

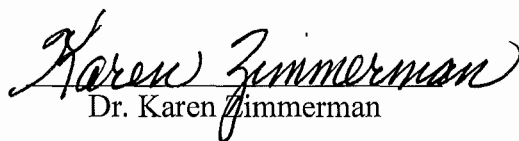
The Use of Homework Grades to Compute Final Course Grades
In a College Preparatory Chemistry Class

by

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ABSTRACT

The purpose of this study is to determine if homework assignment grades should be used to calculate final grades. It also addresses the effect of optional homework on learning and collects student reasons for completing optional homework. This study was administered to 101 students in a college preparatory, high school chemistry course. Test grades were compared to homework grades during a mandatory homework unit and an optional homework unit. A survey collected data about students' reasons for completing homework. The study indicated that students' grades on homework were lower than test performance. Students who did homework scored higher on the exams. The study recommends that homework should not be included in the final course grade, but is an important tool for learning.

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Chapter I: Introduction

Homework has become a way of life for millions of students in the American education system. Many children return home after a rigorous day of school, only to resume the educational process as they open their books and complete mandatory homework. The opinion on homework is as varied as the methods used to assess it. From a critical point of view, we may see homework as another task heaped onto an already overburdened student. The student's grade is the leverage that is used to ensure its completion. A more optimistic view represents homework as an instructional method that teaches responsibility as well as content.

The use of homework grades in calculating a final grade is rarely mentioned in research studies. Grading in itself is one of the most important outcomes of the school experience. Allen (2005) indicates that grading is the most important assessment role of the teacher, yet less than one third of all teacher preparation programs require an assessment course. The grades a student earns can have far reaching impact on a student's future. According to Jasmine (1999), many opportunities for a student are determined by their success in school. This success is measured by grades. The relationship between homework and grades is an important consideration in today's schools.

The importance of accurate grading

High school grade point averages are an important piece of a student's record in the high school setting. Lambating and Allen (2002) list a number of consequences of inaccurate grading practices. Grades are often used to place students in remedial or accelerated programs, determine grade promotion, and inform post secondary schools of the students' abilities. The possible consequences place a heightened importance on accurate grading. Studies indicate that the first step in accurate grading is to remove non-academic criteria from the grade (Allen & Lambating,

2001; Cross & Frary, 1996). In an ideal setting, a student's grade in a course should be a judgment of the student's knowledge in that subject area.

Teachers are typically allowed to develop their own method for assigning a grade to students in their class. McMillan and Lawson (2001) surveyed secondary science teachers and found a wide range of grading practices in use. One of the trends they identified is that summative tests and exams were frequently given a larger weight within the grade. As students move through their educational experience, the grade typically involves more examination grades and less homework grades. The contention of this study is that a student who is in an upper level course in a high school should expect to be graded more on summative examinations and less on formative assignments. Homework is often a part of the formative work done for a class.

Validity of assessment

So, is homework a component of accurate grading? To further consider the question of graded homework, consider its role in the grading process. According to Chapuis and Chapuis (2007), assessment tools that are used to form a final judgment of student success are categorized as summative assessments. They define formative assessment as an assessment tool designed to collect information *during* the learning process. McTighe and O'Connor (2005) emphasize the fact that formative assessment requires continual feedback for students. The feedback is necessary for students to improve learning. When we use the dichotomy of formative versus summative assessments, we typically place homework in the grouping of formative assessment. This category involves the types of work where a student is practicing the material at the beginning and throughout the learning cycle. It would be analogous to a professional gymnast learning her new routine in practice. The Olympic medal is not awarded based on her effort or

difficulty in learning the routine. Yet, her coach provides valuable feedback during this time. The medal is awarded based on a summative performance in a competition. In a similar way, it is not necessarily fair to award points to a student as they begin to practice a new method in a classroom. It is more appropriate to grade the student based on a summative performance at the end of the unit. This could be a take home test, a traditional test, or a major project that incorporates the skills.

In addition, Stephens (2004) reported that 90% of high school students cheated on homework. This may seem like a shocking statistic, but the reality is that high school students are driven to be successful and they often will copy homework answers to do well in class. This leads us to wonder if graded homework leads to accurate grading.

Value of Homework

But does homework have value? A commonly held perception is that homework is a necessary part of the learning process in the classroom. Proponents (Cooper, Robinson & Patall, 2006; Cooper, 1989) of homework indicate that students must complete homework to improve learning. These studies indicated that completing homework improved test scores by twenty three percentile. However, this is not a globally accepted result. There are also studies that indicate that linking homework to learning is based on faulty research principles with too many intervening variables (Kohn, 2006; Kralovec & Buell, 2001).

Research cites other benefits for doing homework. Corno and Xu (2004) found that homework skills relate closely to job skills. It is important for students to develop the necessary skills required to maintain a job as an adult. The implication is that homework is a vehicle for students to learn responsibility. As teachers, we often look to behavior, attendance, and communication skills as being beneficial skills for the student to transfer to the workplace.

Homework also is a job skill. A student's abilities to manage larger tasks, schedule their time, and complete necessary work will transfer to the work place.

Yet, the workplace provides the employee with a salary. This provides a very tangible reason for an adult to be a successful employer. What *salary* does a student receive for homework? The initial response would typically be grades. The belief that the primary reason to do homework is to improve grades may not be true. Xu (2005) indicates that students complete homework for intrinsic reasons. In fact, 82% of middle and high school students responded that homework taught them responsibility. Homework will always have a place in the development of learning and responsibility. The question is whether it has a place in the formal assignment of a grade.

Statement of problem

Homework and grading are important aspects of education. Ideally, students would use the homework as a learning tool to prepare to show their newly acquired knowledge on a summative assessment at the end of a cycle of learning. However, in many situations, the homework is used as part of the overall grade in the course. When this occurs, a student is being held responsible for an assignment that is being given as practice. This assignment may or may not be required for a student to learn the material. When students receive a grade for homework, they may receive an overall grade that does not reflect their true knowledge of the material.

Ultimately, reporting an incorrect grade for a student may lead to a number of negative consequences for a student. In the situation where a student's grade is lower than their actual knowledge, the student could be placed in a less challenging educational program, or be denied admittance to a college. Lambating and Allen (2002) indicate that there are more critical psychological problems that can arise. A student who receives a lower grade than deserved will

often develop a sense of helplessness or inability. This lowers their self-efficacy and their desire to learn.

On the other end of the spectrum, students who receive grades higher than they achieve, will develop a false sense of accomplishment and will continue to accelerate into more rigorous work that they are not equipped to learn. Students also experience a disconnect between learning and achievement. Yet, Stiggins (2001) indicates that the true function of grading should be the communication of a student's achievement in the topic listed next to the grade.

In an effort to determine best practice in grading homework, this research project will attempt to find a relationship between grades on homework and exam grades in a college preparatory chemistry classroom. Through an examination of homework grades and summative exam grades, this research will attempt to determine whether grading homework is an accurate method for helping match achievement with the appropriate grade.

Research questions

This study will attempt to answer these questions about the validity of grading homework.

1. What is the relationship between accuracy on homework and accuracy on the exam covering the same topic?
2. Will this relationship be different if homework is optional?
3. What decision making processes are used by a student when considering optional homework?

Assumptions of the study

1. It is assumed in this study that the students in a high school chemistry course are striving to get a high grade in the class and they care about their overall Grade Point Average (GPA).
2. It is assumed that homework is a formative exercise. Summative work that is given at home will not be considered homework.
3. It is assumed that students will accurately respond to survey questions about their attitudes and motivation to do homework.

Limitations of the study

This study places high expectations on the work ethic of the student. This study will not be reflective of students who are at risk of failure or do not have high motivation to learn. Although these students do not typically enroll in chemistry in this high school, it is not possible to say this does not occur.

Definition of terms

Formative assessment: These assessments provide specific feedback for the purpose of guiding teaching and learning. They occur concurrently with the learning process (McTighe & O'Connor, 2005).

Summative assessment: These assessments “summarize what students have learned at the conclusion of an instructional segment” (McTighe & O'Connor, 2005, p. 10).

Homework: In this study, homework will be categorized as formative assessment that is given to a student to complete outside of class or during school work times.

College preparatory class: A college preparatory course is an elective course that is typically taken by students who are candidates for college entrance.

Traditional grades: The commonly used system of grading that utilizes A,B,C,D, and F.

Grade Point Average: The 4.0 system of using a weighted average for grades where A is assigned a 4, B is assigned a 3, etc.

Chapter II: Literature Review

Homework and grading are two of the traditional foundations of education. The literature is full of research done on both of these educational aspects, but rarely do the two intersect in the research. To delve into the topic of grading homework, it is first necessary to treat each topic individually and then reunite the findings from both topics. Homework is a controversial subject and it is important to identify the current trends in amount of work given, its value to the learning process, and the problems that can arise from its overuse. Grading also has a number of aspects. The methods for calculating grades, the many uses of grades, and the components of grades have also been the subject of a number of research efforts.

Homework

Homework has a long history in the American educational system. According to Gill and Schlossman (2004), homework has been assigned to students for more than a century and a half. Homework is defined as "tasks assigned to students by school teachers that are intended to be carried out during non-school hours" (Cooper, 1989, p. 86). The use of homework has been a function of social issues. Events such as the launch of Sputnik and the publishing of *A Nation at Risk* (National Commission on Excellence in Education, 1983) were catalysts in increasing homework. These events were interspersed with periods where experts cautioned that homework would not promote the health and well being of a child (Cooper, 1989). In today's educational setting, the use of homework is still widely accepted.

Purposes of homework. The research shows a number of purposes for giving homework. Epstein (1988) showed seven purposes for homework. These include practice, participation, personal development, parent-child relations, policy, public relations, and punishment. These purposes range from academic learning goals to politically oriented goals for the school. In most

studies (Xu, 2005; Corno & Xu, 2004), even young children reported Epstein's first purpose for doing homework; mastery of content. Cooper, Robinson, and Patall (2006) synthesized a number of research studies and showed that students who did homework directly related to test items scored better on tests. These students scored twenty three percentile points higher than students who did not do homework. Marzano and Pickering (2007) caution that research validates homework and most critics of homework include emotional and perceived negative impact when advocating against its use. Until a school can show that another method of learning can take its place, homework should be a necessary part of the school program.

Cooper and Valentine (2001) also summarized a number of studies that show that homework has a noticeable effect on student achievement in high school grades. In elementary students, this effect is not as noticeable. Despite this, Bempechat (2004) mentions that most students do not recognize any other reason for doing homework until they reach a cognitive level that is common in middle school students. Although achievement seems to be the most obvious reason to do homework, other reasons exist.

Homework has other intrinsic values. Corno and Xu (2004) assert that homework is the job of childhood. In this study, a group of third grade students were videotaped doing homework. The researchers concluded that students who were able to organize their work and set aside appropriate work places and methods were developing a set of skills that would translate into work skills later on in life. A number of similarities between homework and real work are noted. First and foremost, homework is a form of work. It is not something a child chooses to do. The child does home work out of a sense of duty. Second, homework is exchanged for grades. In a similar manner, real work is exchanged for payment. This payment may be an extrinsic reward like salary and promotion at a job, or the intrinsic rewards associated with activities such as

parenting or doing charitable work. Finally, homework is multifaceted and possibly engaging. A student can find homework to be rewarding and challenging.

From a psychological point of view, the challenging aspects of homework may be one of the most valuable reasons for homework to be given. Bempechat (2004) reports that students develop strong efficacy beliefs through their successful completion of challenging homework. As students are presented with an increasing complexity of work, they develop problem solving skills and confidence in their work. These skills are essential in becoming adults who are able to emotionally handle difficult situations and have a positive outlook as the challenges of life continue to grow more complex.

When students are confronted with challenging homework, they often turn to parents for assistance. Parent involvement is another of Epstein's (1988) purposes for homework. Hoover-Dempsey et al. (2001) indicates that homework as an invitation to parent involvement in the school process is just one of many reasons parents get involved. They go on to show through analysis of research that parents use homework as a method of modeling their educational goals for their child. By stressing the importance of homework, they pass on shared values for achievement in school. This transfer of beliefs tends to manifest itself into the college years. Not only does this parent involvement increase homework achievement, it improves the overall success and behavior of students.

Homework also serves purposes indirectly related to students. Epstein (1988) and Xu (2005) credit homework with having such qualities as providing information on school curriculum to parents and fulfilling school board policy. Although these seem diametrically different from the previously discussed student centered goals of homework, it is important to

consider that teachers sometimes give homework for these reasons. As important as homework appears to be, it is not universally accepted to have value.

Cost of doing homework. Despite the many valuable reasons for giving homework, there are a number of sources that show evidence of its negative nature. Lacina-Gifford and Gifford (2004) point out a rise in popular media's attention to the problems of homework. These stories often point to the time it takes away from family, its ineffectiveness, and the achievement gap it continues to promote.

Lacina-Gifford and Gifford (2004) report that nearly one third of parents indicate their family had considerable conflicts over homework. This is the theme of most studies (Simplico, 2005; Lacina-Gifford & Lacina, 2004; Kralovac & Buell, 2001) that show the negative aspects of homework. This is not universally accepted. Shumow, Schmidt, and Kackar (2008) did not find family contention to be a significant factor that affected students' impressions of homework. In fact, very few respondents in their study found homework to be a negative experience from an emotional point of view.

There are other negative aspects of homework in the literature. Cooper and Valentine (2001) suggest that homework takes time away from other educational activities. Corno and Xu (2004) also indicate that "children also engage in a variety of productive activities of their own choosing outside of school" (2004, p.231). Ultimately, most concerned parties are worried that too much focus on homework will result in children who are unable to explore other interests and learn some of the valuable activities that occur outside of school.

One of these valuable activities is work. Rothstein (2007) indicates that seventy percent of high school seniors hold a part time job while school is in session. These students average eighteen hours of work each week. Although Rothstein found very little drop off in GPA for this

group of working students, she did find a drop in number of credits completed and the number of Advanced Placement credits earned. This indicates that students are making the choice to reduce their credit load in favor of work. This could be related to the amount of homework required in more advanced courses.

When time is found for regular homework, other concerns arise. Simplicio (2005) contends that homework that is given for drilling basic skills is good for very few students. In his example, a student who is given twenty math problems of the same type will not benefit from the process. The student who knows how to do the work will become bored through mindless repetition, and the student who does not know how to do the problem will not be able to do any of the work, and the frustration leads them to give up on the work.

Even in successful students, homework is not the answer in cases that need remediation. Trautwein and Lüdtke (2007) researched students' effort on homework and found that a large number of students reported that they spent more time on homework for classes in which their achievement expectancy was high. The students were capitalizing on their strengths, and disregarding their weaknesses. Teachers often feel that homework will help correct a student's weaknesses, but this study shows that students do not carry out this motive. They actually will leave this work until the end of a homework session and rush through it. This does not carry out the teacher's hopes for improvement.

This appears to be a manifestation of lack of effort. It is commonly perceived that motivation is an outside force that teachers have difficulty controlling. Trautwein and Lüdtke (2007) found that students respond more positively to homework when they feel it is valuable and its completion is being monitored by the teacher. This does provide the teacher with a

method to motivate students. Students will be willing to do homework that is perceived as useful. However, there is a limit to the amount of homework that is appropriate.

Amount of homework given. Despite the research on homework, it is definitely something that is not going to go away. The key is to develop a policy of homework that will be most productive. The time that is given to homework is a critical part of this policy. Gill and Schlossman (2004) reported that the amount of homework given has varied throughout the last century. A student in a late nineteenth century high school may have experienced two to three hours of homework a day. High school at this time was an optional luxury that few students attended. As mandatory attendance took hold in America, the use of homework spread to all ages.

Most of the research on homework shows an agreement with the amount of homework given. According to Gill and Schlossman (2004), The National Assessment of Educational Progress (NAEP) indicates that the average student has less than one hour of homework per night. This is an overall average of all students aged kindergarten through high school. While we may think that this would mean a higher amount of time for high school students as compared to younger children, this is not necessarily true. The same study showed a recent increase in homework for the youngest students. In the same study, the sample of 17-year-olds showed that only 12% spent more than two hours a night on homework. Cooper, Lindsey, Nye, and Greathouse (1998) found roughly the same thing. When questioned, both parents and students felt that the average nightly home work level was between 30-60 minutes. In their study, only 16% of students reported more than one hour of homework each night.

But, has this amount changed over the past few years? This seems to be a controversial question. Lacina-Gifford and Gifford (2004) report that many popular media sources have run

stories decrying the recent increase in the amount of homework assigned. However, the results of the NAEP study and research by Simplicio (2005) indicate that the perception that homework amount has increased over time is false. The actual amount of time spent on homework has remained static over the last two decades. The research seems to show that the amount of homework given by teachers has remained at a reasonable level. However, measuring this amount in terms of time may not be the best way to measure homework throughout time. Corno and Xu (2004) indicated that students may not get enough time for other necessary activities. When we consider the level of activity in a family with two working parents or a single parent, the cost of this homework time may be higher for many families in today's society.

In an analysis of homework research, Trautwein and Koller (2003) raise the concern that the actual time spent on homework may not be an effective measure. When measuring total time spent on homework activities, the researcher has many variables to consider. Normally homework is calculated as an average weekly value. This does not allow the researcher to consider the effects of daily attention to a topic, or a beneficial time period for one sitting of homework. In addition, measuring time does not indicate the amount of work done. Differences in ability will change the amount of time that a particular student does homework. A lower functioning student will reach a limit of time where there are diminishing returns for continuing homework (Woolfson, Harker, Lowe, Shields, & Mackintosh, 2007). The suggestion is that we use amount of work, not total time, as a measurement of homework.

Grading

Grading is perhaps one of the most difficult aspects of a teacher's duties (Allen & Lambating, 2001). There are a number of purposes for grading as well as a significant number of methods that teachers use to evaluate students. While educational measurement researchers have

strong beliefs on the best methods for grading, Cross and Frary (1996) indicate that the message of accurate grading procedures seldom is accepted by mainstream teachers. To fully understand the proper methods of grading, we must first look at the research on its purposes and methods.

Purposes of grading. The purpose of grading in itself is difficult to standardize throughout the educational field. Hendrickson and Gable (1999) show a long list of purposes that grades serve. Many of these purposes are individual to the student. They provide feedback to a student and communicate learning progress to the student's parents. These are the more traditional uses for grades. Guskey's (2002) research shows that teachers, parents, and students all rank these reasons as the most important purpose for grading.

However, two studies, (Guskey, 2002; Hendrickson & Gable, 1999) both list a number of other reasons for grading. They indicate that grades also have administrative functions. Grades are often used by the school to place students in programs and determine whether they will advance grade levels or ultimately graduate. Grades also are used to communicate the effectiveness of the school as a whole. The combination of grades given within a school is tied to graduation rates and overall effectiveness of a school.

Hendrickson and Gable (1999) indicate that counselors and administrators also feel that a primary function of grading is communication of student attributes to additional stakeholders. They believe that grades communicate to future employers and college admission officials some basic competence information and predict future performance. Ultimately, this is a large amount of information to put into a single grade.

Lambating and Allen (2002) believe that grades lose their usefulness when the giver and the receiver of this information have different understandings of this grade. It is essential that all involved parties understand that a single mark on a grade report can not show all of the

information that grades can show. As a result, it is important for a teacher to provide a meaningful grade that is calculated in a valid manner.

Methods of grade determination. Unfortunately, the literature (Randall & Engelhard, 2009; Bursuck, et al., 1996) shows that grades can be calculated in many different ways, even within a single school. McMillan and Lawson (2001) surveyed secondary science teachers and found that there were some commonalities and some wide differences in their grading techniques. Most teachers in the study indicated that disruptive behavior, previous performance and assimilation into the school grading norms have little effect on grades. It was also found that most teachers gave extensive consideration to academic performance and mastery of learning objectives. However, there were a number of grade components that had a large variance among responders.

The five factors that received a disparate rating are student effort, student ability, quality of homework, participation in class, and the inclusion of zeros for missing homework. McMillan and Lawson (2001) indicate that these factors had a large standard deviation among respondents. Of these topics, effort is the one aspect that is considered in a unique manner. The aforementioned authors indicated that most respondents claimed a desire to be fair about their grading and felt that a student who scored poorly but put out a good effort would frequently have their grade moved up, but a high achieving student who showed little effort would not be penalized in a similar manner. All other factors had a two way relationship. McMillan and Lawson (2001) concluded that the grading systems of secondary science teachers varied a great deal and offered information that was a combination of many pieces of information. This is often referred to as *hodgepodge* grading.

The term hodgepodge grading was first used by Sandra Brookhart (as cited in, Cross & Frary, 1996) and is often used in the literature on grading. The current state of research indicates that hodgepodge grading results in miscommunication. As previously stated, a single mark on a grade report is not able to communicate all of the purposes involved in grading. Both Allen and Lambating (2001) and Tomlinson (2005) caution teachers about the use of ancillary or hodgepodge factors in determining a grade. Each author indicates that ultimately, educators need to communicate a student's knowledge about the course that is listed next to the grade on a transcript. They would all suggest that the ancillary bits of information such as effort, homework completion, and participation are all important, but should be communicated in another manner, such as a report home to parents.

In conclusion, grading and homework serve a variety of purposes throughout the literature. As far as homework is concerned, it becomes clear that there is a large divide in its perceived value. Proponents site statistical data that supports its use as a learning tool. Others champion its use in developing responsibility and other non-academic virtues. However, many opponents of homework contend that this may happen at the expense of other viable learning options. There is also concern that homework causes family stress and friction. The one absolute surrounding homework is that it is not going away. This shifts concerns to its use in grading.

Grading is often perceived as one of the more difficult parts of the teachers job. Grades have a variety of uses and have high stakes consequences for the individual. Research shows that the process of grading is as varied in our education system as the teachers who develop them. It is the general feeling in the literature that grades should only communicate academic knowledge. However, this view is not necessarily held by teachers, parents, and students. Ultimately, this research project is designed to find out if homework is an indicator of student performance, or a

formative experience designed to allow a teacher to provide feedback to students along the way to mastery.

Chapter III: Methodology

This study investigated the relationship between homework grades and test grades in a college preparatory chemistry course. The study also considered the difference between learning and performance on mandatory homework compared to optional homework. Student opinions were collected on a survey that addresses their educational goals and reasons for doing homework.

Selection and description of sample

The subjects for this sample were students in a Chemistry I course at Memorial High School in Eau Claire, Wisconsin. The students elected to take this course as one way to fulfill their physical science requirement for graduation and college admissions. Eau Claire Memorial offers a number of other choices to fulfill this requirement. Chemistry I has the highest prerequisite requirements. As a result, a generalization can be made that these students are on a college preparatory track.

The sample group for this study involved 101 students enrolled in the researchers Chemistry I course. The majority (90) of students in the study was in 11th grade, but the study also included 11 students from grades 9, 10 or 12, who were enrolled in the same course. The study group had a representative demographic that matched the overall school population in race and gender. The ethnic profile for 2007-2008 at Memorial High School included 90% Caucasian, 6% Asian, 2% African American, 1% Hispanic, and 1% Native American.

The students in this sample had similar academic background. Although there was an issue of transiency in the sample, all students enrolled in the course met the prerequisite requirements for admission. These prerequisites included successful completion of Earth

Science, Biology, and Algebra I. This is true for the transient students who had entered Memorial recently and the students who had been in the district for their entire career.

Classroom Policies

The Chemistry I classroom environment was developed over the first half of the 2008-2009 school year. During that time, students were given the opportunity to complete homework assignments. These assignments were graded and returned to students before the exam was given. Assignments were evaluated for accuracy and recorded on paper, but the grade was not recorded in the actual grade book software. Therefore it did not contribute to the grade received in the course. Students were allowed to correct errors and resubmit for further feedback. The intention was to set up an environment in which students will have an opportunity to do homework based on their perceived need to do the homework. There were no penalties in grade or parental reporting for students who did not do the work. The students were encouraged to make a choice to do homework based on their intrinsic need to do it.

At the end of each unit a summative exam was given. The exam contained two sections. The first section tested knowledge of vocabulary and overarching concepts presented in the unit. This section was not the subject of this study. The second portion tested students' knowledge of problem based strategies to deal with chemical knowledge. This portion of the exam was a test of the material that the homework covered. The two portions of the test were reported independently and the results on the problem based portion were the subject of this study.

Throughout the Chemistry I course, students were given some summative homework that was graded and recorded. As a result, students in the study were familiar with graded and non-graded homework. All homework was returned prior to the examination for the students to

review. Each homework assignment was evaluated for accuracy before it was returned. This was true for both graded and non-graded homework.

Data Collection and Instrumentation

This study collected two types of data. The quantitative portion of the study is a study of homework grades and achievement on the problem based exam. Each subject was assigned to one of two groups based on their homework behaviors; those who did the homework, and those who did not complete the homework. This data was collected over two units of study during the spring semester of 2009. During one unit, the students had mandatory (graded) homework. During the second unit, the homework was optional (ungraded). Each of these units covered a time frame of two and a half weeks and involved traditional lectures, guided practice, and laboratory activities.

Permission to participate in the study was obtained through a parental consent form (Appendix A). Signed forms were returned by 97 students in the study. One student did not receive parental consent to participate, and three students did not return the form.

The relationship between homework grades and exam grades were observed across five achievement groups. The students were grouped according to the letter grade received on the exam. This allowed the researcher to observe trends for specific achievement groups of students.

A qualitative survey (Appendix B) was administered to each participating student. This survey was used to determine students' reasons for completing homework. The survey was developed by the researcher to collect perceptions about the homework assignments. The survey has no past use that can attest to its reliability. It is a survey designed to collect the reasons for doing homework and associates that reason with an achievement mark on the exam.

The survey was given to the participating students after the optional homework unit. Students that were absent during the testing days were not surveyed. Students were all given the survey on the same day, with the same set of directions. Students who were absent the day of the survey were not surveyed at a later date. Eighty four surveys were collected and used in the qualitative section of the study. The students were given a grade summary sheet with the survey so that they could accurately report their test average and homework average.

The survey was designed to ask students to respond to statements on a five point scale. These ranged from strongly disagree (1 on the scale) to strongly agree (5 on the scale.) Initial questions were given to all students. There were also questions that were given only to those who did homework and questions that were only completed by those who did not do the homework.

The questions on the survey were designed around three different themes. The primary goal was to provide statements that ascertained the reasons why students made a decision about completing homework. These statements related to the value a student placed on the work and root causes for choosing to do the work.

A second group of statements were designed to show if responsibility issues were a problem. These statements asked if students lost their assignment, forgot to hand it in, or other factors that were not an intentional choice to complete the work. These were used to determine if students were consciously choosing to hand in the work, or if lack of homework was a result of carelessness.

A third group of questions were designed to monitor the goals of students. These statements asked students to comment about their overall desire to do well and improve their grades. These questions were designed to show whether motivation was a confounding factor in the study.

Data Analysis

The analysis of the data attempted to associate the accuracy of homework with success on exams. The primary comparison was between test scores and homework scores. The test average of each of the homework groupings was analyzed to see if there is a relationship between homework habits and success on the exams. After students were assigned to a homework group based on their completion habits and achievement group based test scores, the data was analyzed to see if there were trends that were observable in each of the groups.

The survey data helped to interpret the results of the study, and try to determine the reasoning that a student used when deciding if homework was necessary. Students have many different reasons for completing homework. The survey attempted to make some generalization about the decision making abilities of the students.

Limitations

This study was based on the premise that students authentically complete the homework. Unfortunately, a student may not do the actual work. There is always a chance that cheating may have occurred. The student may have worked in a group on the homework and relied on others to provide the answers. This could lead to a misrepresentation of the homework grouping in which a student was actually placed.

The other premise that the study assumed is that all students will complete the homework during the mandatory phase of the study. Although most students completed the homework when a grade was given, there were cases of students who did not complete the homework.

Chapter IV: Results

The research data was collected during March and April of 2009. During that time, students completed a unit of study in which homework was assigned and graded for accuracy. The grades were used in calculating the course grades. This first unit was followed by a second unit in which students were given the option to do homework and the work was graded, but the grade was not used to calculate grades. After this unit, students were given the survey instrument to complete. The data resulting from this study fell into four distinct categories. The first set of data showed the relationship between homework grades and test grades when the homework was mandatory. The second set of data showed the relationship between the mandatory and optional units. The third set of data showed the achievement differences between students who did homework and students who did not do homework on the optional homework unit. The final set of data addressed decision making issues reported on the survey.

The relationship between homework grades and exam grades

During the first unit of the study, 101 students participated in the course. During this learning cycle, four graded assignments were given. These assignments were composed of calculation based chemistry problems. The assignments were graded for accuracy based on having the correct or incorrect answer. For purposes of data collection, overall grade percentages were converted to letter scores (A,B,C,D and F) and then assigned a numeric value of 4 through 0 respectively. This put the data into a traditional GPA scale.

Table 1

Mandatory Unit: Overall Grades

Grade	F	D	C	B	A
Homework	17	13	20	29	22
Test	6	2	7	27	59

In Table 1, the grade distribution is provided for the overall homework average and the grade received on the exam for that material. The homework GPA for all students was a 2.25. This converted to a traditional average in the range of a C+. The test GPA calculated to 3.29, which is a B+ on the traditional scale. This indicated an improvement of one full letter grade from the formative stage of homework to the summative stage of testing.

From an individual point of view, the data can be analyzed to see the specific increase or decrease experienced by each individual student. In the following table, a positive value represents a student who did better on the test than the homework. The numeric value indicates how many letter grades of improvement were observed. Likewise, a negative value shows how many letter grades a student decreased from the homework to the test.

Table 2

Mandatory Unit: Test Grade Departure from Homework Grade

Departure	-4	-3	-2	-1	0	+1	+2	+3	+4
Students	0	1	0	1	33	32	26	7	1

During the mandatory testing unit, only two students did more poorly on the test than on the homework that was assigned. Sixty-six students out of the 101 total students improved their

grade on the exam, with a large portion of those students completing a one or two grade improvement on the test. The data in Table 2 shows that homework grades are not an indicator of learning. Calculating homework grades into the final grade for this course would result in a student receiving a lower grade than their final mastery indicates.

The relationship between mandatory and optional homework units

During the optional homework unit, there were 98 students that completed the exam during the normal testing period. The loss of three students from the sample is due to individual circumstances that caused them to take the exam at a much later date. These reasons included serious illness and a family vacation. They did not experience the unit of study in the normal manner and were not included in the data. As with the previous test performance data, the grades on the test were summarized by letter grade and GPA. Table 3 shows a comparison between overall test grades from the two units.

Table 3

Test Grade Comparison

Grade	F	D	C	B	A
Mandatory	6	2	7	27	59
Optional	16	8	10	22	42

The test grades experienced a decrease when students were given the option to do homework. The GPA for all grades during the mandatory unit was 3.29 (B+). During the optional homework unit, the GPA is calculated to 2.67 (B-). This showed a decrease in test performance during this time period.

This set of data implied that a student does benefit from completing the homework. When students do not do the homework, they may not learn the material as well. A test score drop from B+ to B- is a rather significant drop when homework is not completed. Homework appears to be a viable method of learning the material for those students who have not learned it.

During the optional testing unit, 20 students out of the 98 students completed all homework problems. Fifteen students turned in no homework. The remaining 63 students turned in a portion of the homework. Table 4 shows the departure from homework grade for the 20 students who did each homework assignment.

Table 4

Test Grade Departure: Both Units

Departure	-4	-3	-2	-1	0	+1	+2	+3	+4
Optional	0	0	1	0	4	5	7	2	1
Mandatory	0	1	0	1	33	32	26	7	1

During the mandatory homework phase of this study, students had an average increase of 1.03 letter grades when comparing test grades to their homework grades. During the optional homework unit, the students who completed homework averaged a 1.35 letter grade improvement. This is consistent with the previous assertion that students who completed the homework improved their understanding and accuracy throughout the learning process. The grade given on the exam showed that the homework grade was an early point in learning where the full level of learning had not been realized.

Comparisons of students during the optional homework unit

During the unit that allowed for optional completion of homework, the students who did the homework had a higher exam average. Table 5 shows the exam score distribution.

Table 5

Grade Distribution During Optional Unit

Grade	F	D	C	B	A
Completed Homework	0	0	1	5	14
Did Not Complete Homework	10	8	9	18	28

During the optional homework phase of the study, the students who completed all homework averaged a 3.65 GPA (A-) on the exam. The students who did not complete all of the homework averaged a 2.63 GPA (B-). The distribution shows that students who completed the homework did not have any failures on the exam. Of the 20 students who did the homework, 15 achieved the same test grade. Three of these students improved one letter grade and two of them fell by one letter grade. This would indicate that it is not likely that these particular students caused the overall test average to decrease from the mandatory unit to the optional unit.

Survey results

The survey statements allowed students to show their degree of agreement with the statement given. Scores for these questions can be categorized for subgroups based on test grade and their completion of homework. The results can be classified into three categories; responsibility, homework habits, and personal goals for achievement.

Responsibility. A number of items on the survey were designed to show if there were unintended reasons for not completing the homework. The results on these types of questions are included in Table 6.

Table 6

Responsibility Responses

Question	D	SD	N	SA	A	Average	S.D.
16. I did not hand in the homework because I could not find it when it was due.	61	1	3	0	3	1.27	.91
13. I did most or all of the homework, but just didn't hand it in.	32	18	5	8	5	2.05	1.30
20. The answers on my homework were my original work	0	0	0	6	11	4.64	.69
22. I knew how to do the homework after a few samples, but did all of the homework anyway.	0	1	2	2	12	4.47	.94

Key: D=Disagree, SD=Somewhat Disagree, N=Neutral, SA=Somewhat Agree, A=Agree

This set of responses indicates that students chose to do the homework based on educational and personal reasons. The first two questions in Table 6 show that irresponsibility did not lead to incomplete homework. Students overwhelmingly indicated that they did not lose the assignment, nor did they simply forget to hand it in. Both of these items had average values in the area of disagreement, and large clustering in the area of disagreement. Likewise, all students who did homework indicated that it was their own work. This dispels the myth that cheating is rampant in this group. Students who did not do homework made an intentional choice not to do the work.

The students who completed homework did indicate that they may have done the work out of habit. The subset of students who completed the homework overwhelmingly indicated that they may not have had to do the work for the learning. They were doing the homework out of duty or habit.

Homework habits. Survey items also were intended to determine the work habits of students. These questions dealt with their decision making during the homework process and their perceptions of homework. Data in the following table will be separated into two groups; those who did above average on the exam (A or B) and those who did below average on the exam (C, D, or F). These questions apply only to students who did not complete the homework. These designations are consistent with the achievement level of the class on the exam.

Table 7

Work Habit Responses: Non-Homework

Question	Grade	SD	D	N	A	SA	Average	S.D.
12. I did not do the homework because I did not know how to do it.	High	23	6	3	8	1	1.97	1.29
	Low	2	3	3	12	7	3.70	1.20
14. I did not do the homework because I already knew how to do it.	High	10	4	8	10	8	3.15	1.48
	Low	1	0	1	3	13	4.50	1.04
17. I received help when I was working on my homework.	High	13	2	5	11	11	3.17	1.61
	Low	6	3	5	3	2	3.07	1.41

Key: D=Disagree, SD=Somewhat Disagree, N=Neutral, SA=Somewhat Agree, A=Agree

The work habits of students who did not complete the homework showed a mixed response. Question 12 indicates that many students who did poorly on the test knew that they did not know the material. Yet, the results of question seven indicate that it was not universally accepted that they should get help on the homework from a teacher or friend. This indicates that lower achieving students knew that they were not learning the material. Question 14 also validates that students knew they did not understand the material. They overwhelmingly responded that perceived knowledge of the material was not the reason they did not complete the

homework. This raises the possibility of further research to investigate the disconnect between the knowledge that they need assistance and the reluctance to seek it out.

The students who completed the homework also were asked questions about their work habits. Table 8 summarizes the results on these questions. All students in this group were high achieving.

Table 8

Work Habits: Homework

Question	D	SD	N	SA	A	Average	S.D.
19. I corrected the errors on my homework before the test	5	5	1	1	4	2.63	1.62
7. I received help from someone else when I was working on the homework.	2	2	1	4	9	3.89	1.49

Key: D=Disagree, SD=Somewhat Disagree, N=Neutral, SA=Somewhat Agree, A=Agree

The successful students on the exam showed that they are more willing to get help from someone when they have difficulties. While their less successful peers were more willing to give up and not complete work. These students understood the value of completing all of the questions. Rechecking incorrect answers was not a determining factor for success on the exam.

Personal Goals. Students were also asked to indicate their level of satisfaction with their grade. This group of questions is designed to verify that students in this course are indeed interested in doing well in the course, and whether they see homework as a part of that goal. The results recorded in Table 9 reference students who did not do the homework, and are again divided into high and low achieving groups.

Table 9

Student Goals

Question	Grade	SD	D	N	A	SA	Average	S.D.
4. I am satisfied with my grade on the test.	High	0	3	2	9	28	4.48	.89
	Low	15	5	4	2	1	1.85	1.17
6. I am trying to improve my overall grade in the class.	High	3	1	7	6	25	4.17	1.22
	Low	1	0	1	3	13	4.50	1.04
17. I would have done better if I had done more of the homework.	High	11	4	9	11	6	2.90	1.44
	Low	1	4	4	5	13	3.92	1.27

Key: D=Disagree, SD=Somewhat Disagree, N=Neutral, SA=Somewhat Agree, A=Agree

This group of questions overwhelmingly indicates that students do want to do well in the course and value high grades. In question four, it is clear that students who achieved at a high level were satisfied with their grades and lower achieving students were unhappy with their grade. Few exceptions to this trend are present. Question six shows us that all but five students are trying to learn and improve their grade. This is unnaturally high when we consider the number of students who are already achieving the highest possible grade and yet are still trying to improve.

A puzzling result is that many students who did poorly indicated they should have done more homework, yet previously, the data showed that students did not get help on the homework, nor did they acknowledge that they knew how to do the work. This is an area requiring further research.

Chapter V: Discussion

The practice of grading homework is as old as homework itself. The goal of this study was to analyze the relationship between homework grades and test grades, determine whether this was the same when homework is optional, and determine students' attitudes and perceptions towards completing homework.

Conclusions

This study validates the idea that homework is indeed a formative phase in the learning cycle. A student is given the opportunity to practice skills and develop understanding. While a student develops this mastery, we may not want to use this practice situation as an evaluative measure. McMillan and Lawson (2002) showed that secondary science teachers had varied opinions on what should be placed in a grade. If homework is one of these things, it may not show us the accurate evaluation of knowledge in the specific area taught in the class.

Homework does serve a purpose. Although this study indicates that the accuracy of homework lags behind final mastery at the end of the unit, the data also showed that students who completed the homework did better on the exam. Mandatory homework did raise the average test grade in the group by nearly one full letter grade. This is in line with the work of Cooper, Robinson and Patall (2006) and Cooper (1989). This would indicate that we need to encourage the completion of homework and develop formative instructional methods to verify its accuracy. The purpose of homework may be tied to the teacher's ability to give accurate feedback. Chapuis and Chapuis (2007) indicate that feedback is the key component of grading formative assessments. Unfortunately, in this study, the students who completed homework did not look at their mistakes.

Eighty-two percent of the students who completed homework indicated that they already knew how to do the work, but completed it out of duty or habit. This group was successful on the test, so this was probably an accurate assumption on their part. This group also indicated on the survey that they spent more than an hour outside of class on this homework. Most students take six to seven classes a day during their high school lives. This could add up to an overwhelming amount of work that these students are doing for no reason, except for a mandatory grade in the course. A number of studies (Corno & Xu, 2004; Lacina-Gifford & Gifford, 2004; Cooper & Valentine, 2001) show the negative impact of homework. Many parents indicate that they have had significant conflicts with children over homework. There is also concern over the other educational, social, and recreational opportunities a student may miss due to excessive homework. We must also consider that 70 percent of high school seniors hold a job when school is in session (Rothstein, 2007). This may lead us to believe that homework may be better suited for the classroom setting.

Limitations

The research conducted in this project may be limited to a specialized group of students. The participants of this study have self-selected a college preparatory level chemistry class. Many of the attitudes and habits surveyed require an amount of metacognition that is inappropriate for younger students. Bempechat (2004) indicates that many students are not capable of appreciating the intrinsic values of learning until they reach middle school. This limits the age range and ability level to which this study can be applied.

From a statistical standpoint, there may be some limitations of the data due to a disproportionate number of students who decided not to complete the homework during the optional phase of the study. The number of completers was 20, compared to 64 students who did

not complete homework. The researcher expected more completers, but feels that 20 was a sufficient number to make the generalizations provided.

Recommendations

The results of this survey can lead us to a number of conclusions. If we keep in mind some of the underlying research that direct us in grading and assessment, we can make some important observations about the practices of teaching, as well as the need for further research. The recommendations from this study can be categorized into three categories; homework practices, grading practices, and need for more research.

Recommendations in the area of homework arise from the data itself. When students in the study were required to do homework, they scored higher on the summative assessment. This seems to be in line with the previously mentioned research that promotes the use of homework. Perhaps the place for this homework is inside the classroom. The data showed that many students could be successful without homework, yet some students were not. These unsuccessful students indicated that they were aware of their deficiencies in the material, yet did not often seek help. Mediation for this situation can occur in the classroom much easier than it can occur at home. Simplicio (2005) and Lacina-Gifford and Gifford (2004) indicated that homework heightens the achievement gap between socio-economic groupings. This gap may form anytime that we rely on students to learn in the home environment. This gap could be lessened if we provide the feedback immediately. This can only happen in the classroom.

The practice of grading is also highlighted in this research. The data overwhelmingly shows that students did much better on the exam, than they did on the homework. Of the 101 students in the study, all but three scored as well or better on the homework. Grading homework for accuracy led to grades that were lower, yet provided necessary feedback for the student to

use. Researchers (Allen & Lambating, 2001; Tomlinson, 2005) indicate that we should remove hodgepodge factors from our grading. The challenge to the educator is to develop formative practice to encourage learning without penalizing mistakes in the formative stages of the learning cycle. In the ideal classroom, we may see the opportunity for the faster learner to provide the assistance that the slower learner is not willing to request from the teacher. The goal is for each student to understand the material. Homework does not prove understanding; it is a tool to achieve it. Teachers must keep this in mind when they develop their grading systems and classroom strategies. This study recommends that we forego the formal grades on homework, but encourage students to review their graded work to improve mastery.

In addition to the recommendations for educational practice, there are opportunities for more research. Although the survey in this study showed that students were generally interested in doing well and wanted to improve their grade, there was one puzzling result. Students who did poorly on the exam often stated that they were aware that they did not know the information, yet they did not seek help. Further research in the area of students' perceptions of seeking help would be beneficial. This combination of beliefs seems to be a cause of student failure in some cases.

Further research is also necessary in the realm of feedback. In this study, the feedback given to students on homework was limited to an overall judgment of correctness for the answer. In mathematical, problem based assignments, there may be better ways to show the appropriate feedback that stresses process. This type of research could lead to better teaching practice.

In conclusion, this study seems to identify homework as a valuable part of the learning process. However, its use in calculating a final grade is probably not valid. Additionally, students

may benefit more from this practice when the work is done in the guided environment of the classroom. Homework is here to stay, but we should rename it as classroom practice.

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Appendix A

Consent to Participate In UW-Stout Approved Research**Title: The Use of Homework Grades to Compute Final Course Grades
In a College Preparatory Chemistry Class****Investigator:**

Corey Fritz
715-852-6461

Research Sponsor:

Dr. Karen Zimmerman

Description:

The goal of this research project is to investigate a relationship between homework grades and exam grades. Ultimately, the research is designed to add to a body of research that investigates whether homework grades are a good indicator of overall achievement in the course.

Risks and Benefits:

This research imposes very little risk to the participant. All information will be anonymous and no individual participant's grades or survey responses will be identified.

The participant will receive no direct benefit, but the benefit of the research will be the advancement of research in the area of accurate grading. All students benefit when a grading system is designed to accurately assess the student's knowledge in the content area.

Special Populations:

The majority of participants in this study are minors. As a result, the researcher is asking both the participant and the parent/guardian of the student to sign this consent form. At any time, the parent/guardian is free to contact the researcher with questions.

Time Commitment and Payment:

Participants in this survey will be asked to complete a survey at two different times during this study. These surveys will be incorporated into the regular classroom setting and no time outside of the student's chemistry class will be used for this study. Students will receive no reward or payment for their participation.

Confidentiality:

The participant's name will not be included on any documents. We do not believe that you can be identified from any of this information. The participants will be grouped into larger groupings so that an individual set of data can not be used to identify a specific participant. Furthermore,

this informed consent will not be kept with any of the other documents completed with this project.

Right to Withdraw:

Your participation in this study is entirely voluntary. You may choose not to participate without any adverse consequences to you. Should you choose to participate and later wish to withdraw from the study, you may discontinue your participation at this time without incurring adverse consequences.

IRB Approval:

This study has been reviewed and approved by The University of Wisconsin-Stout's Institutional Review Board (IRB). The IRB has determined that this study meets the ethical obligations required by federal law and University policies. If you have questions or concerns regarding this study please contact the Investigator or Advisor. If you have any questions, concerns, or reports regarding your rights as a research subject, please contact the IRB Administrator.

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Statement of Consent:

By signing this consent form you agree to participate in the project entitled, **The Use of Homework Grades to Compute Final Course Grades In a College Preparatory Chemistry Class.**

Printed Name of Student

Signature..... Date.....

Signature of parent or guardian:..... Date.....

Appendix B

Homework Survey

Please complete this survey by circling the appropriate response. Remember, this is an anonymous survey so I will not know how you answered. **Please be Honest.**

This project has been reviewed by the UW-Stout IRB as required by the Code of Federal Regulations Title 45 Part 46

1. Circle the letter grade you received on the test for this unit?

F D C B A

2. Circle the letter grade you received on the homework for this unit?

F D C B A

3. I did all the homework for this unit and handed it in.

True False

4. I am satisfied with my grade on this test?

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

5. When I took the test, I wished I had done more practice.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

6. I am trying to improve my overall grade in this class.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

7. I received help from someone else when I was working on the homework. (Teacher, Parent, Student, Tutor, etc)

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

8. I thought I would do better on the test.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

9 This is the amount of time I spent on the homework during this unit.

_____ Less than 30 min

_____ 30-60 minutes

_____ 60-90 minutes.

_____ 90-120 minutes

_____ Over 2 hours

10. This is the amount of extra time I spent studying for the test during this unit. (Do not include time doing the original homework).

_____ Less than 30 min

_____ 30-60 minutes

_____ 60-90 minutes.

_____ 90-120 minutes

_____ Over 2 hours

11. Doing the homework helps me learn the material better.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

If you did not hand in all the homework, complete questions 12-17.

OR

If you did all of the homework, and handed it in, than move to the next page and skip 12-17.

12. I did not do the homework because I did not know how to do it.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

13. I did most or all of the homework, but did not hand it in.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

14. I did not do the homework because I already knew how to do the problems and did not find it necessary to complete the assignment.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

15. I planned to do the homework, but I just didn't get around to it.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

16. I did not hand in the homework because I could not find it when it was due.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

17. I would have done better on the test if I had done more of the homework.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

If you did not turn in the homework, you may turn in the survey now.

If you handed in all of the homework, than complete the rest of the questions on this page.

18. Completing homework for this unit helped me do better on the exam.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

19. I corrected the errors on the homework before the test.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

20. The answers on the homework were my own original work.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

21. The homework problems were similar to the test problems.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

22. I knew how to do the homework problems after a few samples, but did all of the homework anyway.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5

23. When I did the homework, I used samples from my notes as models, but was not sure where the numbers came from.

Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree
1	2	3	4	5