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## An Examination of Homework

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## **Abstract**

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An Examination of Homework

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School of Arts and Sciences  
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Abstract

The purposes of this study were first, to examine the effect that various homework policies had on student homework averages and second, to examine the effects that the completion of homework and the correctness of the homework have on test scores. The participants of this study were Regents Chemistry students during the years of 2007 to 2010. Homework averages for each student were compared to their previous year's Regents Earth Science homework average. The differences between each group of Regents Chemistry students were determined to be not significant. Each piece of data, consisting of one student's work for an individual unit, was placed into one of 9 groups based on the amount of homework completed. These groups were then compared using a t-test. There were statistically significant differences between these groups, indicating that homework completion does play an important part in preparing students to perform well on tests.

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## An Examination of Homework

In almost any classroom across the world, in any subject, no matter how different the setups of the classrooms are, one thing that most will have in common is the assignment of homework. Homework can come in many forms, from simple busy-work assignments to real, in-depth, and meaningful projects. Many teachers have difficulty getting students to complete these assignments, regardless of the value to the student. The fight against incomplete and carelessly done work is one that most teachers confront with at least a fraction of their students. If the homework is not purposeful, appropriate for the ability of the students, and designed to help the students attain a better grasp of the concepts being taught in the class, then the assignments are a waste of the students' time and it is pointless for the teacher to struggle to increase the percentage of students completing the assignments. Other than fostering responsibility, which of course is important in itself, there is no real value to the students completing such assignments. Without these homework assignments, the students would have just as great knowledge of the subject as they would if they had completed the work. This is an area that every teacher needs to examine with each assignment given. It is important to make sure each assignment is worth the time and effort required for students to complete it and that it will lead to a better understanding of the targeted concepts when they have thoughtfully completed this assignment.

Once it has been verified that the work being assigned is purposeful, appropriate, and will help the students to better understand what is being discussed in class, it still remains to be determined how to increase the thoughtful completion

of these assignments. Perhaps one way is simply through the policy set at the beginning of the year. Students are constantly asking if an assignment is for credit. The value of a good grade is obviously a strong motivator for some students, although not for all. Having homework count for part of their grade is an external motivator that can help encourage some students to complete their work who otherwise would not. It must be examined what effect accepting late homework has on students. While some teachers see this as an added opportunity for students to complete assignments that they forgot or did not have time to complete, it is possible that it also discourages students from completing work on time. If they can always do the assignment later, then the motivation to complete it on time can dwindle. Students can just keep delaying their work until it either piles up on them and they become overwhelmed or it is so long overdue that it loses its significance to the class content. A teacher must take all of this into consideration when establishing the class homework policy at the beginning of the year.

#### Literature Review

While homework has been a staple of the educational process for years, it has not always been accepted by the experts as a valid way of increasing academic performance. Homework has been the center of much academic debate throughout the years. Questions raised have varied from how much is appropriate to whether it can be considered useful to students at all. While at times homework has been found to be more harmful than beneficial by researchers, it has never been completely eliminated from the classroom. There are many purposes that teachers, students, and parents have for the use of homework, and at least one of these

purposes has been seen as a valid reason for assigning homework at any point throughout the years. For those who believe homework is a worthwhile learning tool, the struggle to get students to complete homework in a thoughtful manner is an important one. Teachers must determine the best ways to motivate students to complete assignments and to see the value in the work assigned.

### *History of Homework*

Homework has been used since the beginning of the schooling system as a means of helping students learn the content covered in school, although there have always been people arguing against the use of homework in the classroom. The types, amounts, and purposes of homework, however, have changed over time based on the current educational research and political climate of the time.

Homework was not controversial until after the nineteenth century. Up to that point, high school was not mandatory. Only those students with the ability and desire to learn continued their schooling. In a child's early years of schooling, attendance was mandatory and homework was not common (Gill & Schlossman, 2004). In the higher grades, students were expected to spend between two and three hours each night on school-related assignments and studying (Reese, 1995). While some people complained about excessive amounts of homework, educators responded that, "asking schools to eliminate homework was like telling farmers to abandon their fields or manufacturers to break their machines. The fear of starvation caused adults to labor, and the prospect of failure caused pupils to study" (Reese, p. 203).

In 1897, Dr. Joseph Mayer Rice published the first study on homework. Rice focused on spelling assignments because these were typical of the memorization homework usually assigned to students at the time. Rice's research demonstrated that the repetition of spelling words, no matter how much a child practiced, had no impact on their ability to spell later in life (Gill & Schlossman, 2004). It was this paper that began the initial debate on the benefits of homework. Now, instead of being viewed as beneficial, it was considered that such high amounts of memorization occurring at school might be harmful to the physical and mental health of the students. Regulation of homework now began, primarily in the lower grades. The American Child Health Association considered homework to be a form of child labor and attributed the high child mortality rate in part to homework (Gill & Schlossman, 2004). The Encyclopedia of Educational Research held that homework had no benefit on academic achievement before high school (Otto, 1941). This view was held by the majority of the educational field until the 1950s (Gill & Schlossman, 1996). Another reason for abolishing homework was to exclude parents from the educational process. Many parents were against the progressive educational movement, and homework was the most vital link between the home and school. By eliminating homework, parents were less likely to know what was going on in the classroom and this would help to reduce parental complaints about what was being taught (Gill & Schlossman, 2003).

#### *Amounts of Homework*

One of the biggest controversies regarding homework seems to be the amount of homework given to students. Many people seem concerned that the

amount of homework students must complete has skyrocketed over the past several years. Students, in their opinion, cannot complete that much work without other necessary activities suffering. Prior to the 1950s, there were few studies done on the amount of homework students were being assigned. From the few records that do exist, it appears that students in high school were required to complete slightly over one hour of homework each night. In 1948, the first national research on homework showed that students were completing less than an hour of homework per day (Gill & Schlossman, 2004).

After the Soviet launching of Sputnik, the United States became worried that the Cold War would be lost due to the American education system. It appeared that Soviet children were smarter than American children and this was partly blamed on the lack of homework in schools. As a result, the amount of assigned homework began to increase in an effort to improve the success of American students as a part of national defense (Gill & Schlossman, 2000). During this time, the fraction of students completing more than two hours of homework each night, while still in the minority, increased substantially. Similarly, in the 1980s, worldwide economic competition helped motivate educators to increase standards and homework assignments in order to allow students to compete in the international market. While public opinion seems to be that homework amounts tend to be excessive, a nationwide poll of parents showed that only ten percent believe that their children are being given too much homework. Throughout the past several years most students, regardless of grade level, completed less than one hour of homework each night, with the amount of homework decreasing since the 1980s (Gill & Schlossman,

2004). By 1999, the majority of students spent less than one hour each night studying (Gill & Schlossman, 2003). Zuzanek (2009) has compared the amount of time students in various countries spend on homework and concluded that, compared to other countries, “the workloads of American high school students (55 min of homework on school days) do not appear particularly heavy” (p. 112). In the countries examined during this investigation, it also appeared that homework had actually decreased over the past several years (Zuzanek). Many schools have policies limiting the amount of homework a teacher can assign nightly. Most teachers report that the assigned homework should take between twenty and thirty minutes. However, with the number of classes a student is taking, this can accumulate to several hours each night. Also, due to differences in ability, the time a student spends on homework can vary greatly from student to student (Sallee & Rigler, 2008).

#### *Purpose of Homework*

While there has been much controversy among educators about whether or not homework is beneficial or detrimental to children, parents have supported homework throughout the years. When schools tried to eliminate homework, they were often met with opposition from parents. While not wanting copious amounts of homework for their children, parents did want their children studying for at least a short amount of time each day. Although the research at the time indicated that homework did not improve learning, parents still believed that it would help their children succeed, thus promoting homework for even the youngest schoolchildren (Otto, 1941). They felt that homework would at least be beneficial to their

children's character development and help keep them out of trouble by giving them additional responsibilities. Parents also felt it helped them stay informed about what was going on in the classroom and kept the school accountable to the parents (Gill & Schlossman, 2003). In the post-Sputnik years, when homework began to increase as a means to fight the Cold War, parents rallied behind the teachers in support. Previous to this event, thirty-nine percent of adults felt that children should be given additional homework. This percentage soon rose to fifty-one, demonstrating that support for homework was growing over this time period (Gill & Schlossman, 2004).

Teachers, likewise, have a variety of reasons for assigning homework. Some of the reasons that teachers give for the assignments are "setting up a shared experience for a class, introducing new content to develop in class, giving students a sense of independence, and providing time for reflection," as well as simply "to get work done" (Sallee & Rigler, 2008, p. 47). It also is used to support the concepts covered in class and to practice and develop skills needed for success (Hong, Peng, & Rowell, 2009). It does appear that some teachers give homework assignments that are too difficult, expecting students to teach themselves the material. Twenty-six percent of teachers admit that they often assign homework simply because they ran out of time in class, in which case students likely do not have the background knowledge and skills to complete the work on their own (Fisher & Frey, 2008). While some of the more successful students may be able to complete the work and possibly learn from it, struggling students will only fall farther behind and become more discouraged, making it more difficult for them to learn related material (Sallee

& Rigler). In order for students to be able to learn from the assignments they complete, it is necessary for the teacher to make sure that students have had adequate instruction in class.

Students do not always see the purpose of the homework that teachers assign. In a survey, equal amounts of students viewed the homework they were assigned as busywork as viewed the same assignment as a valuable tool to help them learn (Sallee & Rigler, 2008). It is possible that some of this has to do with the beginning ability of students. Students who already understand the material might consider the same assignment as busywork that struggling students see as helping them learn. This demonstrates that what the teacher perceives as the purpose is not always shared by, or even clear to, the students.

#### *Perception of Homework*

During the twentieth century, traditional homework began to change. Textbooks and memorization began to take a back seat as educators began to look for new ways of having students practice content. Higher standards were pushing teachers to develop new lessons that would be more enjoyable for the students, provide hands-on experience with concepts, and hopefully push students to think more in-depth about the content they were learning. Parents were incorporated into homework assignments to increase communication and help gain support for the school system (Gill & Schlossman, 2004). Parents were informed of the areas of study that students would be investigating and were asked to make as many connections to home life as possible. Everyday family activities became incorporated into homework, such as shopping applied to mathematics or playing

outdoors applied to science. Students tend to enjoy these non-traditional, open-ended assignments more than the structured assignments used to practice repetitive skills (Hong & Lee, 2000). "Several students who never had handed in an assignment became actively engrossed in the real-life assignments" (Bryan & Sullivan-Burstein, 1998, p. 270). Homework, therefore, can also be used to help increase interest in a subject by allowing students to investigate specific areas that are of particular interest to them. "Homework is perceived by students as more challenging, more important, and, surprisingly, even less boring than time spent in class" (Zuzanek, 2009, p. 114). Developing such assessments can be challenging for many teachers. The typical memorization and repetition homework has been highly engrained in the school system. Teachers and students alike are comfortable with this as these are the types of assignments to which they are accustomed. It is very easy for teachers to slip back into this routine without realizing it. One thing that can be extremely beneficial to teachers, especially as they are beginning to create such assignments, is collaboration with their co-workers. This allows for combining several different people's ideas into a project and helps relieve the stress on each teacher by allowing for the exchanging of ideas (Cooper, Horn & Strahan, 2005).

As students get older, their interest in school seems to dwindle. Along with this, their view of homework also deteriorates. Older students are less likely to view homework as useful and enjoyable. With this jaded view of homework, students are less likely to spend the time and effort necessary to thoughtfully complete the work in a meaningful way (Hong, Peng & Rowell, 2009). High school students sometimes fail to complete their assigned homework because they feel it is too easy to warrant

their time. They feel that “if assignments were more challenging, or if the expectations were more explicit, they would invest more effort in their work” (Cooper, Horn & Strahan, 2005, p. 10). These students have goals of mastering a subject, not simply completing work. They see a challenge as a way to improve their understanding (Cooper, Horn & Strahan).

While open-ended assignments might be more enjoyable to students and create more of a love of learning, “traditional directed homework assignments returned with teacher feedback were superior to open-ended homework formats” (Rosenberg, 1989, p. 315). This could be due to the types of assessments provided at the end of the unit. If students are going to be given assessments that require in-depth, creative thought, it is necessary for them to be able to practice that process in shorter assignments throughout the unit. If students are being given more traditional tests, traditional homework assignments can be just as effective for students to achieve high marks, although perhaps not greater understanding.

Studies have been done which examine the impact of both intrinsic and extrinsic motivators. External motivators can include grades, pleasing parents and teachers, and other rewards offered in either the home or school. One such study showed that only intrinsic motivation is responsible for increased homework completion (Xu, 2005). For this reason, it is extremely important to make assignments relevant and ensure that students know the purpose of each assignment. Another thing that can influence a student’s view of the intrinsic value of homework is the way in which his or her parents view homework. There has been seen a significant relationship between the way parents view homework and

how their children view it. If parents see homework as important to the development of their child, the child is more likely to have a positive perception of homework. Students who complete homework with a parent were observed to work more attentively than those who worked alone or with classmates. This led to a higher achievement by these students (Xu).

### *Effects of Homework*

Although the expected effect of homework is to help students gain higher academic achievement, many people have cited other, possibly negative, effects. Many have pointed to homework as causing “adolescent stress, disruption of family relationships, and questionable academic results” (Zuzanek, 2009, p. 111). Many students are forced to have jobs during the school year due to family economic pressures. They are also pressured to participate in various extracurricular activities in order to make their college resumes stand out (Sallee & Rigler, 2008). It appears, however, that the majority of time that students spend on homework would not have been spent on the activities that people are most concerned about students missing out on, but rather on television, video games, and other non-stimulating activities (Zuzanek). On average, tenth grade students complete 4.43 hours of homework each week, twelfth grade students complete 6.86 hours of homework each week, and both groups watch between eleven and twelve hours of television (Keith, Diamond-Hallam & Fine, 2004). It would seem that, if students have enough time to watch that much television, they would have enough time for the few hours of homework that is assigned.

While some worry that homework is not helping students succeed, Zuzanek's (2009) research showed a positive correlation between increased homework and better grades, with even more benefits coming from completing homework on Sundays. There are, of course, some instances where students who are not completing homework assignments are doing better than some of the students who are doing the work. This could be explained by the fact that some students have an easier time learning certain concepts than other students. If the homework topics are thoroughly taught in class and the student is a quick learner, then that particular student might not need the homework to perform well on assessments (Oliver & Williams, 2005). Assuming that the homework assignments are designed appropriately, this should be an anomaly in the data, and not the general trend. Teachers regularly point to homework as being a problem for students who are struggling in their class (Sallee & Rigler, 2008). Teachers obviously recognize homework as a valuable tool for helping students achieve a greater understanding of the subject and practice skills necessary for success. Kitsantas and Zimmerman (2009) found that there is a strong relationship between homework quality and the improvement of students' study habits. This ability to study effectively will help students beyond the classroom as they begin to study subjects on their own and learn new skills in their jobs. "The quality of the college students' homework had a significant direct impact on their grades and a significant indirect effect primarily via their self-efficacy beliefs" and, "overtime these self-beliefs could lead to a higher quality homework if the relation between these measures is reciprocal" (Kitsantas & Zimmerman, p. 106). While this study was conducted on college students and not

high school students, the conclusions are likely to be applicable to high school students as well. Students in high school, especially in the upper grades in high school, are preparing for college and starting to take on the responsibility and developmental maturity required to succeed in a college setting. Therefore, while these results might not directly show the impact of homework in a high school setting, it can be extrapolated back to the high school level and inferred that the results would be similar.

Increasingly, students are completing homework in school. Students are often given time in class to work on homework. Some students also have study halls in their class schedule or they quickly do homework problems in the hallways or during lunch. Originally homework was done after school hours, but as students become increasingly busy, many try to complete their assignments during school. According to the research done by Keith, Diamond-Hallem and Fine (2004), homework done in school had an insignificant impact on a student's grade point average whereas out-of-school homework had a strong impact on grade point average. Homework completed in a rushed manner between classes would obviously not have the same impact on understanding as homework that is thoughtfully completed. This study did not, however, differentiate between homework done in a rushed manner and that which was done in a more controlled setting such as a study hall. Therefore, the difference could potentially be due to the difference in the manner in which the homework was completed instead of the location. According to Michael Rosenberg, "higher rates of achievement are related to the amount of time students spend actively engaged in academic tasks" (1989, p.

314). It would be very difficult for a student to become actively engaged in any task that they are trying to complete in a rushed manner between classes. Some students also prefer to have background noise when they are doing their work. A study done by Hong and Lee (2000) linked this preference to lower-achieving students. Students who do well in school are more likely to complete homework in a focused, organized manner, while students who are multitasking or working around distractions tend to have lower grades.

Homework allows students to practice skills independently, take responsibility for their education, and gain skills that will allow them to be able to become lifelong learners (Hong, Peng & Rowell, 2009). Students will not have teachers to tell them everything they need to know for the rest of their lives. Homework provides them the opportunity to begin to become independent learners while still having the teacher support they need.

### *Grading Practices*

There are many different ways for teachers to grade homework. Each teacher sets up his or her own policy of whether or not to give credit for late homework and how homework is graded. It can be simply checked for completion, collected and given an effort grade, or graded for correctness. The most common means for evaluating homework is for the teacher to quickly glance at the work to verify that it has been completed (Sallee & Rigler, 2008). Some teachers only require homework to be submitted, not even completed (Oliver & Williams, 2005). These policies would appear to communicate to students that understanding of the material is unnecessary and meaningless, and it does not allow for them to receive

feedback from the teacher as to how well they have done or how to improve their work. It also eliminates the ability for the teacher to evaluate how well the students have grasped the concepts they were supposed to be practicing. Homework on which teachers have given feedback provides the greatest benefit for students, followed by graded homework. Homework which is neither graded nor commented on does not have a very significant impact on student success (Marzano, Pickering & Pollock, 2001).

A study done with four college classes compared the effect of practice exams on the actual exam grades. All of the classes were given the practice test and were to complete it for homework before the actual test. Two of the classes were given credit based simply on the completion of the practice test, while the other two were given credit based on how many answers they got correct. Both policies achieved almost total completion of the practice tests. Not surprisingly, the students in classes that received credit only for correct answers got a higher percentage of the questions correct. This also corresponded to a higher percentage on the actual exams, producing approximately a one-grade-level difference between the classes with the different policies (Oliver & Williams, 2005). If students receive credit for simply having an answer written down, there is a higher probability that students might take the easy path and simply write something down whether it makes sense or not. This would defeat the purpose of having the students do the assignment in the first place. By requiring the students to have correct answers to achieve credit, students are more likely to put forth greater effort to come up with the correct answer. This will lead to more thoughtful completion of the work, and, presumably,

a more thorough understanding of the material. It makes sense that this would, in turn, lead to higher scores on assessments.

For students who are struggling in a class, it is possible that requiring correct answers could have a negative impact. If a student is having a difficult time with the material and is not attaining a correct answer even with extensive effort, this could cause discouragement. These students could become less likely to even attempt homework in the future if they feel that they are not going to get correct answers (Oliver & Williams, 2005). For these students, it might be more beneficial for credit to be given for completion as that would at least encourage the student to attempt each question and hopefully have the intended outcome of a greater understanding of the material.

Regardless of policy, homework usually accounts for between twenty and thirty percent of a student's final grade, making the student's course grade more an evaluation of effort than understanding of the course material. When homework is not properly evaluated, this sends the message that the content being studied is secondary in importance to time management and effort. On the other end of the spectrum, some teachers expect students to read and understand a great deal of information and remember every detail for a quiz on the day the work is due. This does not allow students the opportunity to ask questions of the teacher if they did not understand something and can put great pressure on students (Sallee & Rigler, 2008).

The acceptance of late homework can also have an impact on how likely students are to complete their homework on time. Hartensteiner and Marek-

Schroer (1992) completed a study on two sixth grade classes. One class was given two days after the due date to turn in their homework, while the other class was not given any extra time to turn in their work. Students who did not have their homework turned in on time were given assignment slips to be signed by their parents. While approximately the same number of students in each class was given assignment slips, students in the class that had two extra days to complete the assignments had more slips per student. Students in the class with the stricter homework policy were less likely to come to class without their homework completed (Hartensteiner & Marek-Schroer).

*Summary*

Homework has been an issue of debate for several years. Parents, students, and educators have debated both the impact that homework has on a student's success and the amount of homework that is reasonable for students of different ages. Some fear that homework is compromising the free time that students have to participate in extracurricular and family activities which are important to a child's development (Sallee & Rigler, 2008). Homework has been seen as a vital link between the home and school, providing the majority of communication between parents and teachers. At times, it has been this very reason that teachers have tried to limit, or even eliminate, homework assignments (Gill & Schlossman, 2003). While the styles and purposes of homework have changed over time, homework has remained a staple of the classroom. Although some people remain uncertain that homework helps students achieve a greater understanding of the course material, most educators at present are convinced that properly designed homework will be

beneficial to students who complete it in a thoughtful manner. This makes it extremely important for teachers to determine how to increase the completion and correctness of homework assignments. This can be done through development of interesting assignments, external rewards, or the grading policy established at the beginning of the year. While there has been some research done in this area, the majority of it has been done at the elementary, middle school, and college levels, with relatively little investigation at the high school level. Many of these studies show trends throughout the age groups and therefore it can be estimated what the results might be for high school students. However, it is still important to have studies performed with high school students to verify that the actual results do fall within the overall trend.

### Methodology

There were two questions that this research investigated. The first question was how homework policy affected the successful completion of assignments. The second question addressed was whether or not the completion of the homework assignments impacted a student's success in the course.

### *School Makeup*

The school in which this research was conducted was in a very rural setting. Encompassing four towns, there were a total of 371 students in grades nine through twelve and 35 full-time teachers. The student body was composed of 96.5% Caucasian, 1.6% Hispanic, 1.1% Black, and 0.8% Native American. The student body was 48.8% female and 51.2% male. Of these students, 22.4% of students were eligible for free or reduced lunch.

### *Participants*

The students participating in this study were those taking Regents Chemistry in the years of 2007 to 2010. In the 2007-2008 school year there were a total of 43 students, 28 females and 15 males. One of the females had an IEP. In the 2008-2009 school year there were 28 students evenly split between male and female. The 2009-2010 class was composed of 18 females and 15 males, for a total of 33 students. One of the males had an IEP. The Regents Chemistry teacher was the same for each of the three years, as was the Earth Science teacher.

### *Procedures*

This study was conducted over the span of three years, with different homework policies each year. In the 2007-2008 school year, homework was accepted up to one week late for half credit. For the 2008-2009 school year, the policy changed half-way through the year. At the beginning of the year, students who did not turn in a homework assignment on time were required to stay after school by the end of the week to complete the assignment. Upon completion, they received half credit. Students who did not stay after school by the deadline were then given detention. At this time they would complete the missing work but not receive credit. The second half of the year, students still were given the opportunity to come in and make up missing assignments within the week for half credit, but were no longer assigned detention if they refused to do so. In the 2009-2010 school year, no credit was received for late homework. For the students in the 2009-2010 school year, data was only collected through January. For each class, homework was collected at the beginning of the class and graded for correctness.

To determine the success of each homework policy, each student's homework average for Regents Chemistry was compared to the homework average they received the previous year in Regents Earth Science. This was to help determine if the differences in chemistry homework averages was due to the homework policy or to the quality of the students themselves. A poorer group of students would be likely to have a lower Earth Science homework average, so the lower Chemistry average would be expected. A higher-achieving group of students would be expected to have higher Earth Science and Chemistry homework averages. By looking at the change in homework average instead of just the chemistry homework average, it will help account for the motivation of the students.

To determine whether the homework helped the students to succeed in the course, the homework was broken down by unit. The Regents Chemistry course was divided into sixteen units: Introduction to Chemistry, Atomic Structure, Periodic Table, Ionic and Metallic Bonding, Covalent Bonding, Chemical Quantities, Chemical Reactions, Stoichiometry, Gases, Solutions, Thermochemistry, Kinetics and Equilibrium, Acids and Bases, Oxidation and Reduction, Organic Chemistry, and Nuclear Chemistry. For each of the sixteen units in Regents Chemistry, each student's homework record was examined for submission and correctness and compared with their test grade for that unit. If students who had completed their homework had higher scores on the exam than those who had not, that would indicate that the homework helped them to better understand the course. If there was no correlation between completing homework and test scores, that would indicate that the homework was not accomplishing its intended purpose of

improving student success in the course. As indicated above, data collection for the 2009-2010 school year ended in January, so only the first eight units were included for these students. All of the gathered data was divided first by student and then by unit. This group of grades will be referred to as a student-unit.

### Results

Table 1 shows the number of students in each interval and how their homework averages changed from Earth Science to Chemistry. For all three years of the study, the Earth Science teacher did not accept any late homework. For the first year of the study, 2007-2008, Chemistry homework was accepted late for up to one week for half credit. Of the 43 students in the class, two students had not taken Earth Science in the district and therefore were not included in this part of the study. The results summarized in the second column of Table 1 show 90% of the 41 students having a lower Chemistry homework average than Earth Science homework average, with 10% increasing their homework average. The mean homework average change was -10% and the median change was -7%.

In the second year of the study, students were required to stay after school to complete missing homework assignments for half credit by the Friday of the week the assignment was due. After the first half of the year, this changed to an option to stay after to make up missed work. One student in Regents Chemistry that year had not taken Earth Science in the district and was not included in this part of the study. As shown in the third column of Table 1, of the 27 students, 96% of students experienced a decrease in their homework average, while only 4% of students had

Table 1

*Number of Students with Change in Homework Average from Earth Science to Chemistry*

<b>Change in Homework Average</b>	<b>2007-08</b>	<b>2008-09</b>	<b>2009-10</b>
Increase 6% or more	1	0	1
Increase 1-5%	3	1	0
Decrease 0-5%	11	5	7
Decrease 6-10%	11	7	13
Decrease 11-15%	6	8	0
Decrease 16-20%	5	3	1
Decrease more than 20%	4	3	8

an increased homework average. The mean change in homework average was a decrease of 11% with a median change of -11% as well.

In the third year of the study, late homework was not accepted for credit. Three of the 33 students in the class had not taken Earth Science in the district. As shown in the final column of Table 1, 93% of the 30 students had a decrease in their homework average, 3% showed no change, and 3% had an increased homework

Table 2

*Groups for Analysis of Homework Impact on Test Grades*

<b>Group Number</b>	<b>Homework Completion</b>	<b>Submitted Homework Average</b>
<b>1</b>	85% and higher	85% and higher
<b>2</b>	85% and higher	65-84%
<b>3</b>	85% and higher	Below 65%
<b>4</b>	65-84%	85% and higher
<b>5</b>	65-84%	65-84%
<b>6</b>	65-84%	Below 65%
<b>7</b>	Below 65%	85% and higher
<b>8</b>	Below 65%	65-84%
<b>9</b>	Below 65%	Below 65%

average. The mean change in homework average was -12%, with a median change of -8%. A t-test was done with the changes in homework averages from Earth Science to Chemistry. The p-value for the comparison of the 2007-2008 school year to the 2008-2009 school year was 0.71. The p-value for the comparison of the 2007-2008 school year to the 2009-2010 school year was 0.56. The p-value for the comparison of the 2008-2009 school year to the 2009-2010 school year was 0.77.

The t-test for the changes in homework averages from Earth Science to Regents Chemistry for the three years, with p-values above 0.05 indicate that the differences between the years are not significant. While most of the students showed a drop in homework average, presumably because the content in chemistry is harder than the content in Earth Science, the differences in the amount the homework averages dropped were not significant.

For the examination of how homework completion and accuracy effects test scores, the students' grades were divided into nine categories based on how much of the homework they completed and their homework average for the work they submitted. The groups are described in Table 2. There were a total of 1400 student-units examined in this study. Of these, 690 were in Group 1, 336 were in Group 2, 56 were in Group 3, 96 were in Group 4, 65 were in Group 5, 24 were in Group 6, 58 were in Group 7, 30 were in Group 8, and 45 were in Group 9. Figure 1 shows the breakdown of test scores for student-units in Groups 1-9. In Group 1, four-hundred twenty-two mastered the corresponding test with a score of 85% or higher. Two-hundred thirteen passed the test with a grade between 65% and 84%. Fifty-five failed the test with a grade below 65%. The average test score for this group was 87%. Of the 336 student-units in Group 2, 111 mastered the corresponding test with a grade of 85% or higher, 163 passed the test with a grade of 65% to 84%, and the remaining 62 failed the test with a grade below 65%. The average test score for this group was 77%. The average test score for Group 3 was 75%. There were 56 student-units in this group, with 17 mastering the corresponding test with a grade of 85% or higher, 24 passing the test with a grade

between 65% and 84%, and 15 failing the test with a grade below 65%. There were 96 student-units in Group 4. Forty-five mastered the corresponding test with a grade of at least 85%. Thirty-one passed the test with a grade between 65% and 84%. Twenty failed the test with a grade below 65%. The average test score for this group was 78%. Of the 65 student-units in Group 5, 15 mastered the test with a grade of at least 85%, 26 passed the test with a grade between 65% and 84%, and the remaining 24 failed the test with a grade below 65%. The average test score for this group was 71%. Group 6 contained 24 student-units. Of these, three mastered the test with a grade of 85% or higher, 11 passed the test with a grade between 65% and 84%, and the remaining ten failed the test with a grade below 65%. The average test score for this group was 65%. Group 7 consisted of 58 student-units. Eighteen mastered the test with a grade of 85% or higher, 20 passed the test with a grade between 65% and 84%, and 20 failed the test with a grade below 65%. The average test score for this group was 71%. Group 8 contains 30 student-units. Seven mastered the test with a grade of 85% or higher, ten passed the test with a grade between 65% and 84%, and 13 failed the test with a grade below 65%. The average test score for this group was 69%. There were 45 students in Group 9. Ten mastered the test with a grade of 85% or higher, 18 passed the test with a grade between 65% and 84%, and 17 failed the test with a grade below 65%. The average test score for this group was 62%.

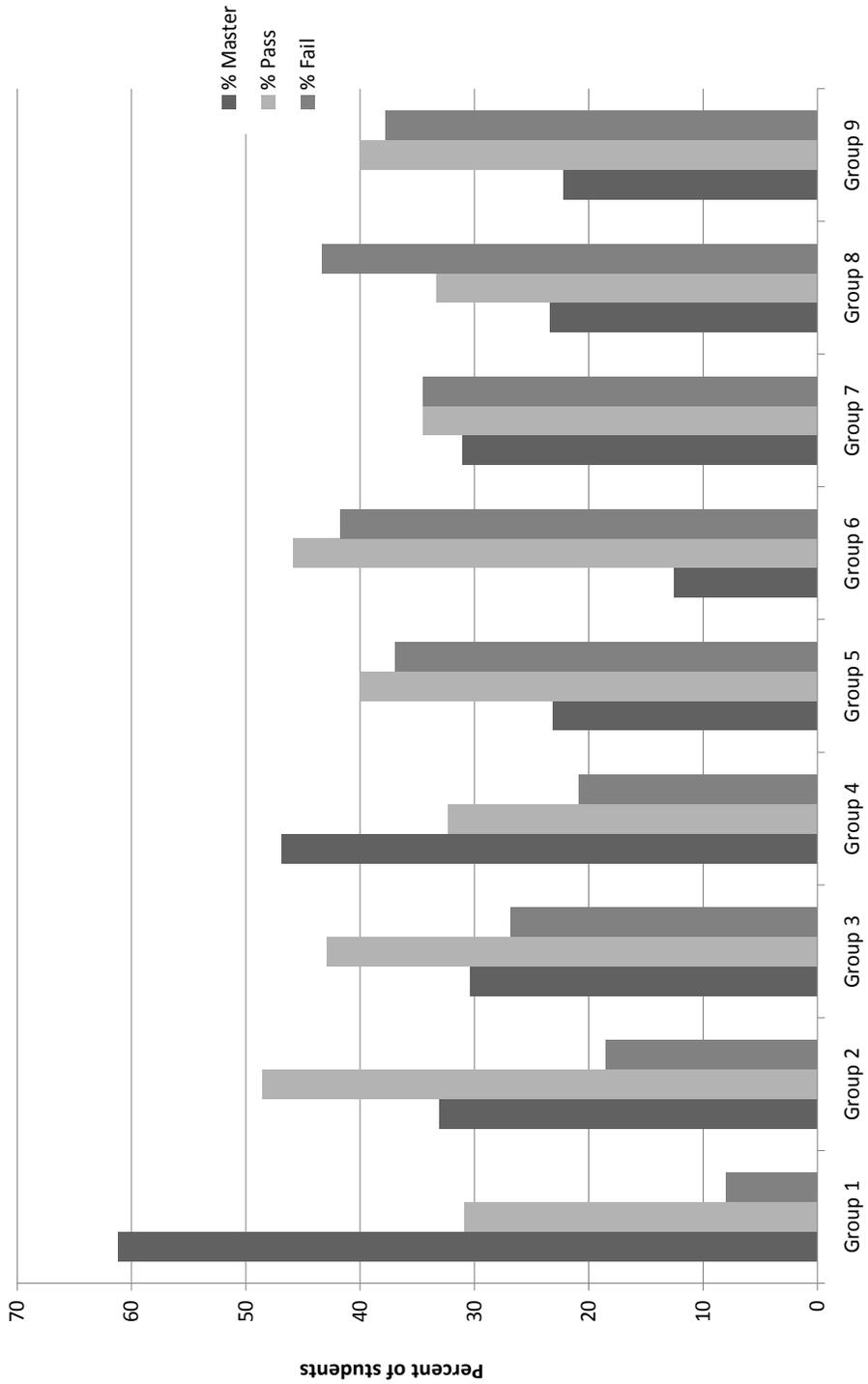


Figure 1

Test Scores for Groups 1-9

Table 3

*T-test for Group Comparisons*

Group Number	1	2	3	4	5	6	7	8	9
1									
2	S								
3	S	N							
4	S	N	N						
5	S	S	N	S					
6	S	S	S	S	N				
7	S	S	N	S	N	N			
8	S	S	N	S	N	N	N		
9	S	S	S	S	N	N	N	N	

*Note.* S = significant; N = not significant

T-tests were also done to compare each of the nine groups for homework completion and average. A summary of the significance for each comparison is shown in Table 3. Assuming a p-value of below 0.05 shows significance, there is a statistically significant difference between Group 1 and all of the other groups. The comparison of Group 2 to the other groups showed that the differences between Group 2 and Groups 3 and 4 were not significant, with p-values of 0.32 and 0.51 respectively. All other comparisons were significant. The comparison of Group 3

with the other groups yielded p-values that showed the differences were mostly not significant. The only two groups that that showed significant differences were Groups 6 and 9 with p-values of 0.029 and 0.0049 respectively. In comparing Group 4 with Groups 5 through 9, all p-values were below 0.05 indicating a statistically significant difference. For each of the remaining comparisons, Group 5 with Groups 6 through 9, Group 6 with Groups 7 through 9, Group 7 with Groups 8 and 9, and Group 8 with Group 9, each of the p-values were above 0.05, indicating that the differences in test scores between these groups were not significant.

### Discussion

The large p-values for the comparison of the classes with different homework policies implies that the homework policy has no effect on how much of the homework students do or how well they do it. If this is the case, determining a homework policy should be left to the teacher as a matter of personal preference with no intrinsic benefit of choosing one policy over another. This study does, of course, only look at three classes of students and their homework average change over two years. This is an extremely small sample size and it would have been very difficult to find a significant difference between the three groups. It also only focuses on science homework. Every group of students is different, and each school has its own mentality. What works for one group of students, or what seems to work best in one school district, might not be the same for others. For this classroom, there appeared to be no benefit of one policy over another, but other teachers have reported different findings. In order to draw any conclusions from the data in this study, it would be necessary to expand the study to include a larger

sample size. If there is one homework policy that is better than the others, continued study with more students would allow its benefits to become apparent.

This study only looked at homework policy as an extrinsic way of motivating students to complete homework. As the homework assignments varied only slightly from year to year and were very similar in format, this study did nothing to examine possible intrinsic motivational factors such as application to life. Most studies show that extrinsic motivational factors are insignificant and can sometimes be detrimental to the educational process. If students are only completing work for extrinsic rewards, they are more likely to lose sight of the importance of education for its own sake. As soon as the extrinsic reward is removed, students will be less likely to do the work than those who had never had the extrinsic reward in the first place. Intrinsic forms of motivation are much more powerful and their benefits are more enduring. This study does support the idea that extrinsic motivators, such as grades based on homework policy, cannot necessarily significantly motivate students to complete their homework.

Comparisons of the groups with different amounts of homework completed and different grades on that homework showed Group 1 had the highest test average, the highest percent of test mastery, the lowest percent of test failure, and was significantly different than all other groups in this study. Since this is the group which had completed at least 85% of the homework with an average of at least 85%, this indicates that doing all of the homework and completing it correctly is able to significantly help students do better on tests than they would have done without the homework.

The comparison between Group 2 and Groups 3 and 4 were not significant, with significant differences between Group 2 and all of the remaining groups. Since the comparison between Groups 2 and 3 were not significant, this implies that simply completing the assignment is beneficial to the student, even if it is not completely understood, as the difference between passing the homework and failing the homework is not significant. Also, the difference between doing at least 85% of the homework and simply passing the homework is not significant when compared to doing between 65% and 84% of the homework with an average of at least 85%. Either passing 85% of the homework or mastering 65 to 85% of the homework is equally beneficial to students. When comparing this group to Groups 5 through 9, Group 2 had the highest test average, the highest percent of mastering the test, and the lowest percent of test failures. Since this group has the highest percentage of homework completed but not necessarily the highest average, this indicates that completing the homework does help students understand the material and perform better on the tests regardless of their grade on the work. This should encourage students to at least try the homework and do their best at attempting to complete the assignment accurately even if they are having trouble with the material, since the extra practice will help them to increase their understanding of the material.

When comparing Group 3 with Groups 6 and 9, the differences were significant. These two groups had the same average on the submitted homework but had different amounts of homework completed. As Group 3 had the highest homework average, the highest percent of test mastery, and the lowest percent of test failure of the three groups, this implies that the completion of homework helps

students to perform better on tests. All of the other comparisons showed differences that were not significant.

The comparison of Group 4 with Groups 5 through 9 all showed significant differences. Of each of the groups compared here, Group 4 had the highest test average, highest percent test mastery, and lowest percent test failure. Since Group 4 had the highest amount of homework done of the remaining groups, and had mastered the work, this implies that both the amount of homework and the homework average had an impact on the test average. This should encourage students to not only complete the homework, but to work their best at attempting to correctly answer the questions. Through this extra practice and additional time to work with the concepts on their own, students will gain a better understanding of the material which will help them perform better on tests.

When comparing Groups 5 through 9, all differences were not significant. This would indicate that once a student drops to doing only 65% to 84% of the homework with an average of 65% to 84%, it makes no difference in the student's test scores than if the student had done no homework or had done a very poor job on the work. This shows that students need to be doing the majority of the homework in order to benefit from the time spent on the work. Also, if the student merely writes down answers without understanding any of the material in order to get the work correct, it will not provide any benefit when it comes to understanding the material and performing better on the tests.

When grouping the comparisons by student-units that had completed the same amount of work, some notable patterns became apparent. Groups 1 through 3

had all completed at least 85%. The only comparison between these three groups that was not significant was between Group 2 and 3. Groups 4 through 6 had all completed between 65% and 85% of the homework. Of these comparisons, the only one that was not significant was between Groups 5 and 6. Groups 7 through 9 had all completed less than 65% of the homework, and none of the comparisons showed significant differences. It is not surprising that when a student does very little of the homework it does not make a significant impact on his or her test grade if the assignment is done well or not. The only other comparisons that were not significant were the comparisons between passing and failing the homework, showing that trying to complete the homework is enough to help a student improve his or her test score even if they are not able to get all of the correct answers.

Notable patterns can also be observed by looking at the comparisons of groups that all received the same grade on the homework that had been submitted. Groups 1, 4, and 7 had all mastered the homework submitted, and all showed significant differences. Groups 2, 5, and 8 had all received grades between 65% and 85% on the homework submitted, and the only comparison that did not show a significant difference was the comparison of Group 5 and 8. Groups 3, 6, and 9 had all received failing grades on the homework submitted, and the only comparison that was not significant was between Groups 6 and 9. All of the comparisons that were not significant involved either failing the work or doing less than 65% of the homework assigned. Both of the comparisons that showed differences that were not significant involved the difference between completing 65% to 85% of the work and completing less than 65% of the homework with the same grade. One possible

reason for differences that were not significant is that the students are not completing the homework regularly enough for it to have a significant impact on test grades. Another possibility has to do with the students that make up the groups of students not completing their homework. There are two main types of students that do not complete homework. The first group of students is the group that does not understand the course material and does not want to go to the trouble of having to learn it in order to complete the assignment. The other group consists of students that understand the material well enough that they do not feel they need the additional practice that homework provides in order to do well in the class. It is possible that it is partially due to this combination of types of students that the differences are not significant.

Within both sets of comparisons, all differences that were not significant involved either completing less than 65% of the homework, or receiving failing grades on the homework that was submitted. These groups, Groups 3, 6, 7, 8, and 9, also contained the fewest number of student-units of all the groups involved, ranging from 24 to 58 student-units, compared to the 690 student-units in Group 1. Another possibility for the differences not being significant is the relatively small sample size. Just as in the small sample size for the homework policy comparisons, it is possible that with more data, these differences would eventually show significant differences.

### Conclusion

Based on the data gathered in this research, it appears that none of the three homework policies has intrinsic benefits to motivate students to complete and do

well on the assignments. Requiring the students to stay after school to complete missing work was no more successful than allowing partial credit for late work or not accepting late work for credit. The p-values obtained from the t-tests indicated that the small differences that did exist were random occurrences and not statistically significant. If this is the case, homework policies should become a matter of personal preference for each individual teacher and not dictated to the teacher as one policy being better than another. While intrinsic motivation cannot be examined by this study due to the fact that the homework assignments were similar over the three years, this does support the notion that extrinsic motivators do not have a large impact on the quantity of homework a student completes.

There were significant differences between several of the groups defined by the amount of homework completed and the grade on the submitted homework. The only group that had a statistically significant difference from all other groups, as evidenced by the resulting p-values, was the group where at least 85% of the homework was completed with a grade of at least 85%. This group was the most successful in terms of test mastery and passing rate. Other group comparisons showed statistically significant differences with groups of either different completion rates or different averages, or both. While some comparisons were shown to be not significant, these were mostly in the lower completion categories.

When looked at as a whole, these findings imply that both homework completion and how well the homework is done play a part in helping students perform better on tests. When comparing groups that had the same amount of homework completed, four out of the nine comparisons were significant. Three of

the comparisons that were not significant involved completing less than 65% of the homework. When a student completed very little homework, it is not surprising that the grade they received on the work did not significantly impact their test grade. When looking at just the groups that had completed at least 65% of the work, four of the six comparisons were significant. This implies that as long as students are completing at least 65% of the homework, the grade they receive is likely to have an impact on their test grade. When looking at the groups that had completed different amounts of the homework but received the same grade on the work submitted, seven of the nine comparisons were significant. This implies that completing homework does impact how well a student does on tests.

Most of the homework for this class was done out of the classroom, with only limited time to begin the assignments to make sure the students were clear on the instructions. Also the homework was very similar in format to the assessments, was all graded and contained teacher comments on how to improve or correct the work. According to the literature, this is the type of work that has the greatest impact on student success on assessments (Rosenburg, 1989, Kieth, Diamond-Halem & Fine, 2004, Marzano, Pickering & Pollock, 2001). While this is very encouraging for the course being examined in this study, because the reason for homework is to help students succeed, it is important for each teacher to examine their own homework assignments to verify that this is the case.

For future study, the individual homework assignments will be examined to determine how they can be improved to help students gain an even better understanding of the material. With these improved assignments, the same analysis

can be done to see if this creates more statistically significant differences. If this is the case, then some of the randomness in these values could potentially be due to poorly designed homework assignments. Also, laboratory assignments will be examined to evaluate their impact on test scores. Laboratory assignments are more hands-on and inquiry based than the majority of the homework assigned in this class. Since these are the types of activities that are supposed to be most beneficial to student learning, there should be an even greater correlation to higher test scores than was observed with the homework.

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