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Creating Effective Homework Policies in the Secondary Mathematics Classroom

By

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ABSTRACT

There has always been a great debate about whether or not homework is really needed in the classroom. Homework policies over the past 100 years have changed drastically. There is a constant battle between advocates for and opponents of homework. Together, they have created a list of positive and negative effects of homework. A review of the literature helps determine what the ideal homework policy would be in order to encourage higher student achievement, and minimize the negative impacts of homework. How do in service teachers’ policies stand up against research based policies? Interviews with rural New York State teachers have determined the core components of a homework policy that most teachers have. Some not-so-common policies and researchers’ key points to include in a homework policy have also been included. Homework is indeed effective, especially when it is based on research and contains the core components of an effective homework policy in the secondary mathematics classroom.
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Creating Effective (Mathematics) Homework Policies

Introduction

This research was designed to determine the ideal homework policy for a secondary mathematics classroom. The lack of research on this topic suggests that homework has often been neglected in the past, aside from it being a major tool in teaching and assessing mathematics. Almost every teacher assigns some form of “out of the classroom” work, yet sometimes mindlessly designs assignments. By following current trends in research and putting in some effort, homework assignments can become more effective. Homework, as it is now, should be created more effectively by educators so that it can most efficiently reinforce what is taught during class time.

I have always been intrigued by homework policies. Homework policies were never discussed in depth at the undergraduate level, even though homework is a major component of teaching. Each one of the teachers I have observed and have actually been taught by has had their very own, unique, homework policies. It made me think, does one homework policy work better than another? There must be some research out there to defend one method over the other. I was not fully interested in this topic until I completed my two student teaching placements.

At Jamestown High School in Jamestown, NY, my cooperating teacher assigned nightly, uncollected, practice problems. He then handed out an answer key the next day and took any quick questions. Occasionally he would check to see who had completed the assignment, but never for a grade. For a grade, he assigned a weekly assignment that he called the POW, or “Problems of the Week” that were due every Wednesday after school and were graded in full detail.

My other placement was at Forestville Central School in Forestville, NY. There, my cooperative teacher assigned homework each night that was checked for completion. No other
homework was assigned. The beginning of class was always devoted to checking homework, for completion only, and going over the entire assignment. Two very different homework policies, from two very experienced teachers. There had to be a right and a wrong policy. I always wondered what their reasoning was for setting up each homework policy the way that they did. That is when I thought that there must be some ideal homework policy that will teach the students most effectively, and that with appropriate research and data collection, I could determine this "perfect" homework policy.

This study focuses on two main goals to determine the most effective homework policy for a secondary mathematics classroom. The first goal is to identify the most effective research based homework policies. The second goal is to determine what homework policies teachers actually use in their classrooms. The combination of these goals will result in how teachers' policies in the classroom compare to research based policies.

*It is hypothesized that mathematics teachers' homework policies are likely to share some commonalities, such as daily assigned homework tasks and mandated collection. Overall, there will be wide variations in homework policies, specifically in the areas of grading method, challenge level, and content.*
The Perfect Homework Policy: A Review of the Literature

Introduction

The purpose of this literature review is to determine the ideal homework policy in a secondary mathematics classroom. Homework is a very controversial subject that researchers have been battling over for the past century on whether or not it is effective. The major push from researchers tends to fluctuate between supporting and opposing homework and throughout the past century, have developed compelling arguments both for and against the effectiveness of homework in the classroom. The importance of homework has been frequently brought into question.

During the last five minutes of a secondary mathematics class the teacher is more than likely assigning some form of homework. According to Cooper (1994), twenty percent of the time spent on school work is homework; so more than likely, the teacher will be assigning some form of homework. With such a major component of traditional academics dependent on homework, it appears that the research on homework was rather scarce. The emphasis that teachers put into designing effective homework assignments has been sub-par in the past (Cooper, 1994). More specifically, in the mathematics classrooms, it is a given that homework will be assigned every night (possibly excluding Fridays).

In order to determine what constitutes the perfect research based mathematical homework assignment, a formal definition of homework must be explored. After homework is defined, an investigation into the history of homework and the purposes of assigning homework will follow. Homework has been investigated by U.S. educational researchers for more than 75 years wherein there has been a pendulum of feelings between advocates for homework and researchers who are completely against homework (Cooper, 1994, 2001b). Since homework has both negative and
positive attributes that must be balanced, researchers have offered very compelling arguments for, and against homework in the classroom (Cooper 2001b). There are many factors that go into developing a homework policy that can make it both effective and ineffective.

Many researchers have based the effectiveness of various homework assignments on the impact it has on a formal assessment tool. Homework can be assessed as effective based on many criteria, which will be discussed later in the literature review. In order to build the most effective mathematical homework policy, it becomes imperative to break homework down into all of its components and determine which combination proves most effective. Last but not least, a perfect homework assignment is not expected to be one size fits all and apply to every classroom. According to researchers, younger students (elementary, early secondary) and older students (secondary, college) are influenced differently by homework assignments (Cooper, 1994, 2001b; Muhlenbruck, 1999).

**Homework: Defined** To formally define homework, homework encompasses the “tasks assigned to students that are meant to be carried out during non-school hours” (Cooper, 1989, p. 7). To refine this definition, note that this definition does not include tutoring (in-school), extracurricular, or any home study programs. Homework is designed to be completed outside the classroom as an additional tool that plays an important role in teaching and practicing mathematics.

**A History of Debate**

Although very little research has been done on homework until the most recent decade (Hein, 2009), it has been a heated topic of debate over the past 100 years. There has been an oscillating pattern of “for homework” and “against homework” eras alternating every 15 years
Homework started to become a topic of research in the early 1900s when researchers believed the brain was a muscle, and would become stronger through more repetitive exercises and practice (Cooper, 1994, 2008a; Thelen, 2008). Around the 1940s, public opinion had changed and problem solving began to enter the picture to replace the original idea of “Drill and Kill” (Thelen, 2008). As aforementioned, political issues have played a major role in the cycle of homework reforms.

When Sputnik was launched in the 1950s, an increased need to “catch up” the education of our youth to match rival countries revitalized the support of homework (Cooper, 2008a). In the 1960s, “the cycle again reversed itself. Homework came to be seen as a symptom of too much pressure on students to achieve” and interfered with family time and free time (Cooper, 2007, p. 2). The “Hippy and Free Spirit” movement during the seventies continued this idea that homework was burdensome on the family and free time, and thus homework took a break until the next decade. The 1980s and 1990s saw the cycle stimulated again due to A Nation at Risk (Cooper & National Council of Teachers of Mathematics, 2008a). This literature argued that homework was “one defense against the rising tide of meritocracy in U.S. education” (Cooper & National Council of Teachers of Mathematics, 2008a).

Recently, Thelen (2008) determined that after examining many polls, the current day students’ workload has not been this high since Sputnik was launched. Thelen (2008) also feels that the most recent controversies surrounding homework have been fueled by this increase in workload. It is time to examine the underlying purposes and effects that homework has on the student. It appears that when swaying between the extremes of “End homework Now” and “Homework for all- In Moderations” that there must be a homework policy somewhere in the middle, perhaps, an ideal homework policy.
Modern debate: For and against homework. Many researchers have revitalized the most recent debate over the importance of homework (Cooper, 2007; Marzano & Pickering, 2007c; Trautwein, Köller, Schmitz, & Jürgen Baumert, 2002; Xu, 2005). While a majority of researchers support homework (Cooper, 1994; Grootenboer, 2009; de Jong, Westerhof, & Creemers, 2000; Kazantzis & Dattilio, 2010; Marzano & Pickering, 2007a; Marzano & Pickering, 2007b; Pelletier & Normore, 2007), there are still others who offer compelling arguments as to why homework should be thought of as a thing of the past (Kohn, 2007; Kralovec & Buell, 2001).

The case against homework. Perhaps the most interesting and unknown side of the debate is the case against homework. At many points in history, adversaries to homework have argued that the list of negative effects of homework is too great to overlook and we need to rethink homework. A major advocate against homework, grading, and conventional testing is an American author by the name of Alfie Kohn. According to his personal website, www.alfiekohn.org, he has authored eleven books on human behavior, education and parenting, and has taken a stand to question and challenge many widely accepted practices in the education field. His main belief is that homework and grading are detrimental to students’ learning.

To begin debunking some research myths about the effectiveness of homework, Kohn brings up several important points. He states that “there is absolutely no evidence of any academic benefit from assigning homework in the elementary or middle school” (Kohn, 2007). The research for the high school level does show a weak correlation though (Kohn, 2007). And although there is no clear cut proof of the effectiveness of homework, teachers still continue to pile hours of busy work. Kohn clearly feels that teachers and parents should get support from the principals in challenging the conventional notion that homework should occur every night and
that homework is effective. An education professor in Kohn’s (2007) paper describes the scenario that majorities of children hate homework and subsequently are growing up to hate learning. This does not necessarily mean we should completely “End Homework Now” (Kralovec & Buell, 2001).

It is a well-known fact that students and parents have an increasingly more difficult workload and are expected to juggle multiple tasks at once (Kralovec & Buell, 2001). A lesser known fact is that, when interviewed in the 1990s by Kralovec and Buell, a group of 45 at-risk to drop out high school students reported the reasons for dropping out as “chaotic family lives, cramped living quarters, and parents who worked at night...[and the] inability to complete homework” (p. 39). They also decided to further investigate the effects of homework on non-academic achievement areas of students’ lives. A conclusion was that homework was interfering with what parents were trying to teach their children, and also disrupted family time.

Kralovec and Buell stated many other effects outside the classroom, but also defend homework in discussing how an increasing pressure for international competition and higher standardized/state test scores have forced teachers into a strictly controlled environment where homework seems to be the only way to add to the classroom (Kralovec & Buell, 2001). This leads to their next argument that we cannot be certain what will happen when the students leave the classroom. There are too many outside factors, such as effort, completion, cheating, and getting “too much” help that would consequently demean the purpose of homework. Although a great argument is posed from Kohn, Krolovec, Buell, and many other researchers, Marzano & Pickering (2007a, 2007b, 2007c) directly attack their allegations.

The case for homework. Homework has played an integral part in American education, with many claiming it to be the most important tool an educator has. Marzano and Pickering
regard many of Kohn’s allegations as misreferenced research; stating that Kohn often neglected to include the important parts of research (Marzano & Pickering, 2007a). Specific inferences can be referenced by further investigation of 2007a and 2007b. Marzano and Pickering (2007c) arrived at the conclusion that the opponents of homework appear to criticize the way the current homework policies are, and based on the current effectiveness of homework, they deem that no homework is the way to go.

‘The Man’ when it comes to homework research is Harris Cooper, a professor at Duke University. According to his biography that is posted on his faculty page at Duke University, fds.duke.edu/db/aas/Education/harris.cooper, his research has single handedly impacted policies and practices throughout the nation. Cooper has appeared on many TV shows, and countless talk shows, also publishing dozens of articles. One researcher alone could not cover the vast topic of homework. There are many other researchers that provide evidence based proof that homework truly is effective, when the correct homework policy is in place (Cooper, 1994, 2001a, 2001b; Cooper, Lindsay, Nye, & Greathouse, 1998; Cooper & National Council of Teachers of Mathematics [NCTM], 2008b; Dettmers, Trautwein, Ludtke, Kunter, & Baumert, 2010; Epstein & Van Voorhis, 2001; Grootenboer, 2009; Hein, 2009; House, 2004; de Jong et al., 2000; Kaur, 2010; Kazantzis & Dattilio, 2010; Mikk, 2006; Muhlenbruck, 1999; Pelletier & Normore, 2007; Thelen, 2008).

The most direct impact of homework is the improved student retention and understanding. In a more indirect fashion, students are developing study skills, independently learning, and improving the attitude that most have towards school (Cooper, 2001b, 2008). Homework also plays the role of building independence and responsibility while also giving parents a chance to get involved in their child’s learning (Cooper, 2001b). As an academic tool,
homework can have numerous positive effects on the students. Homework also offers students the opportunity to practice what was done in class (Epstein & Van Voorhis, 2001) and also prepare for the next day's topics. It increases participation in class because it builds the students' self-confidence. Out of all of the reasons listed for doing homework, Epstein and Van Voorhis (2001) mentioned time management as the most important. Students must balance the free time they have with the time required to accomplish such assignments (Epstein & Van Voorhis, 2001).

Creating an effective homework policy is essentially a balancing act. With all of the benefits of homework, it becomes imperative to also remember that some negative effects of homework are also harming our youth. Educators need to determine if the benefits of an extra hour of practice each week will outweigh the effects it is having on the students' family and attitude towards learning.

**Summary of debate.** As explained by teachers, homework takes on numerous very important roles: from practice, preparation, and participation, all the way to personal development and peer interaction (Epstein & Van Voorhis, 2001). A team of researchers at Mississippi University conducted a poll on high school students to determine what students perceived as the purposes of homework. The results were almost unanimous. "Three quarters of the students agreed or strongly agreed that doing homework helped them (a) develop a sense of responsibility, (b) learn to work independently, (c) learn study skills, and (d) reinforce school learning." (Xu, 2005, p. 50). The list of advantages and disadvantages of homework in the classroom is surprisingly exhaustive (Cooper, 1994). By reviewing the literature, Cooper (1994) conveniently summed up the suggested effects of homework in Figure 1 on the following page.
Creating Effective (Mathematics) Homework Policies

### Positive Effects

**Immediate achievement and learning**
- Better retention of factual knowledge
- Increased Understanding
- Better critical thinking
- Curriculum enrichment

**Long-term academic**
- Learning encouraged during leisure time
- Improved attitude toward school
- Better study habits and skills

**Nonacademic**
- Greater self-direction
- Greater self-discipline
- Better time organization
- More inquisitiveness
- More independent problem solving

### Negative Effects

**Satiation**
- Loss of interest in academic material
- Physical and emotional fatigue

**Denial of access to leisure time and community activities**
- Parental interference
- Pressure to complete and perform well
- Confusion of instructional techniques

**Cheating**
- Copying from other students
- Help beyond tutoring

**Increased differences between high and low achievers**

### Figure 1. Suggested Effects of Homework

**Effectiveness of Homework on Academic Achievement**

In the sense of homework’s effect on academic achievement, many researchers have conducted experiments and studies trying to determine if homework positively affects a student’s academic achievement, or if it is a waste of time. Almost all of the researchers mention negative effects on homework; they do, however, offer specific ways of preventing, or limiting the negative impact and exploiting the positive effects. These researchers have concluded that homework is indeed effective at improving student understanding and retention (Cooper, 1994, 2001a, 2001b; Cooper, Lindsay, Nye, & Greathouse, 1998; Cooper & NCTM, 2008b; Dettmers, et al., 2010; Epstein & Van Voorhis, 2001; Grootenboer, 2009; Hein, 2009; House, 2004; de Jong et al., 2000; Kaur, 2010; Kazantzis & Dattilio, 2010; Mikk, 2006; Muhlenbruck, 1999; Pelletier & Normore, 2007; Thelen, 2008).
In 2006, a straightforward experiment was performed by Cooper. It concluded that a control classroom, in which no homework was assigned, scored 23 percentile lower on tests of the knowledge learned in class than those students who received regular homework assignments, in the treatment group (Marzano & Pickering, 2007a). Numerous studies cited by Cooper (2001b) also show conclusive evidence that a complete no homework policy will result in much lower test scores than those classrooms that received the homework. It is clear that homework has some positive effect on students, but to really understand what makes homework effective, it must be broken down into some subcategories. In the following sections, more research is presented that supports positive effects of homework, and focus their research on the subcategories of homework.

**Making Mathematics Homework More Effective**

A major problem that exists with homework is that teachers assign overbearing amounts of homework to their students (Cooper, 2008b; Epstein & Van Voorhis, 2001; Trautwein, 2007). In the mathematics classroom, often homework is assigned every single night and is almost always checked or collected. Both the difficulty and the total time required to finish the homework assignment are also likely to affect the students' comprehension and completion rate (Cooper, 2008b; Grootenboer, 2009; Trautwein, 2007). Teachers cannot be certain that homework is being completed by the student (Kohn, 2007). Two more major problems that exist are the type of homework being assigned and what choices the students have in determining assignments (Cooper 2008b). Many other researchers have investigated and tried many different homework policies to determine which ones improved student achievement most effectively (Cooper, 1994; Cooper, 2001a; Dettmers et al., 2009; Dettmers et al., 2010; Cooper et al., 1998;
A careful plan and proper implementation will ensure the negative effects of homework are minimized. A major complaint of homework is that it is assigned too often and that the assignments are impractical in terms of length and expectations.

**Duration and frequency.** A student can only stay interested in any topic for a finite period of time (Thelen, 2008). If students receive too much homework, they will shut down or turn in an incomplete assignment. Based on reviewing 100 other articles, Cooper (1994) recommends the following weekly homework amounts in Figure 2.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Assignment Frequency</th>
<th>Duration Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grades one to three</td>
<td>one to three</td>
<td>15 minutes or less</td>
</tr>
<tr>
<td>Grades four to six</td>
<td>two to four</td>
<td>15-45 minutes</td>
</tr>
<tr>
<td>Grades seven to nine</td>
<td>three to five</td>
<td>45-75 minutes</td>
</tr>
<tr>
<td>Grade ten to twelve</td>
<td>four to five</td>
<td>75-120 minutes</td>
</tr>
</tbody>
</table>

*Figure 2. A Recommended Homework Policy for Districts*

As students develop, the recommended amount of homework duration and frequency increase with their mental capacities. Epstein and Voorhis (2001) also support this claim by concluding from their own study that high achieving students spend more time on homework and complete their homework. They also mention that low achieving students become frustrated with longer assignments and give the reason for not completing assignments because it is too long of an assignment (p.184). Cooper (2008b) also states that in a mathematics classroom, an optimal homework policy consisted of short assignments, but given more frequently.

With homework given more frequently, teachers have greater freedom in what topics to choose for each homework assignment. Part of being an effective teacher is to remain flexible.
Teachers have the freedom to use homework for review, practice, and preparation and can cover select topics in each homework assignment.

**Content.** The three choices of homework content consist of prior material, current day material, and future material. This is most related to mathematics, where a new topic is introduced almost every day (Hein, 2009). Cooper (2008b) found that ten out of 11 experiments concluded that the most effective mathematics homework assignments combined problems from prior topics (review), the current topics (practice) and the coming lessons (preparation). Cooper (2008b) also cites seven other studies in the secondary classroom that agree a homework assignment covering only material from the same day it was assigned does not compare, in effectiveness, to homework containing prior and future topics.

Another component of homework content is also how challenging the assignments are. Researchers have found that when a mathematics assignment consists of a combination of both hard and easy problems, the students rated the assignment as less of a challenge and required far less time to complete, thus these assignments increased student completion rates (Cooper, 1994, 2008b; Hein, 2009; Trautwein et al., 2002). Another factor that affects completion rates and effectiveness of homework is the type of homework that is assigned.

**Type of homework/ grading.** Only a few studies have actually investigated the effects of voluntary homework versus mandatory homework, but the results were surprising (Cooper, 2008b). When students were assigned both mandatory (graded) assignments and voluntary (practice) assignments, the students reported increased interest in the mandatory assignments, while treating the voluntary assignments as practice, if needed (Cooper, 2008b). In his earlier work, Cooper (1994) even goes as far as to say that teachers should treat homework more as practice, and very little homework should even be graded. Perhaps the recent trend toward
online homework assignments, especially in mathematics, can be the change teachers have needed (Mendicino et al., 2009). Online homework websites offer immediate feedback, freedom from pencil and paper, and offer many games to motivate students to complete the problems.

Conclusions

Many of the researchers have made some mention of the participants' age, and commented that the age differences between elementary, middle, and adolescent (high school) students has some effect on the impact homework has on their academic achievement. There are some great studies out there that talk about appropriate policies for varying age groups (Cooper, 1994, 2001a, 2001b; Muhlenbruck, 1999; Thelen, 2008). Based on the research, an ideal homework policy does not exist. One can conclude though, that if teachers base their homework policies on effective research and minimize the negative impacts of homework, then it will be beneficial to students' achievement. On page eight of Cooper's paper (1994), he conveniently summed up what he believes to be a foundation for any effective homework policy as evidenced by Figure 3 on the following page.
All students in a class will be responsible for the same assignments, with only rare exceptions. Homework will include mandatory assignments. Failure to turn in mandatory assignments will necessitate remedial activities. Homework also includes voluntary assignments meant to meet the needs of individual students or groups of students. All homework assignments will not be formally evaluated. They will be used to locate problems in student progress and to individualize instruction. Topics will appear in assignments before and after they are covered in class, not just on the day they are discussed. Homework will not be used to teach complex skills. It will generally focus on simple skills and material or on the integration of skills already possessed by the students. Parents will rarely be asked to play a formal instructional role in homework. Instead, they should be asked to create a home environment that facilitates student self-study.

Figure 3. A Recommended Homework Policy for Teachers

The research has been examined and a suggested core set of policies has been developed. Homework must contain mandatory and voluntary assignments. These assignments should cover prior, current and future topics and serve the role of an assessment of learning and practice of simple skills and material. Most importantly, parents will not be supplementing instruction, but rather providing a learning environment for the student. By following research based guidelines, an effective secondary mathematics homework policy can be established. There are limitations to research and mock classrooms. Many policies sound good in theory, but fail to produce positive results in the classroom. It becomes imperative to investigate what teachers implement in the classroom and how those policies compare to the research based policies.

Experimental Design & Data Collection
This research was designed to examine the variation of in service mathematics teachers’ homework policies in rural New York State. A combination of secondary mathematics teachers’ homework policies and the policies of researchers will combine to form an ideal foundation for an effective homework policy. It is hypothesized that mathematics teachers’ homework policies are likely to share some commonalities, such as daily assigned homework tasks and mandated collection that will serve as the foundation. Overall, there will be wide variations in homework policies, specifically in the areas of grading method, challenge, and content that will be individualized for each teacher, school and student body. To accomplish this task, data was collected directly from mathematics teachers in the form of a brief questionnaire that investigated nine aspects of an in service teachers’ homework policy.

The Subjects

Participants in this study were recruited from the pool of teachers in the surrounding SUNY Fredonia area, and neighboring rural schools. A questionnaire and consent form were sent, and completed by each participating teacher. Also, the head of each local school’s mathematics department in Erie, Chautauqua, and Cattaraugus counties in New York State were contacted to receive approval for the mathematics teachers to fill out the questionnaires, or consent to a short interview.

are larger districts. Jamestown School District houses 2300 students in the 7th to 12th grades with 50 mathematics teachers. Springville – Griffith and Fredonia each have about 1050 students enrolled, with approximately 14 mathematics teachers. To ensure extreme measures of anonymity, the demographics of the teachers were not part of the questionnaire and no indicator number or connection to a name was used.

The Design

This study consists of a questionnaire with ten questions that cover important aspects of a mathematics homework policy. The full questionnaire can be found on the following page. Many subcategories of homework are investigated by the questionnaire in Figure 4. The categories investigated appear as underlined words in the questionnaire and helped the participant answer the questions and understand what homework policy I am most concerned with for each question. Underlined words also assisted in the data analysis and compilation of the data. The first question asks what grade(s) the teacher is currently teaching, and has taught. The next question asks about how frequently they assign homework. For each question, common responses are listed to further lead the teachers’ focus to what general responses are expected for each question. There is always room for additional comments so that the teacher may expand or provide rationale when deemed necessary. All of the subcategories were chosen based on a review of the literature, and what researchers determined to be the most important components of a homework policy.

Feel free to add any additional notes and explanation that you feel necessary.
Grades Teaching/Taught:  6  7  8  9  10  11  12

**Frequency:** How frequently do you assign homework? (Weekly? Nightly? Both? Etc)

**Content:** What content is covered in your homework assignments? Prior Current Future topics

**Challenge (Time/quantity):** On a scale of 1 to 10, how challenging is a typical homework assignment?

<table>
<thead>
<tr>
<th>Elementary</th>
<th>Impossible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
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</tr>
<tr>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
</tr>
</tbody>
</table>

How many hours of homework are assigned per week? ____________

**Collection:** How often is homework collected? (Weekly? Nightly? Monthly?)

**Grading/Feedback** What is your grading policy? (Grade every assignment? Special assignments? Randomly selected assignments?)

Is the homework graded for: _____Completion _____ In full Detail _____Both _____Select Problems

**Late Policy:** Do you have a late policy? ______ If so, what is it?

**Reasoning:** How and why did you develop these policies? (Research? Experience/Practice? Someone instructed you to?)

*Figure 4. Teacher Questionnaire*

**Data Collection**
Data was collected and consisted of contacting and setting up appointments with secondary mathematics teachers on an individual basis, as necessary. All collection and interviewing took place during the first four months of 2011. The participating teachers decided to either be interviewed (by telephone, in person or over video chat), or simply filled out and returned a questionnaire (electronic or paper copy). The participating teachers each completed the attached questionnaire (Figure 4), by means of one or more of the methods above. The purpose of the previous questionnaire was to determine the specifics of what different homework policies and practices the teacher was actually implementing in their own classroom.
Methods of Data Analysis

The data collected are summarized by district in Figure 5 below. Overall, 23 teachers from 10 school districts participated in this study.

<table>
<thead>
<tr>
<th>District</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestville</td>
<td>2</td>
</tr>
<tr>
<td>Jamestown</td>
<td>3</td>
</tr>
<tr>
<td>Falconer</td>
<td>4</td>
</tr>
<tr>
<td>Fredonia</td>
<td>2</td>
</tr>
<tr>
<td>Randolph</td>
<td>3</td>
</tr>
<tr>
<td>Lancaster</td>
<td>1</td>
</tr>
<tr>
<td>Pine Valley</td>
<td>2</td>
</tr>
<tr>
<td>Springville-Griffith</td>
<td>2</td>
</tr>
<tr>
<td>Maryvale</td>
<td>1</td>
</tr>
<tr>
<td>Brocton</td>
<td>3</td>
</tr>
</tbody>
</table>

Figure 5. Number of Participating Teachers by School District

Since seven of the nine subcategories in the questionnaire led to qualitative results, the main data was organized into frequency tables and the percentages for each response were calculated. This method of organization helped determine what responses and components of a homework policy are most common and had the highest variability. The percentage of each response (per subcategory) of the qualitative responses of common and uncommon policies is listed in the results section as well as further analysis of responses, beyond frequency. For example, for the content question some teachers answered ‘current’, and others answered ‘current and prior topics’. I took the analysis a step further to calculate the overall percentage of teachers who included some form of current material.

For quantitative data, descriptive statistics were produced for the challenge (on a 1-10 scale) and the amount of homework per week (in hours). Appropriate charts and graphs are also displayed to help visualize the responses. The data collected helped determine what policies
made up the foundation of most in service teachers’ homework policies. Aside from simple data analysis, the additional comments and unique responses were also taken into consideration.
Results

After analyzing the mathematics teachers’ responses from the questionnaire, the commonalities and variations of the teachers’ homework policies became apparent.

The commonalities shared among the mathematics teachers are as follows:

- 90% of teachers assign homework at least four times per week
- 86% include current topics in their homework assignments
- 81% grade at least parts of assignments for completion

Wide variations were found in the following categories:

- The time spent per week on homework
- The challenge level of the homework assignments (a scale of 1 to 10)
- The specifics of each late policy

Figure 6. Commonalities and Variations in Teacher Responses

Category Breakdown

A brief summary of the results shows that almost every teacher assigns homework four or more times per week, while only half of the teachers collect homework that often. Slightly more than half of the teachers graded every assignment, while the majority graded some assignments for completion. If one were to examine the actual homework assignments, almost all of them would contain current topics in each assignment, and a slightly lower percentage of assignments would contain some prior topics. The homework’s mean difficulty is medium, on a scale of 1 to 10, and would require roughly two hours total of work per week. If the homework is late, about three quarters of the teachers would accept it, with some form of penalty. In developing their policies, most teachers were influenced by experience and practice, while
others' reasoning might come as a surprise. Following is a category by category break down of the results.

The frequency of homework assignments can be broken down into three main categories: nightly, three to four times per week, and a combination of weekly and nightly assignments. As can be seen in Figure 7, 57% of the teachers assign some form of nightly homework, 33% assign it three to four times per week, and 29% have weekly assignments. Overall, 90% of the teachers assign homework at least three nights per week. The frequency that homework is assigned can have a large impact on the competition rate of homework, and also on how frustrated students get when doing homework every night of the week. One teacher explained that assigning a more extensive weekly assignments and mini nightly assignments helped bridge the gap between repetitive practice and in depth applications.

<table>
<thead>
<tr>
<th>Individual Responses</th>
<th>Overall Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nightly</td>
<td>Nightly 57%</td>
</tr>
<tr>
<td>3-4 Times/week</td>
<td>Subweekly 33%</td>
</tr>
<tr>
<td>Weekly</td>
<td>Weekly 29%</td>
</tr>
<tr>
<td>Nightly and Weekly</td>
<td>Never 5%</td>
</tr>
<tr>
<td>Never</td>
<td></td>
</tr>
</tbody>
</table>

Figure 7. Responses to How Frequently Homework is Assigned

The frequency of homework collection is much less than the frequency with which homework is assigned. On its own, the frequency that teachers collect homework is not as important of a statistics as it is when it is compared to frequency given. In Figure 8 on the following page, notice that overall, only 53% of teachers actually collect homework more than three times per week as compared to 90% who assign it three or more times per week. As a third of the teachers noted, collecting homework only once per week seemed to work best for them while 10% collected homework in some combination of nightly and weekly assignments. An
unspecified participating teacher noted that collecting weekly was "...less time consuming, compared to grading homework every night."

<table>
<thead>
<tr>
<th>Individual Responses</th>
<th>Overall Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nightly</td>
<td>Nightly</td>
</tr>
<tr>
<td>33%</td>
<td>43%</td>
</tr>
<tr>
<td>2-3 Times/week</td>
<td>Subweekly</td>
</tr>
<tr>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Weekly</td>
<td>Weekly</td>
</tr>
<tr>
<td>33%</td>
<td>43%</td>
</tr>
<tr>
<td>Nightly and Weekly</td>
<td>Monthly</td>
</tr>
<tr>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Monthly</td>
<td>Never</td>
</tr>
<tr>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>Never</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Blank</td>
<td></td>
</tr>
<tr>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 8. Responses to How Frequently Homework is Collected*

The frequency with which homework is graded impacts student accountability. Figure 9 shows that in the classrooms of 62% of the teachers, every single assignment is graded. To help combine the weekly and nightly assignments, 24% of the teachers said that they have a weekly assignment they grade, and check the nightly assignments. One teacher said "nightly to 8th and 9th graders...weekly for seniors." The teachers who cited random grading techniques described rolling a dice or flipping a coin to decide if homework would be graded or not. The method in which each homework assignment was graded was determined differently by each teacher. The next component of a homework policy is how the homework is graded. The weekly and test reviews will be mentioned with other unique responses, in the next section as well.

<table>
<thead>
<tr>
<th>Individual Responses</th>
<th>62%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every</td>
<td></td>
</tr>
<tr>
<td>Random</td>
<td>10%</td>
</tr>
<tr>
<td>Weekly Only, Check Nightly</td>
<td>24%</td>
</tr>
<tr>
<td>Weekly and Test Reviews</td>
<td>5%</td>
</tr>
</tbody>
</table>

*Figure 9. Responses to How Frequently Homework is Graded*
**Grading in detail or for completion** presents teachers with an opportunity to assess student learning. The results are summarized in Figure 10. A mere 29% of the teachers grade solely for completion, while 19% grade only in detail. Overall though, 81% of teachers grade some assignments for completion, 81% grade some assignments in detail and 43% grade the nightly ones for completion and the weekly assignments in detail or some other combination of completion and detail. Take note that 'in detail' means the same as 'for correctness'.

<table>
<thead>
<tr>
<th>Individual Responses</th>
<th>Overall Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completion</td>
<td>Completion 81%</td>
</tr>
<tr>
<td>Detail</td>
<td>Detail 71%</td>
</tr>
<tr>
<td>Completion and Detail</td>
<td>Select Problem 10%</td>
</tr>
<tr>
<td>Completion, Detail, and Select Problems</td>
<td>Nightly (completion) and weekly (detail) 43%</td>
</tr>
</tbody>
</table>

*Figure 10. Responses to Which Method(s) are Used to Grade Homework*

**Homework content** is equally as important as how homework is graded; the homework content also has little variation. In Figure 11, 81% of the teachers included some prior material, 86% included current material and 52% assigned homework that was a combination of both current and prior topics. Another result from the table is that very few teachers only included prior or current or future and most opted for some combination. Interestingly enough, future topics are only utilized by 14% of the teachers. These responses can be found in the unique responses section coming soon.

<table>
<thead>
<tr>
<th>Individual Responses</th>
<th>Overall Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior</td>
<td>Prior 81%</td>
</tr>
<tr>
<td>Current</td>
<td>Current 86%</td>
</tr>
<tr>
<td>Current and Prior</td>
<td>Future 14%</td>
</tr>
<tr>
<td>Future</td>
<td>0%</td>
</tr>
<tr>
<td>Prior Current and Future</td>
<td>14%</td>
</tr>
</tbody>
</table>

*Figure 11. Responses to What Content Teachers Include in Homework Assignments*
The challenge level of the homework plays a large role in shaping students perception on the importance of homework assignments. Based on the responses of how challenging the homework is, on a scale of 1 to 10, the descriptive statistics have been calculated. The average challenge was 4.9 out of 10, which corresponds to a medium difficulty. The variance of the data has a standard deviation of 1.587 that shows that the data is fairly spread out. Figure 12 shows how the responses are distributed.

![Boxplot of Challenge](image)

**Figure 12.** Boxplot for the Challenge Level of Homework Assignments

Notice that 50% of the teachers assign homework with a challenge of somewhere between 4 and 6 out of 10. The lowest challenge was a 1 out of 10 and the maximum challenge was 9 out of 10.

The time spent on homework per week was an average of 111 minutes, or 1.85 hours. With a standard deviation of 1.296 hours, the distribution of the time spent on homework per week can be seen in Figure 13 on the following page.
Figure 13. Boxplot of Time Spent on Homework per Week

The maximum time per week spent on homework was five hours, and the minimum time spent was zero hours per week. Also, 25% of the teachers assigned between one and one and a half hours per week while 50% assigned between one and three hours per week.

Late Policies had the largest variation in responses even though it was a commonality for teachers to have a late policy. On the following page, Figure 14 clearly shows that 76% of teachers have some form of late policy, but each teacher used their own unique policy. If homework is turned in before the unit ends, 42% of the teachers have a set percentage that a student would receive for the assignment while 34% take off a certain number of points per day, until it is no longer accepted. For the lucky students, 10% would accept anything late, at any time.
The reason for various policies is the most important and insightful response. It helped determine what rationales teachers had for developing their personal homework policies. As one might suspect, 71% of teachers have based some component of their policies on personal experience and practice. A school mandated component can be found on 29% of the homework policies. The most disappointing result is that only 10% of the homework policies have components based on action research. The remaining responses were summarized in Figure 15.

<table>
<thead>
<tr>
<th>Individual Responses</th>
<th>Overall Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experience/Practice</td>
<td>Experience/Practice 71%</td>
</tr>
<tr>
<td>School</td>
<td>School 29%</td>
</tr>
<tr>
<td>School, Experience/Practice</td>
<td>Research 10%</td>
</tr>
<tr>
<td>Research, Experience/Practice</td>
<td>Cooperating Teacher 10%</td>
</tr>
</tbody>
</table>

Figure 14. Varying Late Policies of In-service Teachers

An anonymous teacher said that a “team approach to grading” was what they meant when they said school policy while another gave justification for having a late policy because it is hard to “bounce back from a zero so need to give opportunities.”
As one might suspect, some results are obvious and can be found in almost every teachers’ homework policy. These common core components make up a great foundation for a homework policy in the secondary mathematics classroom. What really sets a teacher apart from the rest is the implementation of unique policies.

**Unique policies** play an important role in developing a classroom homework policy. Every teacher has different opinions and different experiences that give reasoning and rationale for what they think works best. There were many unique responses that teachers listed in various categories. One teacher collects homework before school starts, stating “I am able to look it over before each class period...by looking at homework prior to the day’s lesson, I’m able to assess what worked & what didn’t. I am then able to modify the day’s lesson if necessary.” An important aspect of teaching is to be flexible and responsive to assessment, and this unique approach seems to overcome both of those challenges.

Two teachers mentioned having blog assignments, which is a good way to incorporate technology into the classroom and differentiate instruction. A blog is a website that gives approved users the ability to post comments, add material, and read and respond to others posts. Blogs are useful for group projects, extra credit assignments and numerous other assignments. The winner of ‘Most Unique Homework Policy’ goes to a teacher who splits homework assignments up by night of the week. Monday and Wednesday nights are traditional homework assignments alternated with Tuesday and Thursday night Regent’s review worksheets. This is a unique approach to combine “teaching for the test” and teaching mathematics. To finalize the week, Friday is the Odds n’ Ends day where test and quiz corrections, flashcards, and late work are completed.
As one can see, there are numerous components that make up a secondary mathematics teachers’ homework policy. Each component, no matter how significant or not, deserves the appropriate time and effort to develop and implement for maximum effectiveness. Through school mandated policies and personal practice and research, a core set of homework policies has been agreed upon, and most teachers use these policies in their classrooms. Even among the commonalities, there were no policies that 100% of the teachers implemented. This study only uncovered a few unique policies that teachers had developed but there are many more out there. It cannot be stressed enough that what works for some teachers and their school will not always work with another teacher’s students or coincide with another teacher’s philosophy of teaching. Also, what worked last year and last decade is not guaranteed to work this year.
Implications for Teaching

The assumption behind this research was that mathematics teachers’ homework policies would share some commonalities when it came to daily assigned homework and mandated collection. It was also assumed that among these commonalities, there would be wide variations in grading method, challenge and content found on homework assignments. Based on the results of analyzing and comparing participant’s questionnaires, a core set of homework policies exists, leaving room for unique approaches as well.

Classroom Implications

The main implication for teachers in the classroom is a recommended homework policy based on in-service teachers’ questionnaires and research-based results. Combining both aspects produces a solid foundation for a homework policy. It was created with high school (9th to 12th grade) students in mind but by making the weekly assignment shorter by 30 to 40 minutes, this policy can also be used for middle school (6th to 8th grade) students as well. Also, for younger students, making the nightly practice problems mandatory is also an option. On the following pages is the foundation for a recommended homework policy to be used in designing and implementing an individual policy.
Problems/Project of the week. (POW)

- 75 - 120 - minute assignment due weekly
- Graded for correctness
- Combines easy and challenging problems with an overall difficulty of 5 out of 10
- Contains problems from current, prior and future topics
- Can be longer problems, a project, a report, etc.
- Heavily weighted

Nightly Assignment – Participation (NAP)

- 10 to 20 minute assignments due daily
- Graded for completion, possible to grade randomly by rolling dice, flipping coin, etc.
- Covers simple skills and material
- Vary assignments as often as possible
- Could be book work, state test review, online homework, reading, watching a YouTube video or reading an article and summarizing it, making a blog post, etc.
- Allow time to go over and take questions in class
- Lightly weighted as a participation grade

Nightly Practice Problems (NPP)

- Voluntary homework for students needing extra practice
- Will not be checked or graded
- Answers are readily available for the students to check on their own
Extra Credit

- Extra work for students needing challenge or a grade booster
- Takes classroom topics to an advanced level, a project, etc.

Late Policy

- Take off 10% to 25% per day for the weekly assignment
- Take off 25% to 100% per day for late nightly assignments

In service teachers’ policies have shown that assigning homework four or more times per week is a common component of a homework policy. Whether a teacher decides to collect and grade every assignment or not is their personal approach, but having some mandated collection at least once per week is effective. Also, instead of just grading for completion, or just for correctness, combining both ideas helps differentiate your assignments and give students a chance to practice, while also providing formal assessments. A typical policy would have nightly assignments checked for completion and a weekly assignment graded for correctness. The content that is covered in the homework should include a combination of prior and current topics to help students practice, while also refreshing the most important topics that have been previously covered.

If teachers assign mundane repetitive homework, students see no purpose other than having busy work. If the students are getting frustrated because the homework is too hard, they will begin to shut down and build the oh-so-common negative conception of mathematics being too hard. With this in mind, keeping a medium difficulty will ensure ease of completion, while stimulating the mind. The challenge of homework often correlates to the amount of time spent
Creating Effective (Mathematics) Homework Policies

on homework. Try to keep homework between two and four hours per week so that students can concentrate on other subjects and other components of their lives. Life happens, sickness happens, so give a chance to turn in late homework, at least at a fractional percentage. When a student receives a zero, it is hard to raise the grade back up to what the student aims for. Most importantly, do not mindlessly create a homework policy without careful planning. It was disappointing to see that many policies were developed with no research in mind. We, as mathematics educators, need to value and take full advantage of research based practices.

**Research-based policies** should be found in 100% of the classrooms. There are countless research articles providing policy suggestions that are most effective and offer foundations for effective homework policies. To summarize the results from the aforementioned research, homework increases retention and understand as well as develops study skills, independent learning, and improves attitudes towards school (Cooper, 2001b, 2008). For the difference in age groups 6th to 8th graders should receive three to five 45-75 minute assignments per week while the 9th to 12th graders should receive four to five 75-120 minute assignments per week (Cooper, 1994). Homework should not be too hard, and take too long to complete because these factors significantly impact comprehension and completion rates (Grootenboer, 2009; Trautwein, 2007). In 2008, Thelen mentions that a student can only stay interested and have an attention span for so long. That is why it is essential to vary assignments to keep students interested and at full attention.

Research has also determined that the most effective homework policies combine prior (review), current (practice) and future (preparation) topics (Cooper 2008b). As far as the challenge goes, combining easy and hard problems can trick students into thinking the harder problems are easier than they really are, and has resulted in students spending less time on
assignments (Hein, 2009; Trautwein, et al., 2002). Similarly, homework should be seen as practice and only occasionally used to teach complex skills (Cooper, 1994). Students also viewed mandatory assignments as more important when teachers also offered optional assignments as additional practice (Cooper 2008b). These implications for teaching are only a few results that can be found through effective research. As researchers continue to publish and examine results, unanswered questions remain that lead to further research on the topic.

**Suggestions for Future Research**

The research on creating effective homework policies in the secondary mathematics classroom has produced some interesting results. Even so, this research could be further developed and expanded by changing the subjects. All of the participating districts were from Western New York and were mainly rural districts. By expanding the research to the entire United States, a wider range of policies and unique responses would yield more concrete results.

Also, with only 23 subjects, whatever conclusions have been made are rather insignificant considering the difference in size to the overall population of mathematics educators and the fact that this was not a completely random sample. In terms of the questionnaire, and data gathered, having more precise wording of questions would help the results. What one teacher sees as a challenge of 3 out of 10, another could perceive it as 5 out of 10 for their students. Testing the correlation between a school wide policy and state assessment scores would also further develop this study.

**Concluding Remarks**
An insightful response from one participant stated that “Every school is different and has different types of students. What works at one school may not work at another.” That quote is important for each teacher to remember when developing their own policy. These results and implications for teaching are merely a guideline for teachers on which to build a foundation. Homework policies are not “one size fits all.” There are proven policies that work better than others, but it is the role of the mathematics educator to continually fine tune and adjust their policies to fit the needs of their students and their districts.
References


Muhlenbruck, Laura (1999). "Homework and achievement: Explaining the different strengths of relation at the elementary and secondary school levels". Social psychology of education (1381-2890), 3 (4), page 295.


Appendix

TO: Teachers in SUNY Fredonia’s surrounding area
FROM: Mr. Johnston
DATE:

Purpose, Procedure, and Benefits

➢ The purpose of this study is to determine which homework policies are in practice in secondary mathematics classrooms.

➢ The ultimate goal is to get a completed questionnaire from you. This may be accomplished by a physical copy mailed to you, an electronic copy through e-mail, a one on one interview (where I come to your classroom), a phone interview, live video chat, or any other means of completing the questionnaire.

➢ The goal of this study is to improve mathematics homework policies to better enhance student learning and understanding. This is an important study because of the potential benefits it may hold, not just for you, but for mathematics education in its entirety.

Related Information

➢ You are being asked to participate in this study.

➢ To maintain confidentiality, your name will not be used in any way, shape, or form. Any name or identification will not be used with any materials related to the study.

➢ There is no cost (nor any compensation) to participate in this study.

➢ Participation in this study is voluntary. You may withdraw at any time. No penalty can or will be assessed to yourself for declining participation.

➢ Only minimal risks (if any) are anticipated to yourself. This study deals primarily with data collection. If you wish, you may be removed from the study at any time.

➢ The potential benefits to you will be to receive more effective teaching strategies and an overall improvement in performance within the math classroom.

➢ You may contact Mr. Johnston at 716-244-0330 or john8394@fredonia.edu. Or you may contact Dr. Howard at 716-673-3873 or keary.howard@fredonia.edu.
Thank you for being a part of this study. Please print and sign your name in the space provided to show that you agree to participate. Remember that signing the form allows Mr. Johnston to use your data for the research project.

Voluntary Consent: I have read this memo and I am fully aware of all that this study involves. My signature below shows that I freely agree to participate in this study. I understand that there will be no penalty for not participating. I understand that I may withdraw from the study at any time, also without penalty. I understand that my name and any personal information will be kept out of the study. I understand that if I have any questions about this study, I may contact Mr. Johnston at 716-244-0330 or john8394@fredonia.edu. I may also contact Dr. Howard at 716-673-3873 or keary.howard@fredonia.edu.

Please return this original, completed consent form as soon as possible. Thank you for your cooperation.

Preferred method(s) of contact: Phone Video In person Email
Mail

Contact information for preferred method(s) of contact:

________________________________________

________________________________________

________________________________________

________________________________________

Participant Name (please print):

Participant Signature:

Date:
Feel free to add any additional notes and explanation that you feel necessary. The back side of this questionnaire may also be used for additional space.

Grades Teaching/taught: 6 7 8 9 10 11 12

**Frequency:** How frequently do you assign homework? (Weekly? Nightly? Both? Etc)

**Content:** What content is covered in your homework assignments? Prior  Current  Future topics

**Challenge (Time/quantity):** On a scale of 1 to 10, how challenging is a typical homework assignment?

<table>
<thead>
<tr>
<th>Elementary</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
</table>

How many hours of homework are assigned per week? __________

**Collection:** How often is homework collected? (Weekly? Nightly? Monthly?)

**Grading/Feedback:** What is your grading policy? (Grade every assignment? Special assignments? Randomly selected assignments?)

Is the homework graded for: ______ Completion ______ In full Detail ______ Select Problems ______ Both

**Late Policy:** Do you have a late policy? ______ If so, what is it?

**Reasoning:** How and why did you develop these policies? (Research? Experience/Practice? Someone instructed you to?)