
*Classroom Management for Mathematics in
Secondary Education*

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Introduction

At Hutchison High School students promote an academic environment. Thanks to small size of the school, students are able to get the attention they need to succeed in their classrooms. The faculty make sure that each classroom is fully equipped to create a comfortable learning, a number one priority for classroom preparation (Pedota, 2007).

This classroom management plan is designed for a Math classroom from grades 9-12. It relies on the practices and methods from Hutchison and Homer High School, both of which involve a small student count and academic rigor. What matters most is that this plan defines the tone for the classroom, then students are situated into an academic rhythm (Guercio, 2011). Through the success of this plan, students should also be able to promote a learning environment for others.

Preparation

The physical layout of the classroom is a strong influence when it comes to student learning (Denton, 1992). Within my classroom, my main goal for student seating is to optimize Math engagement. The second goal in seating is to achieve optimal spacing within the classroom. It would be beneficial to place the teacher's desk in the back of the room. While I plan to teach in the front of the class, it's important that the teacher's desk remains in the back of the class. Placing the teacher's desk in the front pushes students away from the front by up to an additional 8 feet (Jones, 2007).

The size of the high school may affect the size of my class. Thus my seating arrangement should function in any classroom size. For a Mathematics classroom, it is very common to arrange seats in pairings. I expect to work with either individual seats or tables designed for two students. In either case, I plan to seat students so that there are three walkway areas. Seats will be arranged in pairings, so that students may collaborate with each other during homework time. I want to be able to look over student desks so that I can assess student work, and easily access every student. This is the most common seating within a secondary classroom, especially for Mathematics, but it will help create a spacious environment, even in a small classroom (Denton, 1992).

It is very important that I cover the classroom syllabus within the first day of school (see Policies/Procedures). I also intend to hand out a worksheet asking students to describe their interests. It is one of the rare opportunities I have to learning about the students. Thus the worksheet will contain the following questions:

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- Where were you born?
- How many brothers and sisters do you have?
- What's your favorite class?
- Name your top 3 hobbies
- Are there any sports/activities you like to do?
- Are there anything else you like to let me know?

Now that I'm a teacher, I know just how valuable these worksheets are. Even if students don't know what to put down for their interests, I can still assess their life based on the first two questions. If time permits, students can share their responses so that the students can learn about each other.

Policies/Procedures

On the first day of school I will make sure to hand out the classroom syllabus. The syllabus will contain the following information:

- Contact information
- Objectives
- Topics (List of Chapters we'll go over)
- Materials
- Homework policies
- Quiz/Test policies
- Classroom policies
- Grading policies/Grading scale
- Emergency procedures
- Special Needs services

Contact information is standard protocol, so that students know how to appropriately contact me when they need help. Objectives are also standard procedure, and are based on the topics presented. In a Math classroom, an average of 5 chapters per semester is what I expect to cover. The materials consist of the textbook, as well as a binder for notes, a calculator, and a pencil (not pen) for doing homework.

All information regarding homework will immediately concern students. After the first day of school students will receive their first homework assignment, which means they must learn how to receive credit for their work. Students will probably be pleased to hear that homework is not based on correctness, but on effort. Each homework is based on a 20-point scale, since that is the average amount of problems they'll be assigned each night. Their score on homework is directly proportional to the amount of problems they answered. I am willing to accept late homework, but an immediate 10% is deducted for each class period that it's late. To make sure that students perform the homework, I will contact their home as soon as they miss three assignments.

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Students are permitted to re-take one quiz and test. Students that miss a quiz or test are allowed to retake it without using up their re-take, but they must take it as soon as possible. Of course, any students caught cheating will receive an automatic zero. Each quiz is taken after a few sections and each test is a summative assessment of a chapter.

Classroom policies inform students what I expect from them. Homework is assigned on a daily basis, and it should be turned in on a daily basis. Instruction time is teacher time, meaning that talking is not permitted. For freshmen and sophomore classes, seating is a privilege, and assigned seating can occur if students are continually disruptive. Students are expected to take notes during instruction, and notes are part of their grade.

Regarding discipline, consequences are based on a three strikes system. When it comes to a serious offense, first the student will receive a warning. If the student continues the action, I will write a referral. The third offense will result in me calling the student's parents. Depending on the severity of the action, the student may receive an alternative consequence in place of the first strike. In the event that the entire classroom is responsible (such as constant chatter), then student privileges may be taken away. For example, if students aren't productive after instruction, then I would take away their privilege to listening to music during homework time.

Grades are weighted. They are based on five different assessments, and are roughly weighted the following:

- Homework: 20%
- Quizzes: 35%
- Tests: 30%
- Notebook Checks: 5%
- Final: 10%

I weigh quizzes more than tests because there are more of them. I want to make sure students actually fill out the notes for their homework. The notes are a small weight in the grade, but is enough to raise a grade by a letter. I also expect the letter grading to be standard: 97-100% for A+, 93-96% for A, 90-92% for A-, 87-89% for B+, 83-86% for B, 80-82% for B-, 77-79% C+, 73-76% for C, 70-72 for C-, 67-69% for D+, 63-66% for D, 60-62% for D-, and 0-59% for F. Although the passing grade will probably be a C- or higher, the plus/minus grading for a D helps parents measure how much students need to improve their grade.

The one thing not mentioned in the syllabus (but featured in the classroom) is the rules for my classroom. The rules are simple, but are memorable:

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- Make the best out of Math
- Aspire to teach others
- Turn in all homework
- Hear, respect, be considerate

I use the first rule because it's a rule I can refer to if students display negative behavior. I also strive to have students learn from their peers, which is why it's the second rule. The third rule is mundane, but there should be no confusion about what it means. Although my rules are simple in detail, the point of them is that they assert respect and consideration, while giving general rules to outline my expectations (Marzano, Gaddy, Foseid, Foseid, Marzano, 2005).

See Safety/Legal Requirements for emergency procedures and special needs services.

Safety/Legal Requirements

When it comes to any classroom, it's urgent for students to know how to react in an emergency. At the very least, they should know what to do during a drill. Students should know where to go in the event of a fire drill. It would be very convenient to provide a chart showing the safest route of escape from the school building. Not only should the chart provide the layout of the building, it should have a line describing the quickest and safest path of exit.



Fire exit; photo credit by Jody Gaines

In situations concerning earthquakes, or any other emergency situations, a poster describing what to do would help the classroom. That way students it's there so that students don't panic during

an emergency. By the time students reach high school, students will probably be conditioned in performing the drills, but it's better to be safe than sorry.

For special needs services, it is important that I am informed of student disabilities or services. In the event I teach in Fairbanks, I will provide the phone number for FNSBSD Special Education Department in case students need it. The sooner I am informed of their disabilities, the sooner I can accommodate the students' special needs. In some cases, students may not share their disabilities. In those cases, I will communicate with the parents if I notice any unusual behavior from the student(s).

Instruction/Differentiation

Each day begins with a warm-up activity. The warm-up activity consists of three sample problems that evaluate the material taught from the previous class period. Students will only have five minutes to complete the warm-ups before I go over the process for obtaining the answer. It is vital that students correct their answers and pass the warm-ups to the turn-in basket. I will grade these based on their effort of answering the problems.

1.) Solve the system using substitution.

$$\begin{aligned}x - y = 1 &\rightarrow x - 1 = y \\2x + 3y = 7 & \quad y = (x) - 1 \\2x + 3(x - 1) = 7 & \quad = 1 \\5x - 3 = 7 & \\5x = 10 & \\x = 2 & \quad \boxed{(2, 1)}\end{aligned}$$

2.) Solve the system using Elimination.

$$\begin{aligned}3x + 4y = 3 &\rightarrow 3x + 4y = 3 \\-3(x + 5y) = -10 &\rightarrow -3x - 15y = 30 \\-11y = 33 & \\y = -3 & \\x + 5(-3) = -10 & \\x - 15 = -10 & \\x = 5 & \quad \boxed{(5, -3)}\end{aligned}$$

3.) Solve the system using the graphical method. Round to two decimal places.

$$\begin{aligned}x - \sqrt{5}y = 0 &\rightarrow y = \frac{1}{\sqrt{5}}x \\4x + y = 2 &\rightarrow y = -4x + 2 \\(0.45, 0.20) &\end{aligned}$$

Warm Up Answer Key; photo by Jody Gaines

Immediately following the warm-up, I will pass out a note-taking guide. Most of the guide is filled in. What I require students to fill in are the steps to completing the sample exercises. The note guides even contain the important formulas/theorems that I will cover in the class period. The note guide is structured in such a way to guide students through my instruction, as well as provide notes for their homework and studying.

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Ideally, each instructional period consists of teaching one lesson from the Math textbook. Most Math textbooks are structured so that each chapter teaches an entire unit, and each section teaches one lesson. For example, a textbook might teach Polynomials in Chapter 1, and section 1.1 involves graphing polynomial functions. Each section also has homework exercises, and I intend to have those exercises as their main homework.

Most instruction will take place on Smart Board technology. In the event that Smart Board is not provided, a whiteboard and PowerPoint technology should accommodate my instructional needs. In both cases, a projector is required. The generic format of each section is as follows:

- Theorem/Formula/Concept to cover
- Example exercises
- Secondary Theorem/Formula/Concept to cover
- Examples relating to last point
- Word problem
- Solving of word problem

Regardless of the Math subject, this format is consistent in every American Math textbook I've seen anywhere.

The Smart Board (or PowerPoint) will structure the same format of each textbook section. Based on previous experience with Smart Board, a typical lesson will consist of 15-20 Smart Board slides. On the Smart Board software, the first page will consist of the chapter title. The next page will consist of the topics we will cover in the class period. From there I present the theorem/formula students will use to answer the homework problems. Finally, an example problem will be given. I intend to teach the process for answering the first exercise problem. The next sample problem will rely on me describing the first step, and then students will fill in the details. On the third example problem, I will rely completely on student responses to answer the question.

There might be more than one theorem/formula in a section. In those cases, I perform the same process for the first theorem/formula presented. However, it's the word problems that require the most attention, because word problems rely on critical thinking. Thus it's important that I begin the setup of the word problem, and then students fill in details. Fortunately, word problems are structured to apply the material presented in the section, and they explain the practicality of reading the section.

By the time the Smart Board lesson is over, students should have the note-taking guide completely filled out. They may use the note guide to answer the problems on the assigned homework,

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which is presented immediately after the Smart Board lesson. I expect that teaching a section takes up 75% of classroom time, which leaves 25% of the time to perform homework. That means in a 60-minute period, I would spend 45 minutes on the lesson and 15 minutes on homework time.

10.1 Systems of Linear Equations In Two Variables

Substitution Method

- 1.) _____
- 2.) _____
- 3.) _____

Example 1-Using substitution to solve a system of linear equations

Find all solutions of the system

$$\begin{aligned}2x + y &= 1 \\3x + 4y &= 14\end{aligned}$$

Elimination Method

- 1.) _____
- 2.) _____
- 3.) _____

Example 2-Using Elimination to solve a system of linear equations

Find all solutions of the system.

$$\begin{aligned}3x + 2y &= 14 \\x - 2y &= 2\end{aligned}$$

Note Guide; photo by Jody Gaines

In the preparation of the school year, I mentioned that seats will be arranged to have three walkways. This is because I can watch over students as they spend time on homework. For those that are not working on it, I can easily come over and politely remind them how to spend their class time. Students are allowed to listen to music and converse with their peers, as long as they also use the remaining class time for homework.

On the day before a quiz or test, students have the time dedicated to a quiz/test review. It is on these days that I incorporate cooperative learning. For cooperative learning, I either pair students in groups of 2 or 3, then each student are given a review packet. The purpose of grouping students together is so that the high-achieving students can assist the low-achieving ones. Class time is dedicated to students filling out the packet, then I go over the review questions. The review packets are for student use.

Of course, there will be several days where instruction is changed. For instruction, it's beneficial to assess how students respond to different instruction, and vary instruction based on those results (Pedota, 2007). For my classroom, there will be breaks from the instruction, where students can play board games or draw. There will also be opportunities to perform Math worksheets, ones where

students fill in a crossword puzzle based on their solutions to Math problems. The easiest way to differentiate instruction is to give students more time to finish a lesson. In most cases this involves breaking up the lesson into two class periods.

Collaboration with substitutes/Parents

On the first day of school, students are required to provide contact information for their parents, which is necessary for parent communication. Whenever I have to give a mass message to all the students, my mentor does not know how she could do this without emailing all the parents at once (students didn't provide their own emails). Based on the consistency of my mentor, I expect to email parents approximately once a week.

There are several situations when I will want to directly contact the parent of one student. I would obviously do this via phone call. PowerSchool provides the contact number for parents, but it would be convenient to have a binder containing the numbers. Then when the power is out, I still have access to parents' numbers.

These phone calls or emails are extremely beneficial to parents. Not only are they informed about their child's life, it develops a positive relationship between the parents and teachers. At conferences, not a single parent said anything negative about my mentor's role as a teacher; they took her advice on how to help their child. This was important because then parents can act as coaches in their child's education (Goodall, Montgomery, 2013). From there parents can decide if their child requires more exercises or activities to strengthen his/her academic career.

Whenever I need to hire a substitute, my goal is to make it as comfortable for the substitute as possible. At the beginning of the school year, my mentor was out for 2-3 weeks, and she provided daily communication with the substitute. Fortunately, my mentor already planned 2 weeks of material, and the substitute was able to teach exactly what my mentor would've taught.

Thanks to the previous experience, I know how I intend to communicate with substitutes. First, I will provide binders containing all the materials for each class period. A sticky note will explain the procedure for how to run the class. Since I will teach Math, most substitutes probably won't feel comfortable teaching the material, which means they'll mostly hand out the appropriate worksheets. For those that are teaching the material, I will make sure to communicate with the substitutes on a daily basis. It would also help to prepare two weeks in advance, in case what happened to my mentor ever happened to me.

Summary

Teaching Mathematics has its benefits and disadvantages compared to other content areas. Math teachers have the advantage of a textbook to guide their instructional units. Unfortunately, Math classes are not effective at raising student interest. During conferences I am constantly reminded that the parents are not good at Math, and apparently their children receive the same Math anxiety.

At Hutchison High School, my mentor and I try to make Math as engaging as possible. We perform a lot of busy work, but it pays off. Students constantly communicate with my mentor and I whenever they miss notes for a lesson. Students constantly show averages above 73% on quizzes and tests. I see positive results from the students whenever they collaborate on study guides. Even if students don't enjoy doing homework, my mentor and I see a visible relationship between doing homework and test results.

In conclusion, this classroom management plan expects hard work from the students. In return, students receive an enriching education, even for those that struggle with Math.

Resources for Teachers/Students

- **The Door:** A 24/7 shelter designed for teens of ages 12-18. This I would probably feature on a bulletin outside of the classroom, available for student use.
- **FNSBSD Special Education Department:** Used for students who require special needs services. This I would feature in the syllabus, so that parents can know who to contact.
- **DonorsChoose.org:** A website available to obtain furniture for free for classroom use. In return, students may send thank-you notes as payment.
- **Careline Crisis Intervention:** Careline has a phone number which people can call if students are struggling with suicide or depression. Like the door, it's an open resource that students can use if they need outside help.
- **Khan academy.org:** A website where students can get free math lessons online. There are online tutors available in case students need additional help. I would feature this in the syllabus, for students and parents to see.

Sources

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