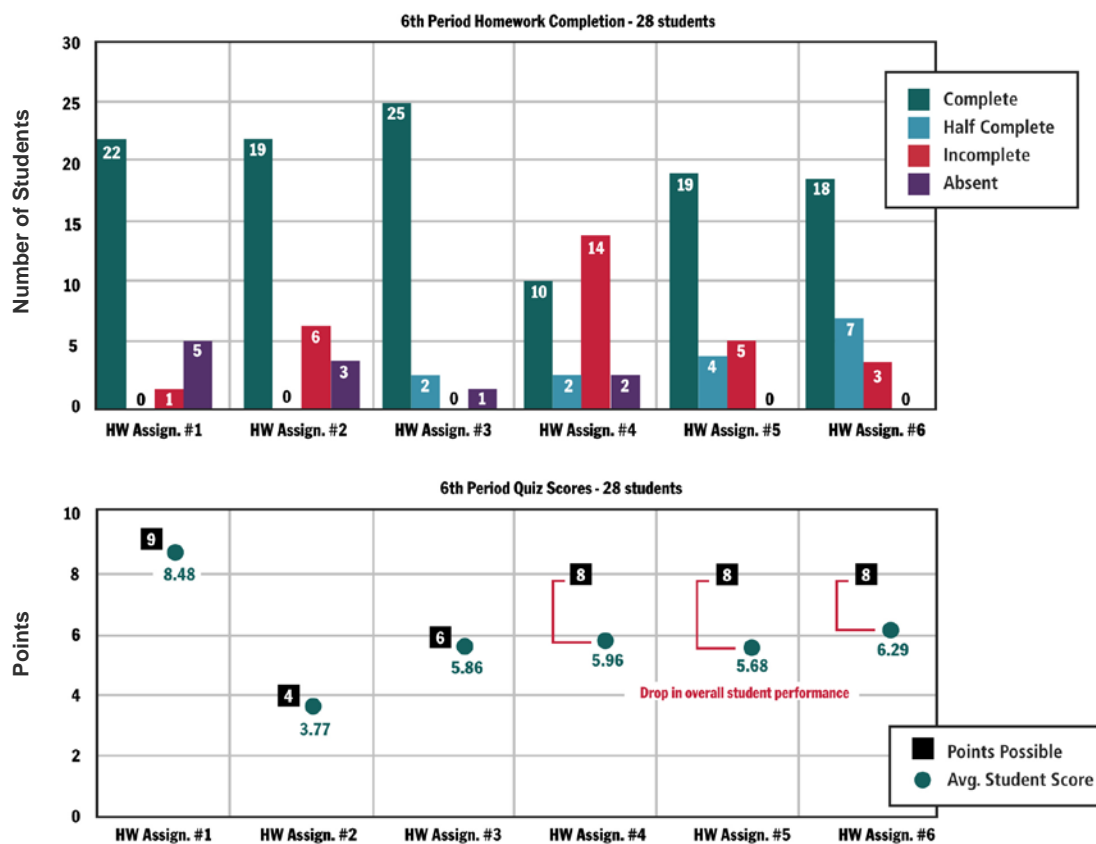


Figure 5. Homework Completion, 6<sup>th</sup> Period, ( $N=28$ ).

Looking at Figure 6 you can clearly see the trend between the quantity of homework students completed and the mean scores on each assessment. Again there was a major drop off in student performance on the assessments when the quantity of students who did not complete their homework increased.

## Homework Completion - 7th Period Chemistry Class

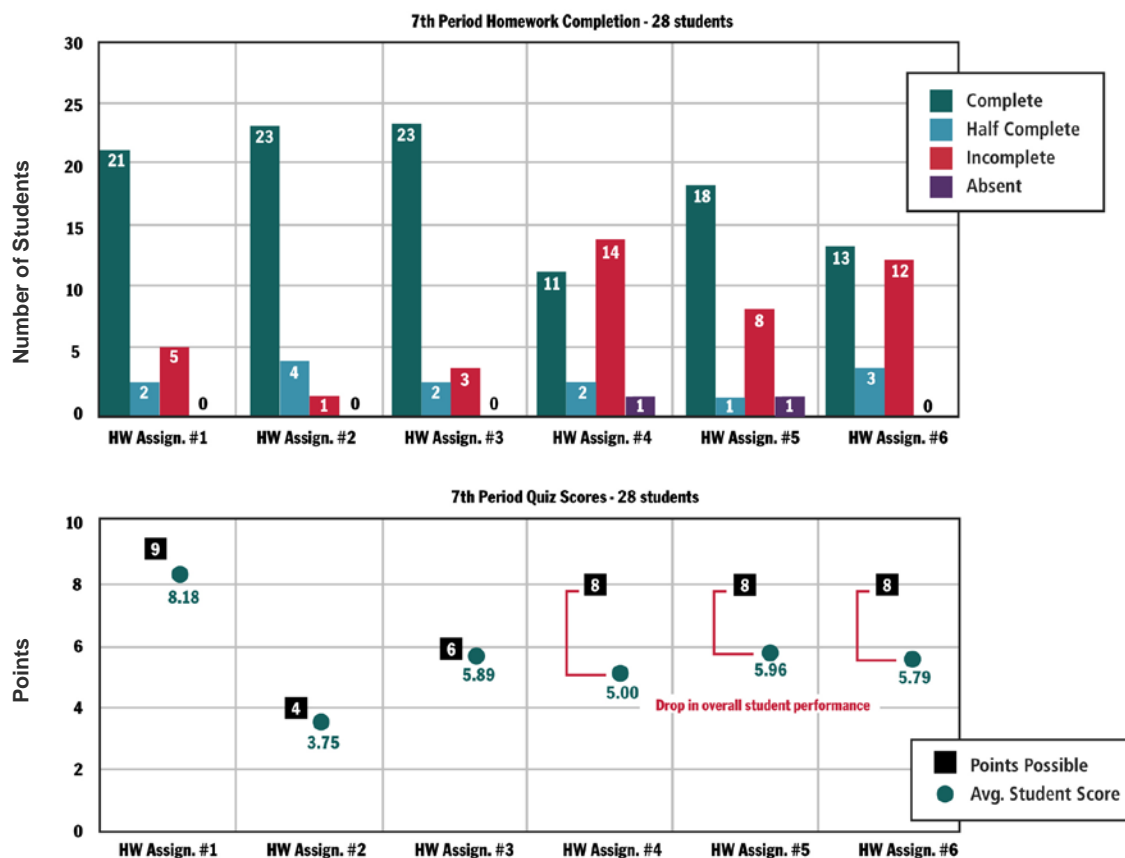


Figure 6. Homework Completion, 7<sup>th</sup> Period, ( $N=28$ ).

The trends discussed relating homework completion to quiz scores is compelling and predictable. As far as the rest of the data is concerned, how did the quiz scores relate to student's performance on the unit's summative assessment?

Table 4 breaks down the number of students that fall into each grade level category. This table also triangulates the quiz averages to the test averages for each grade level category. One trend that was interesting was how close the quiz averages were to the test averages. It was identical for the A and B grade level groups. The standard deviation is more compelling. As students fall out of the A grade level group, the



standard deviation jumps dramatically. This means that the averages do not tell the whole story. This prompted me to break down the data even further.

Table 4  
*Test Averages based on Grade Level, (N=78)*

Grade Level	# of Students	Quiz Averages	Test Averages (1 <sup>st</sup> Treatment)	Standard Deviation (test)	# of Students above Std Deviation (test)	# of Students below Std Deviation (test)
A	7 Students	91%	91%	3.6%	1	1
B	37 Students	83%	83%	12.3%	5	4
C	27 Students	76%	71%	12.7%	3	5
D & F	7 Students	65%	64%	18.6%	2	1

Table 5 outlines what occurred during the first treatment unit. It shows the quantity of students that had a quiz average ranging from A – F. It also shows the number of students that fit into the similar grade category. Typically students that performed at a high level on the frequent assessments also scored highly on the end of the unit summative assessment. Students that scored poorly on the frequent assessments also scored poorly on the end of the unit summative assessment generally speaking.

Table 5  
*Number of Students based on Grade Category, (N=81)*

	1st Treatment	1st Treatment
Grade	# of Students	# of Students
Category	Quiz Average	Test Average
A	26	19
B	25	24
C	13	20
D	8	8
F	9	10

This was not the case for all students. There were 13 students that had an A average on the frequent assessments and they experienced a drop in performance on the summative assessment. Five students dropped two letter grades, one of which dropped from an A to an F. The other eight students only dropped one letter grade below their quiz average. There were six students that maintained a frequent assessment average of a C that raised their performance level at least one letter grade higher on the summative assessment. Two students advanced two letter grades on the summative assessment. Now let's take a look at the overall performance on of summative assessments.

Increasing summative assessment performance is an important goal of my action research project. Ideally I would like to see students improve their performance significantly due to the implementation of this treatment. To obtain baseline data I determined each student's test averages prior to the treatment. The scores and averages can be viewed under Appendix U. The data in this table is extremely valuable for my action research project and I was able to establish a credible baseline for all of my students based on their performance on summative assessments. Let's take a look at what happened during the first treatment unit.

During the first treatment unit there were significant improvements toward student performance on summative assessments. I compared their previous 3 test averages with the first treatment unit's summative assessment score by performing a two-tiered t-test. The p-value was  $3.31 \times 10^{-9}$  showing that there was a significant improvement in their summative test scores. Figure 7 breaks down the each chemistry classes test average prior to the treatments (3 tests total) and the test average after the first treatment's summative assessment. Each class improved their test average significantly.

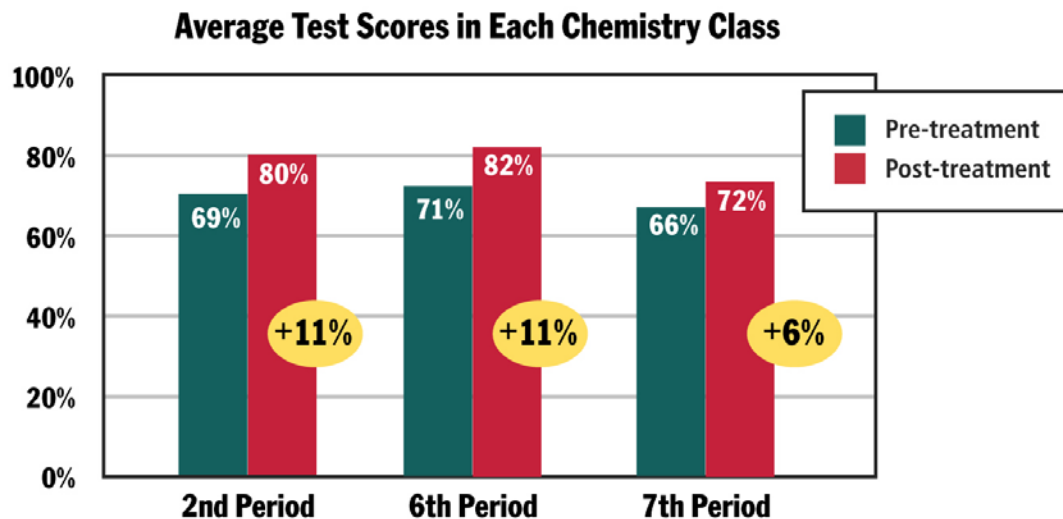


Figure 7. Average Test Score Improvement by Class, 1<sup>st</sup> Treatment Unit, (N=76).

I also segregated the data based on each student's summative assessment performance prior to and after the treatment so a greater perspective could be gained. Table 6 shows the test averages of each student based on overall performance (grade level) before and after the treatments. Across the board there was an increase in student performance on summative assessments. Students that fell into the B subgroup had the largest average increase and students that fell into both lower grade level categories were tied with a 9% increase. I think the frequent assessments helped the B subgroup more because it showed them what topics in the unit they struggled with so they could improve on them prior to taking the summative assessment. The students that fall into this subcategory are generally good students and the frequent assessments allowed them to get over the hump.

Table 6

*Desegregated Data Based on Overall Performance – Test Performance  
(Pre/Post Treatment; N=78)*

Grade Level	# of Students	Previous Test Average	Test Average during two Treatment Units	Average Increase	# of Students who increased test avg.	# of Students who did not increase test avg.
A	7 Students	85%	91%	6%	4	3
B	37 Students	73%	83%	10%	30	7
C	27 Students	56%	70%	14%	18 (1 student = no change)	8
D & F	7 Students	49%	58%	9%	5	2

The final piece of data analysis that I performed was the comparison between the two treatment unit's summative assessments with that of the non-treatment unit that followed. The unit that followed the two treatment units was set up in the exact same format as the treatment units except I did not administer frequent assessments after each homework assignment. I performed a two-tiered t-test comparing the test averages during the treatment with the test average during the non-treatment and the p-value was  $9.24 \times 10^{-14}$ . Table 7 clusters the students based on their treatment test averages and it shows the comparison between the averages during the non-treatment unit. It also shows the quantity of students that improved their test scores or lowered them.

Table 7

*Triangulation of Assessment Scores (Treatment vs. Post Non-Treatment; N=79)*

Grade Level	# of Students	Mean Treatment Test Average	Mean Non-Treatment Test Average	Average Difference	# of Students improving avg.	# of Students lowered avg.
A	10	92%	90%	-2.0%	5	5
B	16	85%	77%	-8.0%	5	11

C	18	74%	62%	-12%	1	15
D	17	65%	49%	-16%	1	16
F	18	47%	30%	-17%	1	17

Interesting enough, all of the grade level groups (A-F) performed worse on the summative assessment in the absence of the frequent assessments. By looking at the average difference in Table 7 all groups with the A grade level group dropped the least (-2.0%) and the F grade level group dropped the most (-17%). Decreasing performance levels were not true for all students though. Half of the students in the A grade level group and almost half in the B level group did improve their summative assessment score during this non-treatment unit. This could be in response to increased preparation that was taught in the previous two units and showing the students how to perform at a higher level on the summative assessments. Groups C – F only had one student per group that actually improved their summative assessment score. Most of the students, 64 out of 79 students, performed at a lower level in the absence of the frequent assessments. These students typically perform at a lower level on tests scoring a C or lower. One of the reasons could be that they did not have the frequent assessments looming over them keeping them accountable for the duration of the unit. On the other hand, 15 total students improved their scores on the summative assessments. Most of these improvements were small with increases ranging from one to three percent. One student increased her test score 12% but her test average prior was an 88% during the treatment units. With the final data analysis complete a significant difference in the test scores prior, during, and after the two treatment units emerged. This outcome is very encouraging and it has several implications toward impacting teaching in a positive manner.

## INTERPRETATION AND CONCLUSION

My main focus question was: What impact does frequent assessments (homework quizzes), combined with a non-punitive homework policy, have on summative assessment scores in a high school chemistry class. The data showed that when students complete their homework assignments they are more likely perform at a high level on the summative assessments. Table 6 ( $N=78$ ) shows that each group of students, when clustered into grade levels, increased their test averages by at least 6%. The B subgroup had the largest increase in summative assessment performance (10%) and the A subgroup increased the least (6%). Overall, each class improved their test averages anywhere from 6% to 11% (Figure 7). In comparing summative assessment performance after the two treatment units, in the absence of the frequent assessments there was a significant decline. The F and D subgroups (Table 7;  $N=79$ ) were affected the most with average differences ranging from -17% to -16% respectively. Sixty four (Table 7;  $N=79$ ) students observed a drop in their performance on summative assessments in the absence of frequent assessments. 80% of the students interviewed during the post-treatment support the theory that frequent assessments prepare students for summative assessments. One student stated, "I like the new structure of class. I do much better on tests since we started taking quizzes over the information in a unit." There were a few outliers. One student stated, "I didn't care for the new homework system but that is because I don't like homework." The majority of students saw test averages increase ranging all the way up to a 48% increase for one student (Appendix U). Survey results support this same sentiment. 92% of students either strongly agreed or agreed (Figure 3;  $N=72$ ) that they liked the new

structure.

My research project was also designed to measure the impact of the use of frequent assessments on the quantity of homework that is being completed by students. 80% of the students surveyed said that they completed more homework during the first treatment unit than they have done so in the past (Figure 3;  $N=72$ ). Although this is a high percentage, only 11 out of the 22 stated they strongly agreed (Table 2;  $N=22$ ) completed every homework assignment. Fourteen students surveyed (Table 3;  $N=14$ ) stated that the treatment did not cause them to complete more homework assignments. Over the course of the first treatment unit all classes involved experienced a decrease in homework completion by the third assignment in the unit (Figure 4-6;  $N=23-28$ ). This translated into a drop in student performance for each class on each subsequent frequent assessment (Figure 4-6;  $N=23-28$ ). My seventh period class held the largest quantity of students not completing their homework during this timeframe for the final three homework assignments and they also experienced the largest drop in average scores on the frequent assessments (Figure 6;  $N=28$ ). Generally speaking, most of the students were completing their assignments more at the beginning of the first treatment unit than at the end.

A conclusion can also be made regarding the affect of the policy changes and frequent assessments on student's perceptions of the value of homework and student confidence levels before summative assessments. Surveying student's attitudes through individual interviews (pre and post-treatment) showed there was a measurable positive improvement in these categories. Overall the surveys produced some quality data. One of the largest differences was the question about homework being busy work. It was evident

after the pre-treatment survey (Figure 1) that students viewed homework as “busy work”. This initial perception to the value of homework and the goal for teachers was clearly a negative one. After the implementation of the two treatments and the analysis of the post-treatment survey, more students viewed homework positively and the quantity of students that viewed homework as “busy work” dropped. There was an average positive increase (Figure 1;  $N=72-76$ ;  $+0.85$ ) suggesting that most students in the sample ( $N=72-76$ ) now view homework as a beneficial tool to the learning process. In addition students felt the homework better prepared them for the frequent assessments (Figure 1;  $+0.66$ ;  $N=72-76$ ) and the students also felt more confident prior to summative assessments (Figure 1;  $+0.45$ ;  $N=72-76$ ). Finally, the surveys showed a measurable difference in how helpful homework is, in general, with a positive increase of 0.35 (Figure 1;  $N=72-76$ ). 20 out of 76 students thought there was no correlation between homework completion and performance on assessments prior to the treatment (Figure 2; Appendix R;  $N=72-76$ ). 68% (Figure 2;  $N=72-76$ ) said they feel less confident when they do not complete their homework thus alluding to the fact that most students feel as though homework is not a punishment. Also 35% (Figure 2;  $N=72-76$ ) feel more confident on assignments when working in class then they do when working at home.

I found my research extremely beneficial and it impacted my teaching and teaching strategies. It showed me an alternative method to keep track of student homework completion (Appendix Q). It also allowed me to immediately address confusing concepts and misconceptions all the while giving me time to re-teach difficult concepts to students the next day after a lesson. Overall the treatment design decreased the quantity of time that I spent in grading homework assignments while keeping me



aware of individual student progress throughout a unit, culminating in an increase in student performance on summative assessments (Figure 7). With a few modifications, implementation of future treatment units for my next batch of chemistry students should not be an issue. With the success and positive results in test scores, frequent assessment scores and moral, I have a solid foundation to greatly impact future students with this research design.

## VALUE

From the development and implementation of this action research project I was able to gain an increased awareness in how to effectively modify the structure of my class to cause improvement in student performance in my high school chemistry classes. I plan on continuing to administer the frequent assessments for my future students. This practice led to an increase in homework completion (Figure 3 – 6; Appendix Q) and it also translated to an increase in performance on assessments (Table 2; Table 5). Students in all of the grade categories benefited performance wise from the implementation of the treatment (Table 5; Table 6) and there was a positive increase in the value of homework (Figure 1). By frequently assessing student's abilities after homework assignments, student's opinions of the value and the importance of homework in preparing them for summative assessments experienced a positive change (Figure 1). There was also a dramatic decrease in the idea that homework is "busy work" (Figure 1). I believe that students now understand that homework is not a punishment, but a tool used by teachers to facilitate learning. Since I often assign homework and do not collect it, students felt that I was punishing them (Appendix C, Figure 1). Now most of my students know when I assign work for them to complete, it will help them perform at a higher level on all assessments. This was evident by the increases represented in Table 6 (for the two treatment units) and the decreases in performance represented in Table 7 (for the one non-treatment unit).

One of the most encouraging aspects of my action research project was the affect that the treatment had on C (average) students. Table 6 outlines the test averages prior to

the treatment unit and after. The bulk of my students (Table 6; 64 total) are either B or C students. The C average students increased their test average from 56% to 70% (+14%). The B average students increased their test average as well (Table 6; +10%). The reason I mention this is because typically my A average students are going to be successful regardless what I do. Students that typically fail chemistry do not put in the time and effort needed to be successful. The majority of my students are in the middle of these two groups and my treatment affected them the most in a positive way. I was really impressed with these results and there are several changes that I would make toward the treatment to make it more successful.

While the treatment was successful for most students, I need to find a method of keeping a closer eye on the students that the treatment did not work for. There were 20 students that experienced a drop in their summative assessment performance during the two treatment units (Table 6; Appendix U) spanning all grade level groups. The decreased ranged from -1% to -53% (Appendix U). Only five students out of the twenty experienced a drop of more than a letter grade (Appendix U). The B and C grade level groups had the largest number of students experienced a drop in performance at seven and eight respectively (Table 6;  $N=78$ ) with a range between -1.0% to -19% (Appendix U). Further analysis and future treatment units need to be completed to gain a better perspective on this matter. I would also like to change the way I keep track of homework completion. At times the method that I used took too much time in class. I need to find a quicker, more efficient way of looking at student's homework. I would also like to incorporate a student tracking sheet that they can place in their notebooks. This sheet will serve as a self-evaluation tool for my students so they will keep track of how much

homework they are completing, what their frequent assessment scores are, and what their summative assessment scores turn out to be. This allows students to take more ownership in their own progress and makes this more student-centered. I would also like to complete more treatment units each semester where every unit in my class would be structured like the original treatment design. Every unit will have the same structure; homework, questions and answer period, frequent assessment, new lesson, and finally the summative assessment. This way every student's grade in my class based off content knowledge and skills acquired in my chemistry class, and not off of how hard someone works or how quickly they can copy their neighbors' assignment.

My action research project has a multitude of implications for my colleagues and other educators. The implementation of frequent assessments could potentially provide proof that these types of mini-assessments are a viable and reliable way to measure student progress. Also, my research indicates that when students are frequently assessed over several concepts throughout a unit, they are more aware of their own deficiencies. Administrators will also care about these findings, because they want to know what modifications teachers can make so students can perform at high levels in a traditional academic setting. Overall the first chapter of this research is complete and I view it as a successful one. I learned some valuable information about my students, my teaching methods and practices, and how I can positively impact student performance on summative assessments with frequent assessments. Chapter two will be coming soon....

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## APPENDICES

APPENDIX A

TREATMENT VS. NON-TREATMENT

Non-Treatment Units	Treatment Units
<ul style="list-style-type: none"> <li>• Inform students of daily lesson objectives and goals.</li> <li>• Teach lessons in unit using PowerPoint presentations</li> <li>• Assign necessary homework that student will complete of topics in each unit.</li> <li>• Collect observational data on student completion of homework throughout unit.</li> <li>• Collect samples of student work on their homework to informally assess their progress.</li> <li>• Administer summative assessment.</li> </ul>	<ul style="list-style-type: none"> <li>• Administer student surveys on perceptions of homework.</li> <li>• Complete student interviews using a random sampling strategy.</li> <li>• Inform students of daily lesson objectives and goals.</li> <li>• Teach lessons in unit assigning homework over each topic/s.</li> <li>• Administer Question and Answer period over homework.</li> <li>• Collect observational data on student completion of homework throughout unit.</li> <li>• Administer Homework Quizzes throughout each unit.</li> <li>• If necessary, re-teach concepts if large quantities of students perform poorly on formative assessment keeping time log.</li> <li>• Administer 2<sup>nd</sup> student survey on homework and self confidence survey.</li> <li>• Administer summative assessment.</li> </ul>

### Treatment Schedule

Unit	Data Collection Techniques	Treatment (Y/N)	Dates
Ionic Compounds	Student Interviews – Pre/Post Student Surveys – Pre/Post Homework Quizzes Informal Observations Log of Re-teaching Time Summative Assessment	Y	10/26 – 11/11
Covalent Compounds and Acids	Student Interviews – Pre/Post Student Surveys – Pre/Post Homework Quizzes Informal Observations Log of Re-teaching Time Summative Assessment	Y	11/12 – 11/23
Chemical Reactions	Student Interviews – Pre/Post Student Surveys – Pre/Post Informal Observations Summative Assessment	N	11/24 – 12/15



APPENDIX B

PRE-TREATMENT LIKERT SURVEY

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Chemistry – Mr. Ernst****Homework Survey**

*For the following questions, please circle the answer the best indicates whether you strongly agree (SA), agree (A), are undecided (U), disagree, or strongly disagree (SD). Please be completely honest as your responses will guide future decisions that I make in regards to policies and practices in my classroom.*

1. **Homework is a tool that is used by teachers to help student's learn new topics in the courses in which they are enrolled.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
2. **I am often given too much homework.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
3. **I complete all of my homework assignments.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
4. **I do not find homework to be helpful when I am trying to learn new concepts.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
5. **Homework that I am given in my chemistry class is valuable and useful.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
6. **When I do my homework I perform at a high level on quizzes.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
7. **Homework assignments model questions that are found on quizzes and tests.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
8. **I find myself less confident on quizzes and tests when I do not complete my homework assignments.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
9. **I complete my homework assignments when I know that there will be a quiz over the information.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
10. **I feel that most homework is "busy work".**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
11. **When I complete my homework assignments, I feel more prepared for class.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
12. **If I know a homework assignment is going to be collected I sometimes hurry up and complete it right before class to get points.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
13. **Homework is given so teachers don't have to waste class time with practice.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
14. **Homework assignments are excellent study tools to prepare for tests.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
15. **Homework frustrates me because I don't know how to do it on my own.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree
16. **I am less likely to do homework if I am not going to get points for completing it.**  
Strongly Agree   Agree   Undecided   Disagree   Strongly Disagree

APPENDIX C

POST-TREATMENT LIKERT SURVEY

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_  
Chemistry – Mr. Ernst

# Homework Survey

*For the following questions, please circle the answer the best indicates whether you strongly agree (SA), agree (A), are undecided (U), disagree, or strongly disagree (SD). Please be completely honest as your responses will guide future decisions that I make in regards to policies and practices in my classroom.*

- |   |                |       |          |                   |
|---|----------------|-------|----------|-------------------|
| <b>1. I like the new homework structure in my chemistry class.</b>  | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>2. Homework assignments in this unit were excellent study tools to prepare for the unit test.</b>                      | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>3. I completed more homework in this unit than in the past.</b>  | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>4. I found the homework helpful in this unit.</b>  | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>5. I found myself more confident on the unit test in this unit when compared to the previous unit.</b>                 | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>6. When I did my homework I perform at a high level on quizzes.</b>  | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>7. Homework assignments in this unit modeled questions that are found on quizzes.</b>                                  | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>8. I find myself more confident on quizzes when I did complete my homework.</b>  | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>9. I completed my homework assignments because I knew that there will be a quiz over the information the next day.</b> | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>10. I still feel that most homework is “busy work”.</b>  | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>11. When I completed my homework assignments, I felt more prepared for class.</b>                                      | Strongly Agree | Agree | Disagree | Strongly Disagree |
| <b>12. I am less likely to do homework if I am not going to get points for completing it.</b>                             | Strongly Agree | Agree | Disagree | Strongly Disagree |

APPENDIX D

## PRE-TREATMENT SURVEY - TRIANGULATION

Research Question/Sub-Question Addressed	Survey Question
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<p><i>“What impact do frequent assessments and a non-punitive homework policy have on student performance on summative assessments</i></p>	<ol style="list-style-type: none"> <li>1. When I do my homework I perform at a high level on quizzes.</li> <li>2. Homework assignments model questions that are found on quizzes and tests.</li> <li>3. I find myself less confident on quizzes and tests when I do not complete my homework assignments.</li> <li>4. I complete my homework assignments when I know that there will be a quiz over the information.</li> </ol>
<p><i>“The quantity of homework that is being completed”</i></p>	<ol style="list-style-type: none"> <li>5. I complete all of my homework assignments.</li> <li>6. I am often given too much homework.</li> <li>7. I am less likely to do homework if I am not going to get points for completing it.</li> <li>8. If I know a homework assignment is going to be collected I sometimes hurry up and complete it right before class to get points.</li> <li>9. When I complete my homework assignments, I feel more prepared for class.</li> </ol>
<p><i>“Student perceptions of the value of homework and student confidence levels before summative assessments”</i></p>	<ol style="list-style-type: none"> <li>10. Homework is a tool that is used by teachers to help student’s learn new topics in the courses in which they are enrolled.</li> <li>11. I do not find homework to be helpful when I am trying to learn new concepts.</li> <li>12. Homework that I am given in my chemistry class is valuable and useful.</li> <li>13. Homework frustrates me because I don’t know how to do it on my own.</li> <li>14. Homework is given so teachers don’t have to waste class time with practice.</li> <li>15. Homework assignments are excellent study tools to prepare for tests.</li> <li>16. I feel that most homework is “busy work”.</li> </ol>
<p><i>“What impact do frequent assessments have on student’s overall performance in a high school chemistry class?”</i></p>	<ol style="list-style-type: none"> <li>17. Homework assignments are excellent study tools to prepare for tests.</li> <li>18. When I do my homework I perform at a high level on quizzes.</li> <li>19. Homework assignments model questions that are found on quizzes.</li> </ol>

APPENDIX E

## POST-TREATMENT SURVEY - TRIANGULATION

Research Question/Sub-Question Addressed	Survey Question
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<i>“What impact do frequent assessments and a non-punitive homework policy have on student performance on summative assessments</i>	<ol style="list-style-type: none"> <li>1. Homework assignments in this unit were excellent study tools to prepare for the unit test.</li> <li>2. I found myself more confident on the unit test in this unit when compared to the previous unit.</li> </ol>
<i>“The quantity of homework that is being completed”</i>	<ol style="list-style-type: none"> <li>3. I am less likely to do homework if I am not going to get points for completing it.</li> <li>4. I completed my homework assignments because I knew that there will be a quiz over the information the next day.</li> <li>5. I completed more homework in this unit than in the past.</li> </ol>
<i>“Student perceptions of the value of homework and student confidence levels before summative assessments”</i>	<ol style="list-style-type: none"> <li>6. I like the new homework structure in my chemistry class.</li> <li>7. I still feel that most homework is “busy work”.</li> <li>8. I find myself more confident on quizzes when I did complete my homework.</li> <li>9. Homework assignments in this unit modeled questions that are found on quizzes.</li> <li>10. I found the homework helpful in this unit.</li> </ol>
<i>“What impact do frequent assessments have on student’s overall performance in a high school chemistry class?”</i>	<ol style="list-style-type: none"> <li>11. When I completed my homework assignments, I felt more prepared for class.</li> <li>12. When I did my homework I perform at a high level on quizzes.</li> </ol>



APPENDIX F

## HOMEWORK ASSIGNMENT – VALENCE ELECTRONS &amp; COMMON IONS

*For the following elements, write the symbol, determine the total number of valence electrons, how many electrons will be gained/lost to satisfy the octet rule, and predict the common ion that will form for each element and write the symbol.*

Valence Electronse<sup>-</sup> Gained/Lost (Octet Rule)Common Ion

1. Potassium  
Symbol:

2. Aluminum  
Symbol:

3. Bromine  
Symbol:

4. Strontium  
Symbol:

5. Cesium  
Symbol:

6. Oxygen  
Symbol:

7. Fluorine  
Symbol:

8. Neon  
Symbol:

9. Lithium  
Symbol:

10. Calcium  
Symbol:

11. Chlorine  
Symbol:

12. Magnesium  
Symbol:

APPENDIX GHOMEWORK QUIZ – OCTOBER 26<sup>TH</sup>

## VALENCE ELECTRONS AND OXIDATION STATES

*Answer the following questions by using the periodic table that has been provided. Make sure that you answer all parts of each question. Good Luck!!!*

1. Determine the quantity of valence electrons in the following elements.

- a. Mg
  - b. F
  - c. N
2. How many electrons are needed to be gained/lost to satisfy the octet rule for each element?
- a. O
  - b. Na
  - c. Al
3. Using the information from question #2, write the common oxidation state for the following elements.
- a. O
  - b. Na
  - c. Al

## APPENDIX H

HOMEWORK QUIZ – OCTOBER 27<sup>TH</sup>

## WRITING FORMULAS FOR COMPOUNDS

Using the following combinations of elements, write the correct formula for the compound.

1.	<u>Calcium</u>	&	<u>Chlorine</u>	<u>Formula</u>

2. Aluminum      &      Sulfur                      Formula

3. Potassium      &      Nitrogen                      Formula

4. Magnesium      &      Oxygen                      Formula

APPENDIX IHOMEWORK QUIZ – OCTOBER 28<sup>TH</sup>

IONIC COMPOUND NAMING QUIZ

*For the following formulas, determine the correct name for each compound.*

1.  $\text{CaF}_2$ 2.  $\text{K}_3\text{N}$

3.  $\text{Ag}_2\text{O}$

*For the following compounds, write the correct formula for each compound.*

4. Calcium Oxide

5. Cadmium Nitride

6. Lithium Sulfide



APPENDIX JHOMEWORK QUIZ – NOVEMBER 2<sup>ND</sup>

TYPE II BINARY IONIC COMPOUNDS

1. Write the correct formulas for these Type II Binary Ionic Compounds.

a. Iron (III) Bromide

c. Nickel (III) Selenide

b. Chromium (VI) Sulfide

d. Tin (IV) Oxide

2. Write the correct Type II name for the following ionic compounds.

a.  $\text{Pb}_2\text{S}_3$

c.  $\text{MnO}_2$

b.  $\text{CuI}$

d.  $\text{AuCl}_3$

APPENDIX KHOMEWORK QUIZ – NOVEMBER 3<sup>RD</sup>

IONIC COMPOUND NAMING QUIZ

*For the following formulas, determine the correct name for each compound.*

1.  $\text{CaF}_2$ 2.  $\text{SnO}_2$

3. FeN

4. NaCl

*For the following compounds, write the correct formula for each compound.*

5. Calcium Sulfide

6. Vanadium (IV) Selenide

7. Silver Oxide

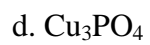
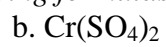
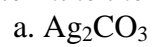
8. Tungsten (VI) Phosphide

APPENDIX LHOMEWORK QUIZ – NOVEMBER 5<sup>TH</sup>

## WRITING FORMULAS AND NAMING: TERNARY IONIC COMPOUNDS

1. *Write the correct formula using the following names of common ionic compounds.*
  - a. Sodium Nitrate
  - b. Potassium Sulfate
  - c. Iron (III) Hydroxide
  - d. Calcium Phosphate

2. *Determine the correct name using the following formulas.*



APPENDIX M

PRE-TREATMENT INTERVIEW QUESTIONS

1. In your opinion, what is homework?
2. Why do you think that I assign homework for you to complete?
3. Do you think that you are assigned too much homework or too little homework?
  - a. Why do you think this way?

4. Do you complete all of your homework that is assigned in my class?
  - b. If so, why do you complete all of the homework?
  - c. If not, why do you fail to complete the homework?
5. Do you find the homework that is assigned in my class helpful?
  - d. Why or why not?
6. Do you find the homework that is assigned in my class valuable and useful?
  - e. Why or why not?
7. How prepared do you feel before we take quizzes in chemistry?
8. Do you feel that the homework that is assigned in my class prepares you for quizzes and tests?
  - f. Why or why not?
9. How confident do you feel before taking quizzes and tests?
  - g. What factors influence your confidence the most?
  - h. Why do these have such an influence on your ability to perform?
10. What motivates you to complete your homework assignments?
  - i. Do you feel more prepared when you complete your homework assignments?
  - j. Why or why not?
11. Do you feel that homework prepares you for tests?
  - k. Why or why not?
12. Have you ever been frustrated with homework?
  - l. If so, provide an example and explain why it was frustrating.
13. Are you more or less likely to complete homework if I do not collect it?
  - m. Explain why you feel this way.



APPENDIX N

POST – TREATMENT INTERVIEW QUESTIONS

1. Do you view homework positively or negatively?
2. Do you think the homework that was assigned in this unit was appropriate?
  - a. Why or why not?
3. In this unit do you think that you were assigned too much homework or too little homework?

- b. Why do you think this way?
- 4. What percentage of the homework assigned in this unit did you complete?
- 5. Did you find the homework that is assigned in this unit helpful?
  - c. Why or why not?
- 6. Did you find the homework that is assigned in this unit valuable and useful?
  - d. Why or why not?
- 7. Did you feel prepared before we took the homework quizzes in this unit?
  - e. Why or why not?
- 8. Did you feel that the quizzes that were completed in this unit prepare you for the unit test?
  - f. Why or why not?
- 9. How confident did you feel before taking quizzes and tests?
  - g. What factors influence your confidence the most?
  - h. Why do these have such an influence on your ability to perform?
- 10. What motivated you to complete your homework assignments in this unit?
  - i. Did you feel more prepared when you completed your homework assignments?
  - j. Why or why not?
- 11. Did you feel that the homework assigned in this unit prepared you for the test?
  - k. Why or why not?
- 12. Were you ever frustrated with homework that was assigned in this unit?
  - l. If so, provide an example and explain why it was frustrating.
- 13. Were you more or less likely to complete homework in this unit since I was not going to collect it?
  - m. Explain why you feel this way.

APPENDIX O

## PRE – TREATMENT INTERVIEW – TRIANGULATION

<b>Research Question/Sub-Question Addressed</b>	<b>Survey Question</b>
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<p><i>“What impact do frequent assessments and a non-punitive homework policy have on student performance on summative assessments</i></p>	<ol style="list-style-type: none"> <li>1. How prepared do you feel before we take quizzes in chemistry?</li> <li>2. Do you feel that the homework that is assigned in my class prepares you for quizzes and tests?</li> <li>3. How confident do you feel before taking quizzes and tests?</li> </ol>
<p><i>“The quantity of homework that is being completed”</i></p>	<ol style="list-style-type: none"> <li>4. Why do you think that I assign homework for you to complete?</li> <li>5. Do you think that you are assigned too much homework or too little homework?</li> <li>6. Do you complete all of your homework that is assigned in my class?</li> <li>7. What motivates you to complete your homework assignments?               <ol style="list-style-type: none"> <li>n. Do you feel more prepared when you complete your homework assignments?</li> </ol> </li> <li>8. Are you more or less likely to complete homework if I do not collect it?</li> </ol>
<p><i>“Student perceptions of the value of homework and student confidence levels before summative assessments”</i></p>	<ol style="list-style-type: none"> <li>9. In your opinion, what is homework?</li> <li>10. Do you find the homework that is assigned in my class helpful?</li> <li>11. Have you ever been frustrated with homework?</li> <li>12. Do you find the homework that is assigned in my class valuable and useful?</li> </ol>
<p><i>“What impact do frequent assessments have on student’s overall performance in a high school chemistry class?”</i></p>	<ol style="list-style-type: none"> <li>13. Do you feel that the homework that is assigned in my class prepares you for quizzes and tests?</li> <li>14. How confident do you feel before taking quizzes and tests?</li> </ol>

APPENDIX P

## POST – TREATMENT INTERVIEW - TRIANGULATION

Research Question/Sub-Question Addressed	Survey Question
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<p><i>“What impact do frequent assessments and a non-punitive homework policy have on student performance on summative assessments</i></p>	<ol style="list-style-type: none"> <li>1. Did you feel that the quizzes that were completed in this unit prepare you for the unit test?</li> <li>2. How confident did you feel before taking quizzes and tests?               <ol style="list-style-type: none"> <li>n. What factors influence your confidence the most?</li> <li>o. Why do these have such an influence on your ability to perform?</li> </ol> </li> </ol>
<p><i>“The quantity of homework that is being completed”</i></p>	<ol style="list-style-type: none"> <li>3. What percentage of the homework assigned in this unit did you complete?</li> <li>4. Were you more or less likely to complete homework in this unit since I was not going collect it?</li> <li>5. Were you ever frustrated with homework that was assigned in this unit?</li> <li>6. What motivated you to complete your homework assignments in this unit?               <ol style="list-style-type: none"> <li>p. Did you feel more prepared when you completed your homework assignments?</li> </ol> </li> <li>7. Do you view homework positively or negatively?</li> <li>8. Did you find the homework that is assigned in this unit valuable and useful?</li> </ol>
<p><i>“Student perceptions of the value of homework and student confidence levels before summative assessments”</i></p>	<ol style="list-style-type: none"> <li>9. Do you think the homework that was assigned in this unit was appropriate?</li> <li>10. In this unit do you think that you were assigned too much homework or too little homework?</li> <li>11. Did you find the homework that is assigned in this unit helpful?</li> </ol>
<p><i>“What impact do frequent assessments have on student’s overall performance in a high school chemistry class?”</i></p>	<ol style="list-style-type: none"> <li>12. Did you feel that the homework assigned in this unit prepared you for the test?</li> <li>13. Did you feel prepared before we took the homework quizzes in this unit?</li> </ol>

APPENDIX Q

TEACTER JOURNAL – HOMEWORK COMPLETION

OCTOBER 28<sup>TH</sup> – NOVEMBER 8<sup>TH</sup>

<b>2nd Period</b>	26-Oct	27-Oct	28-Oct	2-Nov	3-Nov	5-Nov	8-Nov
<b>Chemistry</b>	Valence	Formulas	Type I	Type II	Ionic	Ternary	Binary/Ternary

Student #	Electrons				Compounds			
1	complete	complete	complete	complete	complete	complete	complete	complete
2	complete	complete	complete	complete	complete	complete	complete	complete
3	complete	complete	complete	complete	complete	complete	complete	complete
4	complete	complete	complete	complete	complete	incomplete	half complete	
5	incomplete	complete	complete	incomplete	half complete	complete	incomplete	
6	Absent	complete	absent	absent	complete	complete	incomplete	
7	complete	complete	complete	complete	complete	absent	complete	
8	complete	complete	complete	incomplete	half complete	incomplete	incomplete	
9	half complete	complete	complete	complete	complete	complete	complete	
10	complete	complete	complete	complete	complete	complete	complete	
11	complete	complete	incomplete	incomplete	half complete	complete	incomplete	
12	complete	complete	complete	complete	complete	complete	complete	
13	complete	complete	complete	complete	complete	complete	complete	
14								
15	incomplete	complete	complete	incomplete	complete	complete	half complete	
16	complete	complete	complete	complete	complete	complete	complete	
17	complete	complete	complete	complete	absent	complete	complete	
18	complete	complete	complete	incomplete	absent	complete	complete	
19	complete	complete	complete	complete	complete	complete	complete	
20	complete	complete	complete	complete	complete	complete	complete	
21	complete	complete	complete	complete	complete	complete	complete	
22	incomplete	complete	complete	complete	half complete	complete	incomplete	
23	incomplete	incomplete	complete	incomplete	incomplete	absent	incomplete	
24	complete	complete	complete	complete	complete	complete	complete	
<b>Complete</b>	17	22	20	14	16	18	16	
<b>Half</b>								
<b>Complete</b>	1	0	1	2	4	1	2	
<b>Incomplete</b>	4	1	1	6	1	2	6	
<b>Absent</b>	1	0	1	1	2	2	0	
<b>Total</b>	23	23	23	23	23	23	24	
<b>6th Period</b>	26-Oct	27-Oct	28-Oct	2-Nov	3-Nov	5-Nov	8-Nov	
<b>Chemistry</b>	Valence				Ionic			
	Electrons	Formulas	Type I	Type II	Compounds	Ternary	Binary/Ternary	
Student #								
25	complete	complete	complete	complete	complete	half complete	half complete	
26	Absent	absent	absent	incomplete	incomplete	incomplete	incomplete	
27	complete	complete	complete	incomplete	half complete	half complete	complete	
28	complete	incomplete	complete	incomplete	complete	complete	half complete	
29	complete	complete	complete	incomplete	complete	complete	complete	
30	Absent	complete	complete	absent	complete	complete	incomplete	
31	Absent	absent	complete	incomplete	half complete	complete	absent	
32	complete	incomplete	complete	absent	incomplete	complete	complete	
33	complete	complete	complete	complete	complete	complete	complete	
34	complete	complete	complete	complete	half complete	half complete	complete	
35	complete	complete	complete	complete	half complete	complete	complete	





70	complete	complete	complete	complete	complete	incomplete	complete
71	incomplete	complete	complete	incomplete	complete	complete	incomplete
72	complete	complete	complete	incomplete	complete	incomplete	half complete
73	complete	complete	complete	complete	complete	complete	complete
74	complete	complete	complete	incomplete	complete	complete	incomplete
75	complete	complete half	complete	complete half	complete	complete	complete
76	incomplete	complete	complete	complete	incomplete	incomplete	half complete
77	incomplete	complete	complete	incomplete	complete	incomplete	complete
78	complete	complete	complete	complete	complete	complete	incomplete
79	complete	complete half	complete	complete	complete	complete	complete
80	complete	complete	incomplete	incomplete	incomplete	incomplete	half complete
<b>Complete</b>	21	23	23	11	18	13	12
<b>Half</b>							
<b>Complete</b>	2	4	2	2	1	3	7
<b>Incomplete</b>	5	1	3	14	8	12	8
<b>Absent</b>	0	0	0	1	1	0	1
<b>Total</b>	28	28	28	28	28	28	28

## APPENDIX R

HOMEWORK QUIZ SCORES – 1<sup>ST</sup> TREATMENT UNIT[illegible]

								Average
	9/9	4/4	6/6	8/8	8/8	8/8	8/8	51/51
1	9	4	6	6	5	6	5	<b>0.80</b>
2	9	4	6	8	7	7	8	<b>0.96</b>
3	9	4	6	7	6	7	7	<b>0.90</b>
4	9	4	6	8	8	8	7	<b>0.98</b>
5	9	3	6	6	6	7	7	<b>0.86</b>
6	9	4	6	7	4	4	6	<b>0.78</b>
7	6	4	6	8	6	7	6	<b>0.84</b>
8	9	4	4	3	6	5	4	<b>0.69</b>
9	7	4	6	4	8	6	7	<b>0.82</b>
10	9	4	6	8	8	8	7	<b>0.98</b>
11	9	3	6	3	5	4	6	<b>0.71</b>
12	9	4	6	8	8	7	8	<b>0.98</b>
13	9	4	6	4	8	4	5	<b>0.78</b>
14	6	4	6	7	7	7	7	<b>0.86</b>
15	7	4	4	6	6	6	6	<b>0.76</b>
16	9	4	6	8	6	6	8	<b>0.92</b>
17	9	4	6	8	8	5	5	<b>0.88</b>
18	9	4	6	3	5	5	2	<b>0.67</b>
19	6	4	6	3	3	4	3	<b>0.57</b>
20	8	4	6	6	7	6	5	<b>0.82</b>
21	9	4	6	6	3	6	7	<b>0.80</b>
22	8	4	6	5	7	6	5	<b>0.80</b>
23	9	4	6	8	8	8	8	<b>1.00</b>
24	6	4	6	7	6	6	7	<b>0.82</b>
<b>Mean</b>	8.25	3.92	5.83	6.13	6.29	6.04	6.08	0.83
<b>Standard Deviation</b>	1.189	0.282	0.565	1.872	1.546	1.268	1.586	0.109

<b>6th Period</b>	26-Oct	27-Oct	28-Oct	2-Nov	3-Nov	5-Nov	8-Nov	Quiz Average
<b>Chemistry</b>	Quiz	Quiz	Quiz	Quiz	Quiz	Quiz	Quiz	51/51
	9/9	4/4	6/6	8/8	8/8	8/8	8/8	
25	9	3	6	8	8	6	6	<b>0.90</b>
26			6	4	1	4	3	<b>0.35</b>
27	9	4	5	8	8	6	8	<b>0.94</b>
28	9	4	6	6	7	6	6	<b>0.86</b>
29	5	4	6	7	7	6	7	<b>0.82</b>
30	6	3	6	0	3	7	8	<b>0.65</b>
31	7	2	5	1	4	5	3	<b>0.53</b>
32	6	4	5	4	5	7	6	<b>0.73</b>
33	9	4	6	7	6	8	8	<b>0.94</b>
34	8	4	6	7	7	7	7	<b>0.90</b>
35	8	4	6	8	8	8	8	<b>0.98</b>
36	9	4	6	7	6	4	4	<b>0.78</b>
37	7	4	6	1	4	5	6	<b>0.65</b>
38	9	4	6	5	3	6	6	<b>0.76</b>
39	8	4	6	8	4	7	6	<b>0.84</b>
40	9	4	6	7	7	8	6	<b>0.92</b>

41	9	4	6	6	5	4	7	<b>0.80</b>
42		3	6	8	7	5	7	<b>0.71</b>
43	9	4	6	8	7	7	8	<b>0.96</b>
44	9	4	6	8	7	7	5	<b>0.90</b>
45	9	4	6	3	3	4	3	<b>0.63</b>
46	9	4	6	8	6	7	6	<b>0.90</b>
47	9	4	5	7	7	8	7	<b>0.92</b>
48	9	3	6	8	8	8	8	<b>0.98</b>
49	9	4	6	8	8	8	8	<b>1.00</b>
50	9	4	6	4	7	6	7	<b>0.84</b>
51	9	3	6	2	3	5	6	<b>0.67</b>
52	9	3	6	3	3	7	5	<b>0.71</b>
<b>Mean</b>	8.35	3.70	5.86	5.75	5.68	6.29	6.25	0.81
<b>Standard Deviation</b>	1.164	0.542	0.356	2.562	2.019	1.357	1.555	0.154

<b>7th Period</b>	26-Oct	27-Oct	28-Oct	2-Nov	3-Nov	5-Nov	8-Nov	
<b>Chemistry</b>	Quiz	Quiz	Quiz	Quiz	Quiz	Quiz	Quiz	Quiz Average
	9/9	4/4	6/6	8/8	8/8	8/8	8/8	51/51
52	9	4	6	8	7	8	8	<b>0.98</b>
53	9	4	6	8	8	8	8	<b>1.00</b>
54	9	4	6	2	6	6	8	<b>0.80</b>
55	9	2	6	0	3	1	2	<b>0.45</b>
56	9	1	6	4	7	4	8	<b>0.76</b>
57	9	4	6	4	4	6	5	<b>0.75</b>
58	9	4	6	1	8	8	6	<b>0.82</b>
59	9	4	6	8	8	7	7	<b>0.96</b>
60	9	4	5	8	7	6	7	<b>0.90</b>
61	9	4	6	0	0	6	0	<b>0.49</b>
62	7	4	6	2	4	4	5	<b>0.63</b>
63	6	4	6	7	7	6	7	<b>0.84</b>
64	6	4	5	1	6	3	4	<b>0.57</b>
65	6	4	6	4	6	5	6	<b>0.73</b>
66	9	4	6	7	7	5	5	<b>0.84</b>
67	8	4	6	4	7	6	6	<b>0.80</b>
68	7	4	6	6	8	6	6	<b>0.84</b>
69	9	4	6	4	7	6	8	<b>0.86</b>
70	9	3	6	4	5	3	2	<b>0.63</b>
71	9	3	6	3	5	8	4	<b>0.75</b>
72	9	4	6	8	4	8	8	<b>0.92</b>
73	9	4	5	0	0	6	2	<b>0.51</b>
74	9	4	6	4	6	7	6	<b>0.82</b>
75	9	4	6	8	8	6	7	<b>0.94</b>
76	1	4	6	7	3	2	3	<b>0.51</b>
77	8	4	6	7	5	7	5	<b>0.82</b>
78	9	4	6	3	4	7	7	<b>0.78</b>
79	9	4	6	8	8	7	8	<b>0.98</b>
<b>Mean</b>	8.18	3.75	5.89	4.64	5.64	5.79	5.64	0.78
<b>Standard Deviation</b>	1.744	0.701	0.315	2.831	2.248	1.853	2.231	0.159



APPENDIX S

PRE-TREATMENT SURVEY RESPONSES

$N = 76$

Question Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
N = 76																
1	4	3	4	5	3	4	2	2	4	2	4	2	4	3	2	1
2	5	4	2	5	5	5	4	5	2	2	5	2	1	4	3	4
3	4	3	2	5	5	4	4	4	4	3	5	2	2	4	3	1
4	5	4	4	1	4	4	5	4	5	4	5	3	2	4	4	3
5	4	3	3	2	3	2	2	2	4	2	3	4	3	2	1	4
6																
7	4	4	4	4	3	3	2	2	4	2	3	4	3	3	4	2
8	5	4	2	5	4	4	3	4	4	4	5	2	4	4	3	1
9	4	2	3	4	4	4	3	2	3	4	4	2	2	4	3	2
10	3	1	2	4	2	2	4	4	2	4	3	2	5	2	3	3
11	5	3	3	4	5	4	4	4	3	4	4	2	3	4	4	3
12	4	1	3	2	4	4	4	5	4	4	5	3	3	3	3	3
13	4	4	4	3	4	4	4	5	4	3	4	3	4	4	4	2
14	4	1	4	4	4	4	4	3	2	4	4	4	4	4	4	2
15	4	2	4	4	4	4	4	4	4	3	4	2	3	4	3	3
16	2	4	4	3	4	3	4	2	3	1	4	2	2	3	5	4
17	5	2	4	5	5	5	5	5	5	4	5	2	2	5	3	2
18	4	2	3	3	3	2	3	3	4	2	4	2	5	3	3	1
19	4	4	4	4	4	2	4	4	4	4	4	2	3	3	4	2
20	4	4	5	5	5	4	4	4	4	4	4	4	3	3	3	3
21	5	3	3	4	4	4	4	5	4	3	5	1	2	2	4	2
22	4	3	2	4	3	4	4	4	2	3	4	2	2	2	3	1
23	4	2	4	4	5	5	4	4	5	2	4	1	3	5	3	2
24	4	2	2	3	4	2	4	3	4	2	4	2	4	4	1	4
25	4	2	2	3	4	3	3	4	3	3	4	3	3	4	2	2
26	4	2	3	4	4	4	4	4	3	3	4	2	4	3	4	2
27	2	2	2	4	3	2	4	4	4	1	4	2	5	2	2	1
28	5	1	4	4	4	2	2	3	2	3	5	2	4	2	2	2
29	4	1	2	3	3	3	4	2	3	3	3	2	3	2	3	2
30	4	2	3	3	4	3	4	5	4	2	4	3	2	4	3	3
31	4	1	2	4	4	3	3	4	4	3	4	2	4	4	4	4
32	4	2	3	4	3	2	4	3	4	3	2	2	3	4	2	4
33	4	5	3	5	5	4	4	5	4	2	4	3	3	4	1	4
34	4	4	5	5	4	3	4	4	4	1	3	3	3	4	4	2
35	4	2	3	3	4	2	4	4	4	2	3	2	3	3	3	2
36	3	4	2	2	4	3	5	4	5	2	5	2	3	4	3	2
37	4	1	3	2	3	3	4	3	4	2	4	2	2	4	3	2
38	5	3	5	5	5	3	3	5	5	3	5	5	1	5	4	5
39	4	4	4	3	4	2	4	2	2	2	4	2	3	2	2	2
40	5	4	2	4	4	3	4	3	5	2	3	1	2	3	4	5
41																
42	4	4	4	5	5	5	4	4	4	4	4	2	1	5	2	2
43																
44	4	1	3	3	3	2	3	2	3	2	3	2	4	2	2	2
45	3	1	2	5	4	3	4	5	5	3	4	4	4	4	1	1
46	4	1	3	3	4	3	3	2	4	2	5	1	3	3	2	1
47	2	2	5	3	3	2	4	4	5	3	5	4	3	3	4	2
48	5	4	4	5	5	5	4	5	5	4	5	4	2	5	4	4



49	4	2	3	1	4	4	5	3	5	2	4	2	3	4	4	3
50	4	2	3	3	4	3	5	2	5	4	5	2	3	5	4	2
51	4	3	3	4	3	3	4	4	4	1	4	3	4	4	2	3
52	2	4	2	2	3	3	4	4	2	2	4	4	1	3	4	1
53	4	2	5	4	5	4	5	4	5	2	5	4	5	5	4	5
54	5	2	5	4	5	4	4	4	5	2	5	3	2	4	3	3
55	4	3	3	3	2	4	4	4	4	2	5	2	4	4	1	1
56	4	2	4	3	4	5	5	3	4	3	4	3	4	4	4	1
57	4	1	2	2	5	4	2	4	4	2	5	1	5	4	1	2
58	2	1	2	4	4	4	3	2	4	2	5	2	5	3	2	4
59	4	2	5	3	4	2	4	4	4	3	4	2	3	4	2	4
60	4	4	2	5	4	4	4	5	4	3	5	4	4	5	2	4
61	4	4	2	3	4	3	4	4	2	4	4	2	4	3	4	2
62	5	5	3	5	5	2	2	2	4	3	5	3	3	5	3	2
63	4	2	1	4	5	5	5	4	3	2	5	3	3	3	3	3
64	4	4	3	4	4	4	4	4	3	4	5	2	2	4	4	2
65	4	2	4	3	4	4	5	5	4	1	5	2	3	4	3	2
66	5	3	4	5	4	3	4	4	4	3	5	3	2	4	3	2
67	4	4	3	3	4	2	3	4	3	2	5	2	4	3	1	2
68	2	3	2	2	3	2	1	4	4	3	4	3	4	1	1	2
69	3	1	2	3	3	2	3	2	4	3	2	2	3	3	3	2
70	3	2	3	2	4	4	2	2	4	2	5	3	2	2	2	1
71	4	2	3	4	4	3	4	5	3	2	2	5	3	4	1	3
72	4	2	4	4	5	4	3	5	5	3	4	2	2	5	3	3
73	4	4	3	5	5	4	3	1	1	4	5	4	2	4	2	4
74	4	4	3	2	5	4	5	4	4	2	5	2	3	3	2	3
75	4	3	2	4	4	2	4	3	3	2	4	2	4	2	2	1
76	4	1	3	2	3	2	3	2	3	5	3	1	3	2	3	1
77	5	4	4	5	5	5	4	5	5	4	4	2	2	5	3	2
78	4	3	4	3	4	3	3	2	4	1	5	2	3	3	1	4
79	4	4	2	4	3	2	3	3	2	4	3	2	3	4	4	2

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Mean</b>	3.96	2.67	3.13	3.61	3.97	3.32	3.70	3.59	3.75	2.72	4.18	2.49	3.05	3.53	2.83	2.46
<b>Standard Deviation</b>	0.76	1.17	0.98	1.06	0.77	0.98	0.86	1.07	0.95	0.96	0.81	0.93	1.01	0.97	1.04	1.10
<b>Mode</b>	4	2	3	4	4	4	4	4	4	2	4	2	3	4	3	2
<b>Student Responses</b>																
<b>5</b>	14	2	7	17	19	8	10	15	15	1	30	2	6	11	1	3
<b>4</b>	51	23	20	26	38	28	42	33	38	18	33	11	18	32	22	13
<b>3</b>	5	13	26	17	17	20	16	11	13	22	10	15	30	20	26	14
<b>2</b>	6	24	22	10	2	20	7	16	9	29	3	42	18	12	17	32
<b>1</b>	0	14	1	2	0	0	1	1	1	6	0	6	4	1	10	14
<b>% of Student Responses</b>																
<b>Very Positive</b>	18	3	9	22	25	11	13	20	20	1	39	3	8	14	1	4
<b>Positive</b>	67	30	26	34	50	37	55	43	50	24	43	14	24	42	29	17
<b>Undecided</b>	7	17	34	22	22	26	21	14	17	29	13	20	39	26	34	18
<b>Negative</b>	8	32	29	13	3	26	9	21	12	38	4	55	24	16	22	42
<b>Very Negative</b>	0	18	1	3	0	0	1	1	1	8	0	8	5	1	13	18

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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APPENDIX T

## POST – TREATMENT SURVEY RESPONSES

$$N = 72$$

**Post Treatment Survey Responses****All Classes**

<b>Question Number</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
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N = 72

1	4	4	4	4	5	4	5	5	5	4	5	2
2	5	5	5	5	5	5	5	5	5	5	5	5
3	5	4	5	4	5	4	4	5	5	4	5	1
4	5	5	5	5	5	5	5	5	4	4	4	4
5	5	4	5	5	4	5	4	5	4	1	2	4
6	4	4	4	5	4	4	4	4	4	2	4	4
7	4	4	4	4	2	4	4	4	4	2	4	2
8	5	5	4	4	5	4	4	4	4	4	5	4
9	5	5	5	5	4	4	4	4	4	4	4	2
10	4	4	4	4	4	2	4	2	4	5	3	2
11	4	4	2	4	2	2	4	2	4	3	4	4
12	5	5	5	5	4	5	4	5	5	3	4	1
13	5	4	4	4	4	5	4	5	5	4	4	4
14	4	4	4	5	4	4	4	4	4	4	4	2
15	4	4	4	5	5	4	4	4	5	4	4	4
16	4	4	4	4	4	4	4	4	4	4	4	4
17	5	4	5	4	5	5	4	5	5	4	5	2
18	2	4	4	4	4	2	4	4	5	1	5	1
19	4	5	4	4	4	5	4	4	4	4	4	2
20	5	4	2	5	5	5	5	5	4	4	4	4
21	4	2	4	5	5	5	5	5	5	4	5	1
22	4	4	2	4	4	2	4	2	2	4	2	1
23	4	5	4	5	4	5	5	5	5	4	5	2
24												
25	4	4	2	4	2	4	4	4	2	4	4	2
26	4	4	5	4	5	5	4	5	4	4	4	4
27	2	2	2	4	5	2	4	2	2	2	4	1
28	4	4	2	4	4	4	4	4	4	4	4	2
29	4	4	4	4	4	4	4	4	2	4	4	4
30												
31	4	4	4	5	4	4	5	5	2	4	4	2
32	5	5	5	5	5	5	4	5	4	4	4	4
33	4	5	4	4	5	5	5	4	2	4	4	4
34	4	4	5	4	5	5	5	5	4	4	4	2
35	4	4	4	4	4	5	4	5	4	4	4	2
36	4	5	5	4	4	2	5	4	4	4	5	2
37	4	5	5	5	5	4	5	5	5	4	4	2
38	5	5	2	5	5	5	4	4	5	5	4	5
39	4	4	4	4	4	4	4	4	5	4	4	2
40	1	5	1	5	5	5	5	2	2	4	5	1
41	2	4	2	4	4	5	5	5	4	4	5	2
42	4	5	4	4	5	5	5	4	4	4	4	4
43	4	4	4	4	2	2	5	4	4	4	5	1
44	4	4	4	4	4	4	4	4	4	4	4	2
45	4	5	5	4	4	4	5	4	4	4	4	2
46	4	4	5	5	5	4	4	5	5	4	5	2
47	5	5	4	5	5	4	4	4	4	5	4	4
48	4	5	5	5	5	5	5	5	5	5	5	5
49	4	5	5	5	5	4	5	5	5	4	5	1

50												
51	4	4	4	4	5	4	4	4	4	2	4	4
52	5	1	1	2	4	2	4	2	2	1	2	2
53	5	5	5	5	5	5	5	5	5	4	5	5
54	4	4	4	4	4	4	4	4	4	2	4	4
55	4	4	4	4	5	5	5	5	5	2	4	1
56	4	4	2	4	4	4	4	4	2	4	4	1
57	5	5	2	4	5	4	5	4	4	4	4	4
58												
59	4	5	5	5	5	4	4	5	4	4	5	4
60	4	5	4	4	4	4	4	5	2	4	4	4
61												
62	4	4	4	4	4	4	4	4	4	2	4	2
63	4	5	2	4	4	4	5	4	1	4	4	1
64	4	4	4	4	4	2	5	5	4	4	4	2
65	4	4	4	4	5	4	5	4	5	2	5	2
66	4	5	5	5	5	5	5	5	5	4	5	4
67	4	2	4	4	5	4	4	4	4	4	5	2
68	4	4	5	4	4	4	5	5	5	2	4	3
69	2	4	4	4	4	4	4	4	4	4	4	1
70												
71	2	2	4	4	2	2	2	2	4	2	2	4
72	4	4	5	5	5	4	4	5	5	4	5	4
73	4	4	4	5	1	5	2	5	5	4	5	1
74	4	4	2	5	5	5	5	5	5	4	5	2
75												
76	5	4	4	4	4	4	4	4	4	1	4	1
77	4	4	5	5	5	5	5	5	5	4	5	2
78	4	4	4	4	4	4	4	4	5	2	4	2
79	5	4	2	2	2	1	4	2	1	4	2	2

Question	1	2	3	4	5	6	7	8	9	10	11	12
<b>Mean</b>	4.07	4.18	3.86	4.32	4.25	4.04	4.33	4.22	4.00	3.57	4.18	2.61
<b>Standard Deviation</b>	0.81	0.81	1.13	0.62	0.93	1.03	0.63	0.92	1.09	1.02	0.78	1.28
<b>Mode</b>	4	4	4	4	5	4	4	5	4	4	4	2

**Student Responses**

5	18	24	22	27	33	26	28	32	26	5	24	4
4	48	43	35	43	32	35	42	32	34	50	42	23
3	0	0	0	0	0	0	0	0	0	2	1	1
2	5	4	13	2	6	10	2	8	10	11	5	29
1	1	1	2	0	1	1	0	0	2	4	0	15

**% of Student Responses**

<b>Very Positive</b>	25	33	31	38	46	36	39	44	36	7	33	6
<b>Positive</b>	67	60	49	60	44	49	58	44	47	69	58	32
<b>Undecided</b>	0	0	0	0	0	0	0	0	0	3	1	1
<b>Negative</b>	7	6	18	3	8	14	3	11	14	15	7	40
<b>Very Negative</b>	1	1	3	0	1	1	0	0	3	6	0	21

Question	1	2	3	4	5	6	7	8	9	10	11	12
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APPENDIX U

## TEST SCORES – PRE VS. POST TREATMENTS

2nd Period					11- Nov Test Score	23-Nov Test Score	Treatment	Difference
Students	14-Sep	5-Oct	26-Oct	Average		Score	Test Score	in Test Scores

<b>Test Scores</b>	<b>70/70</b>	<b>75/75</b>	<b>64/64</b>	<b>Test Scores</b>	<b>79/79</b>	<b>61/61</b>	<b>140/140</b>	<b>(After two treatments)</b>
1	56	55	31	<b>0.68</b>	73.0	50	<b>0.88</b>	<b>0.20</b>
2	33		22	<b>0.41</b>	67.0	58	<b>0.89</b>	<b>0.48</b>
3	55	52	38	<b>0.69</b>	60.0	55	<b>0.82</b>	<b>0.13</b>
4	60	70	51	<b>0.87</b>	77.0	56	<b>0.95</b>	<b>0.08</b>
5	34	45	18	<b>0.46</b>	58.0	45	<b>0.74</b>	<b>0.27</b>
6			16	<b>0.25</b>	51.0	34	<b>0.61</b>	<b>0.36</b>
7	61	49	40	<b>0.72</b>	66.0	61	<b>0.91</b>	<b>0.19</b>
8	44	53	32	<b>0.62</b>	64.0	50	<b>0.81</b>	<b>0.20</b>
9	56	62	29	<b>0.70</b>	67.0	53	<b>0.86</b>	<b>0.15</b>
10	54	63	32	<b>0.71</b>	46.0	54	<b>0.71</b>	<b>0.00</b>
11	56	58	42	<b>0.75</b>	66.5	29	<b>0.68</b>	<b>-0.06</b>
12	57	69	48	<b>0.83</b>	64.5	58	<b>0.88</b>	<b>0.04</b>
13	42	55	41	<b>0.66</b>	59.5	43	<b>0.73</b>	<b>0.07</b>
14	56	54	41	<b>0.72</b>	71.0	60	<b>0.94</b>	<b>0.21</b>
15					75.5			<b>0.00</b>
16	52	65	54	<b>0.82</b>	72.5	52	<b>0.89</b>	<b>0.07</b>
17	61	77	63	<b>0.96</b>	73.0	60	<b>0.95</b>	<b>-0.01</b>
18	58	55	41	<b>0.74</b>	53.0	53	<b>0.76</b>	<b>0.02</b>
19	47	56	24	<b>0.61</b>	62.5	41	<b>0.74</b>	<b>0.13</b>
20	51	75	48	<b>0.83</b>	71.5	51	<b>0.88</b>	<b>0.04</b>
21	42	61	33	<b>0.65</b>	53.0	36	<b>0.64</b>	<b>-0.02</b>
22	42	56	46	<b>0.69</b>	43.5	34	<b>0.55</b>	<b>-0.14</b>
23	54	60	25	<b>0.67</b>	65.0	54	<b>0.85</b>	<b>0.18</b>
24	57	62	50	<b>0.81</b>	60.0	47	<b>0.76</b>	<b>-0.04</b>
<b>Mean</b>	51.27	59.62	37.61	0.69	63.33	49.30	0.80	0.11
<b>Std. Dev.</b>	8.328	8.188	12.123	0.154	9.102	9.212	0.112	0.141
<b>Mode</b>	56	55	41	0.83	73	50.00	0.95	

<b>6th Period</b>						<b>23-Nov</b>	<b>Treatment</b>	<b>Difference</b>
<b>Students Test Scores</b>	<b>14-Sep</b>	<b>5-Oct</b>	<b>26-Oct</b>	<b>Average Test Scores</b>	<b>11-Nov</b>	<b>Test Score</b>	<b>Test Score</b>	<b>in Test Scores</b>
	<b>70/70</b>	<b>75/75</b>	<b>64/64</b>		<b>79/79</b>	<b>61/61</b>	<b>140/140</b>	<b>(After two treatments)</b>
25	53	61	38	<b>0.73</b>	64.0	55	<b>0.85</b>	<b>0.12</b>
26	38	60		<b>0.68</b>	56.5	26	<b>0.59</b>	<b>-0.09</b>
27	47	63	49	<b>0.76</b>	75.5	56	<b>0.94</b>	<b>0.18</b>
28	56	52	34	<b>0.68</b>	58.0	33	<b>0.65</b>	<b>-0.03</b>
29	39	50	44	<b>0.64</b>	35.5	27	<b>0.45</b>	<b>-0.19</b>
30	47		47	<b>0.70</b>	70.5	42	<b>0.80</b>	<b>0.10</b>
31	54	56	20	<b>0.62</b>	46.5	36	<b>0.59</b>	<b>-0.03</b>
32	52		49	<b>0.75</b>	78.5	55	<b>0.95</b>	<b>0.20</b>
33	60	66	24	<b>0.72</b>	77.5	57	<b>0.96</b>	<b>0.24</b>
34	60	59	31	<b>0.72</b>	77.0	55	<b>0.94</b>	<b>0.23</b>
35	58	68	36	<b>0.78</b>	70.0	55	<b>0.89</b>	<b>0.12</b>
36	55	57	35	<b>0.70</b>	59.5	33	<b>0.66</b>	<b>-0.04</b>
37	41	57	25	<b>0.59</b>	50.0	40	<b>0.64</b>	<b>0.05</b>
38	47	61	39	<b>0.70</b>	70.0	51	<b>0.86</b>	<b>0.16</b>
39	59	70	43	<b>0.82</b>	69.0	58	<b>0.91</b>	<b>0.08</b>
40	42	56	38	<b>0.65</b>	57.5	46	<b>0.74</b>	<b>0.09</b>
41	56	63	38	<b>0.75</b>	65.0	37	<b>0.73</b>	<b>-0.02</b>



42	56	56	37	0.71	67.0	33	0.71	0.00
43	61	70	41	0.82	72.0	53	0.89	0.07
44	59	72	53	0.88	69.0	51	0.86	-0.02
45	39	36	27	0.49	50.0	25	0.54	0.05
46	57	60	36	0.73	72.5	59	0.94	0.21
47	56	60	21	0.66	66.5	51	0.84	0.18
48	50	58	32	0.67	68.0	58	0.90	0.23
49	63	71	61	0.93	74.5	61	0.97	0.03
50	60	61	30	0.72	69.0	57	0.90	0.18
51	35	50	24	0.52	57.0	60	0.84	0.31
52	52	53	34	0.67	74.0	57	0.94	0.27
Mean	51.86	59.46	36.52	0.71	65.00	47.39	0.80	0.10
Std. Dev.	8.059	7.845	9.967	0.094	10.449	11.669	0.147	0.121
Mode	56	61	38	0.72	69	55.00	0.59	
7th Period								
Students Test Scores	14-Sep	5-Oct	26-Oct	Average Test Scores	11- Nov	23-Nov Test Score	Treatment Test Score	Difference in Test Scores (After two treatments)
53	70/70	75/75	64/64	0.59	79/79	61/61	140/140	0.24
54	35	51	37	0.75	63.0	53	0.83	0.22
55	65	58	34	0.68	76.0	60	0.97	0.07
56	44	57	41	0.50	59.0	46	0.75	-0.08
57	39	50	16	0.63	38.0	21	0.42	0.10
58	43	58	31	0.65	56.0	47	0.74	0.14
59	42	64	29	0.56	56.0	54	0.79	-0.01
60	45	50	23	0.78	45.0	33	0.56	0.16
61	59	61	43	0.78	78.0	54	0.94	-0.03
62	53	60	49	0.93	55.0	49	0.74	-0.57
63		70		0.36	51.5	0	0.37	0.06
64	36	25	14	0.59	39.5	19	0.42	0.11
65	61	47	15	0.59	56.0	42	0.70	-0.18
66	39	60	25	0.67	40.5	17	0.81	0.14
67	51	56	32	0.62	68.0	45	0.77	0.15
68	53	57	20	0.79	66.0	42	0.85	-0.03
69	58	68	39	0.65	58.5	60	0.63	0.12
70	51	56	29	0.77	50.5	37	0.89	-0.14
71	61	52	48	0.55	66.0	59	0.41	0.25
72	28	61	26	0.51	38.0	19	0.76	0.06
73	47	51	8	0.88	52.5	54	0.94	-0.16
74	64	63	56	0.49	72.0	59	0.63	-0.05
75	46	48	9	0.66	28.0	18	0.80	0.14
76	54	51	38	0.65	64.5	24	0.78	0.13
77	48	46	44	0.54	64.5	48	0.78	0.25
78	58	54	24	0.62	57.5	52	0.78	0.16
79	51	37	24	0.89	57.5	52	0.88	-0.01
80	48	50	32		72.0	51		
Mean	49.70	54.71	31.04	0.66	56.68	41.64	0.70	0.05
Std. Dev.	9.667	9.610	12.990	0.131	12.283	16.292	0.189	0.171
Mode	51	51	29	0.59	56	54.00	0.78	

