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Worcester Polytechnic Institute

Teaching Practicum

Achieving Competency in the Massachusetts Professional Standards



WPI

Samantha MacNeal
Professor John Goulet, Advisor
October 16, 2014

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Abstract

In order for a teacher to become certified in Massachusetts, one must prove that they have achieved competency in five professional standards: Plans Curriculum & Instruction, Delivers Effective Instruction, Manages Classroom Climate & Operation, Promotes Equity, and Meets Professional Responsibilities. In this paper, the background of Massachusetts school systems as well as details about Burncoat Senior High School are explored. Proof is given for my competency in each of the five professional standards.

Dedication

I would like to dedicate this paper to the late Gary Abaka Amuah. Gary was an inspiration in the classroom. Dedicated to his school and his studies, he was a role model to the students around him. I would not have learned as much as I did during my teaching practicum if Gary was not a part of it. I am blessed to have been touched by his life and hope that his memory may live on in those around him.

Chapter 1: Background

Massachusetts has been working on improving their education system over the past few decades. The Massachusetts Education Reform Act of 1993 created a 7-year plan to improve education in the state. The act has drastically increased the amount of state financial assistance for schools in the Commonwealth, with a goal to have state and local shares to be equal throughout the state. Other goals included having a school council in each school, providing continuing education for teachers, giving principals more authority, having well-defined roles for school committees, and creating statewide measurable standards for both students and schools.

Massachusetts Education Reform Act

Before the Massachusetts Education Reform Act, the only statewide educational requirements were for history and physical education. Now there are standards for all core subjects. The MCAS (Massachusetts Comprehensive Assessment System) was developed as a statewide examination to determine which students and schools need the most aid in education. Passing the MCAS has also been made a high school graduation requirement. A foundation budget was developed to get schools onto the same level of spending. Grants are being given to further technology in school districts. Teaching requirements have changed to include passing two tests – one in their subject area and the other in communication/literacy skills. School performance is now being more closely monitored and evaluated.

Massachusetts Performance

Massachusetts has been staying strong at the tops of the lists for state education performance and potential. Dr. Matthew Ladner and Dave Myslinski developed an education report card as an overview of each state's educational achievements. The states are graded on

academic standards, private school choice programs, charter schools, teacher quality, online learning, and home school regulation. According to this report, Massachusetts is ranked 1st in the nation. The 17th edition of *Education Week's Quality Counts* reports Massachusetts as the number two state in the country and gives it 84.1 out of 100. Massachusetts is reported to have the highest chance for success for the sixth year in a row. The Trends in International Mathematics and Science Study, or TIMSS, provides data on the mathematics and science achievement of 4th and 8th graders in the U.S. and compares them to students in other countries. The most recent study, completed in 2011, showed that Massachusetts 4th graders tied for third place worldwide in mathematics, and came in second in science. Eighth graders came in sixth for mathematics and tied for first in science. These studies show that not only is Massachusetts a strong contender in education in the United States, but in the world as well.

Burncoat Senior High School Performance

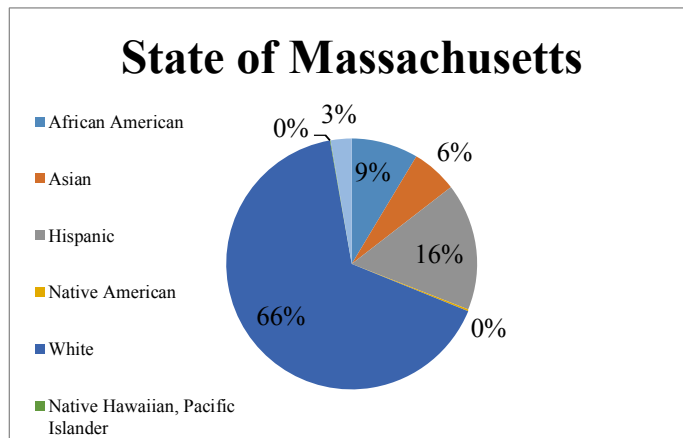
Curriculum frameworks are organized plans, standards, or learning outcomes that clearly define the content to be covered in the classroom with statements of what students should know and be able to do after taking a certain course. Massachusetts has been developing their curriculum frameworks over the past few years. Burncoat High School currently uses the Partnership for Assessment of Readiness for College and Careers (PARCC) Model for Content Frameworks in mathematics. The PARCC Model for Content Frameworks serves as “a bridge between the Common Core State Standards and the PARCC assessments.” The Common Core is a set of standards that will be implemented throughout the United States to ensure that there is “a consistent, clear understanding of what students are expected to learn, so teachers and parents know what they need to do to help them.” The standards are supposed to be relevant to the real

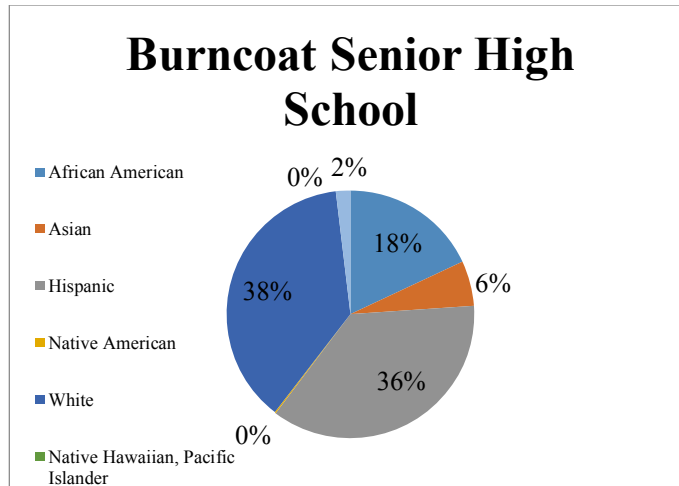
world and help students develop their knowledge for careers and college. The fact that Burncoat is using the PARCC frameworks will help create a seamless transition to the Common Core.

Burncoat Senior High School is one of seven public high schools in Worcester, MA. The school’s demographics vary slightly from the district’s and pretty largely from the state’s as a whole. The breakdown can be seen in the table and charts below.

Enrollment by Race/Ethnicity (2012-13)			
Race	% of School	% of District	% of State
African American	18	14.2	8.6
Asian	5.9	8.1	5.9
Hispanic	36.4	38.1	16.4
Native American	0.2	0.3	0.2
White	37.6	35.8	66
Native Hawaiian, Pacific Islander	0	0	0.1
Multi-Race, Non-Hispanic	1.9	3.5	2.7

Enrollment Data from Mass Dept. of Elementary and Secondary Education

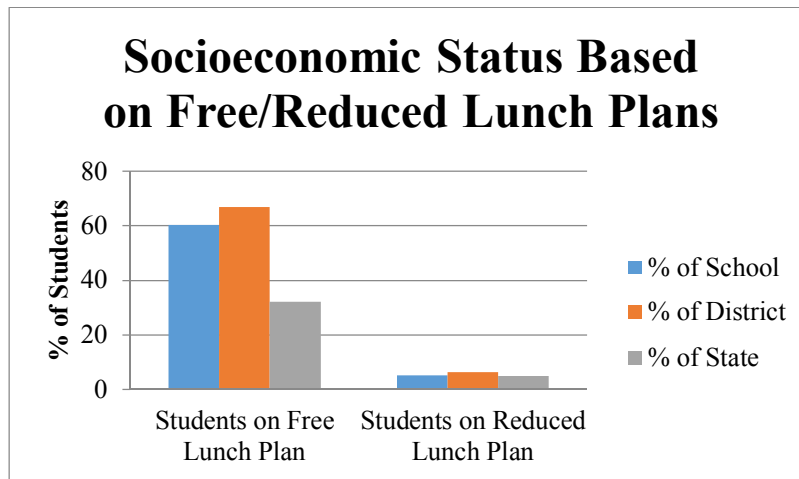




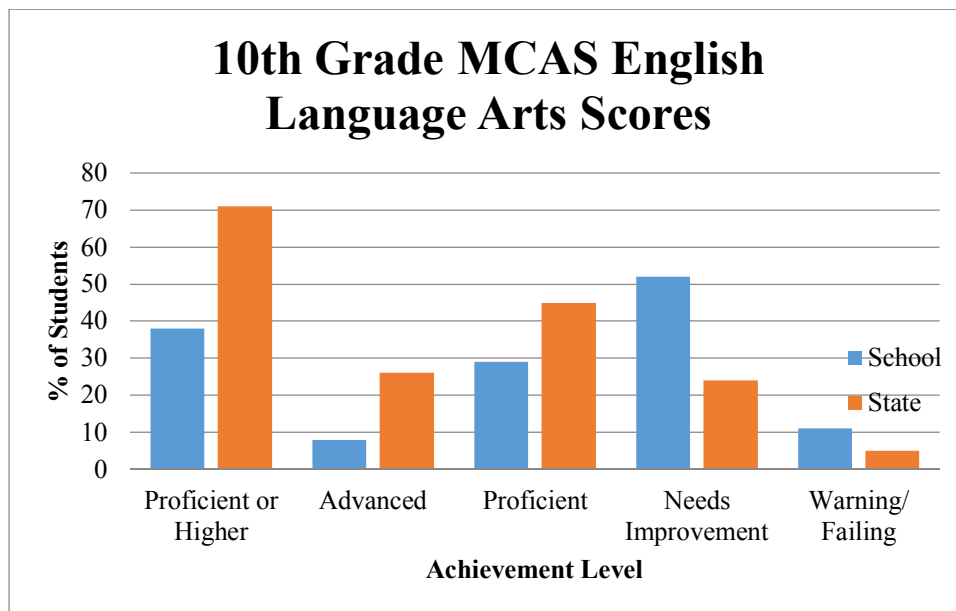
The school has a high percentage of English Language Learners, or ELLs, (27%) as well as students whose first language is not English (40.3%). An ELL is anyone who is in the process of learning English. When students enter the Worcester Public Schools they are given a home language survey, an oral test, as well as tests and samples of reading and writing. The students are then categorized and may be distributed into programs to help them with their English or put into a regular classroom. Introducing an ELL into an all-English classroom is called Sheltered English Immersion. The student may still receive outside help and resources, but for the most part they are immersed in the American culture and English language. The students around them often help them understand classroom norms as well as course material.

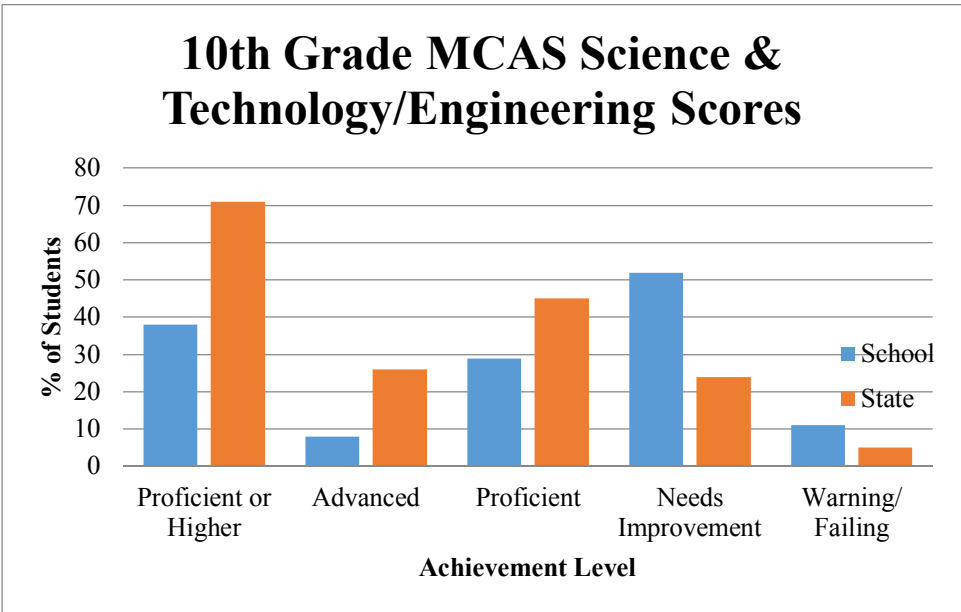
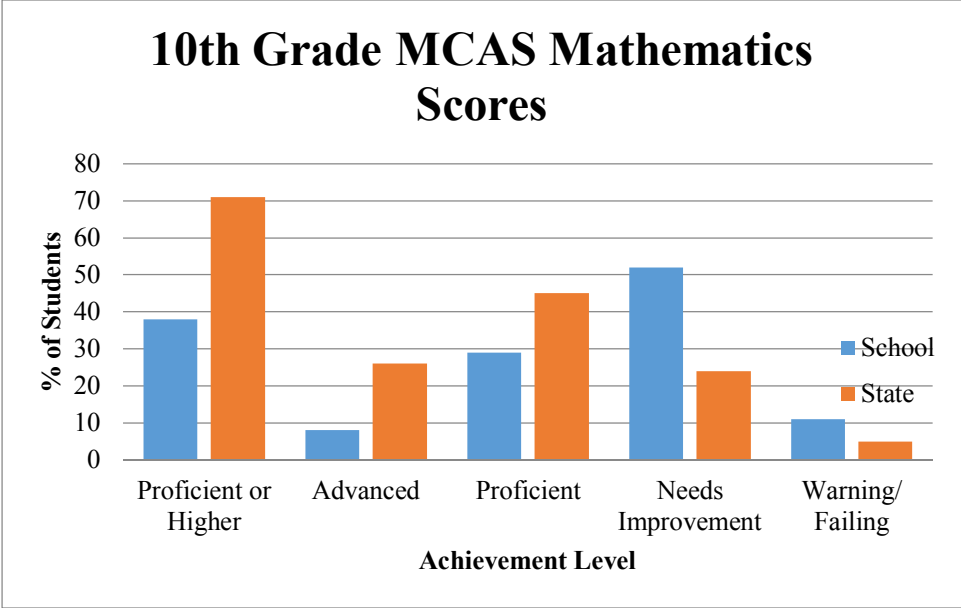
Burncoat’s socioeconomic profile is best shown by the percentage of students on free or reduced lunch plans. A family must fill out an application that takes household members, housing situations, and gross income into effect. Over 60% of Burncoat High School students receive free lunch compared to the 32% of students statewide.

Plan	% of School	% of District	% of State
Free Lunch	60.4	66.8	32.1
Reduced Lunch	5.1	6.3	4.9



The MCAS is a very important and high-valued measurement of student and school achievement levels. Below is a comparison of the percentages of students in each achievement level for Burncoat High School and the state of Massachusetts.





Burncoat’s percentages for Proficient or Higher are significantly lower than the state’s in all three 10th grade MCAS exams. The majority of the high school’s students are in the “Needs Improvement” category. The school definitely has room for improvement on standardized testing.

Burncoat High School's has improved in terms of graduation and dropout rates in the past couple of years. In 2012, the school had a graduation rate of 68.4% and a dropout rate of 4.4%. The graduation rate increased to 72.2% in 2013 and the dropout rate decreased to 3.6%. These rates are below the district average, but are improving over time.

Massachusetts is one of the best states for education in the country. However, the local Burncoat Senior High School is suffering when it comes to the MCAS exams. Improvements are being made to the curriculum frameworks and education system that should help the school improve and help its students reach their full potential. The diverse community from varying socioeconomic standpoints shows how unique Burncoat is and how much of an impact this high school has on its students.

My experience at Burncoat High School included two Algebra I classes and a Pre-Calculus class. Heather Farrington's Algebra I class was a college level freshmen course with a wide variety of students. The inclusion classroom contained some students with learning disabilities, behavior problems, and language barriers. Mary Doyle's Algebra I class was an honors level freshmen course and included students from diverse ethnic and socioeconomic backgrounds. Mary's Pre-Calculus class contained both juniors and seniors and was at an honors level. All of the students in the classrooms had their strengths and weaknesses and the dynamics varied greatly.

Chapter 2: Plans Curriculum and Instruction

The first professional teaching standard is Plans Curriculum and Instruction. This standard ensures that teachers are exhibiting subject matter knowledge, structuring rigorous lessons, creating a variety of assessments, using the information gained from assessments in a productive manner, and using applicable resources to strengthen teaching. This standard is broken down into eight subsections.

1. Draws on content standards of the relevant curriculum frameworks to plan sequential units of study, individual lessons, and learning activities that make learning cumulative and advance students' level of content knowledge.

Since the Algebra I classes I taught were at different levels, one college and one honors, I began teaching in different topics. However, as the year went on, the topics overlapped and I was able to teach some of the topics from the honors class to the college class, just a few weeks behind. I will focus on the Algebra I classes and the topics covered in both classes. I taught both classes the classic exponent rules and how to simplify expressions, which led directly in to creating, graphing, and solving quadratic and polynomial equations. The background knowledge helped students to understand more material as the course progressed to increasingly difficult topics. The Massachusetts frameworks covered include:

Algebra

Seeing Structure in Expressions

A-SSE

Interpret the structure of expressions.³⁷

1. Interpret expressions that represent a quantity in terms of its context. ★
 - a. Interpret parts of an expression, such as terms, factors, and coefficients.
 - b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1 + r)^n$ as the product of P and a factor not depending on P .*
2. Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*

Solve equations and inequalities in one variable.

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
MA.3.a. Solve linear equations and inequalities in one variable involving absolute value.
4. Solve quadratic equations in one variable.
 - a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
 - b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions⁴¹ and write them as $a \pm bi$ for real numbers a and b .
MA.4.c. Demonstrate an understanding of the equivalence of factoring, completing the square, or using the quadratic formula to solve quadratic equations.

As the topics progressed, it was easy to see whether or not the students grasped the initial information given to them. If students were struggling with the exponent rules, for example, multiplying polynomials would not be their strong point. I was able to go back and review the rules with students individually and as a group to make sure they had a solid foundation before moving forward. Each lesson that I gave began with a few “Do Now” problems which reviewed previous material as well as led into the next topic. Students could see direct correlations between the previous lesson and the current one. As students made connections, their understanding grew stronger and their motivation to keep learning increased.

2. Draws on results of formal and informal assessments as well as knowledge of human development to identify teaching strategies and learning activities appropriate to the specific discipline, age, level of English language proficiency, and range of cognitive levels being taught.

I used many forms of formal and informal assessment throughout my time at Burncoat High School. One of my main strategies was asking each member of the class to answer a problem, circling around the room to make sure every student had a chance to answer. That way I could check to make sure each student grasped the concepts being focused on. If they did not, I was able to slow down and go back over the topics, or use one-on-one time to explain material in more detail. “Do Now” problems were helpful in gauging students’ understanding of the previous lesson as well as fundamental knowledge

necessary for the coming lessons. If students struggled with their “Do Now” problems, I did more of a recapitulation before diving in to the next topic.

The amount of formal assessments given depended on the class and their ability to grasp new concepts. I quizzed the college level algebra I class almost every week. This way I was able to ensure that they were learning each piece of the processes before taking a culminating test on the overall topic. The honors level algebra I class was usually given larger quizzes that were more spread out. I could see that they were making connections between more lessons and their progress on those allowed me to see if it was appropriate to move on. The honors pre-calculus class had more difficult topics to cover, so their quizzes and tests tended to be more spread out as well. I often gave each of the honors classes take-home quizzes to see if they could solve MCAS or word problems. They were allowed to use notes on these, so I was able to decide whether or not they were truly soaking in what we used in class.

After each test or quiz, I looked for patterns in the responses from students. If a lot of students got certain types of questions wrong, I was able to revisit those in class the next day and point out where many students went astray. Constantly checking in on the students’ progress made it possible to mold my lessons to their specific needs and keep the majority of the students on track at all times.

For the college level algebra I class, I often had them do group work. The activities that they completed in groups had problems for a range of cognitive levels. By hand-selecting the groups, I was able to pair together people who had similar needs and people whose strengths built of each other’s. I was able to meet with each group individually to assess their progress and see how their team dynamic was working. I had some students who were very strong in certain subjects, so I paired them with the struggling students to have them serve as mentors. Some students with similar learning disabilities were placed in the same group along with an Instructional Assistant to make sure that they were staying on task and getting all of the work completed properly. After learning more about the students, it became easier to create cohesive groups that remained productive throughout the class period.

3. Identifies appropriate reading materials, other resources, and writing activities for promoting further learning by the full range of students within the classroom.

Each class I taught had a textbook that we usually used for example problems and follow-up information. Since the classes all focused on math, there was not much relevant reading. However, I did give the students writing assignments quite frequently. Usually the assignments consisted of a word problem (from past MCAS exams or otherwise) and were counted as quiz grades. The students had to learn how to interpret the word problems and formulate their answers in full sentences. They had to explain their work and show a firm grasp of the math content as well. I stayed after school with students who needed extra help, and for my college level class I did a similar example problem so that they had something to base their answers off of. Most students progressed steadily on these assignments throughout the year. The more they wrote about math, the more comfortable they got with it, and the better their assignments became.

4. Identifies prerequisite skills, concepts, and vocabulary needed for the learning activities and design lessons that strengthen student reading and writing skills.

Each lesson plan that I created indicated prerequisite skills, concepts, and vocabulary. Whether it was simple operations for algebra I classes or trigonometry terms for pre-calculus, I touched upon the most important concepts and terms to ensure that all students were on an even playing field when it came to prerequisite knowledge. I made sure that each lesson built off of the previous one and if there was any room for knowledge gaps from previous courses, I gave a refresher at the beginning. I clearly spelled out important vocabulary words at the beginning of each lesson, giving examples relating back to everyday life. Students took notes on these vocabulary words, which helped them to grasp them further as well as practice their note-taking skills.

5. Plans lessons with clear objectives and relevant measurable outcomes.

The lessons that I created for my classes all had objectives and outcomes that related directly to the content covered in class. I wrote the objectives on the board before each class so that students could

see what we would be covering that day. Each objective was measurable and explained what students would be able to do by the end of the lesson. I checked in on students periodically and adjusted my teaching to make sure that the objectives were being met to their fullest potential.

6. Draws on resources from colleagues, families, and the community to enhance learning.

My colleagues were my biggest resources during my time teaching at Burncoat High School. My mentors were always full of helpful advice about students and lessons. Heather Farrington showed me many resources, such as handouts and websites, which enhanced my lesson plans. Mary Doyle always had another way to look at problems that helped push me to approach my lessons from varying standpoints. I tried to link my lessons back to everyday life as much as possible and asked students to do some homework assignments which involved explaining what they learned in class to a family member at home. Although I did not have many direct interactions with families, I heard a lot about them through my mentors.

7. Incorporates appropriate technology and media in lesson planning.

I was lucky to have a few different types of technology available in my classroom at Burncoat. I used the ELMO projector quite frequently to go through problems. I also used it to display student work and project calculators or other problems. If I gave students work to do on their own, to go over it at the end I would put samples under the ELMO and project them for the whole class to see. We could see what the students did right and correct common mistakes as a group. The projector was especially helpful when teaching about graphing, both with inequalities and trigonometric functions. I used it to display graph paper as we drew graphs together and also to project the graphing function on calculators.

Graphing calculators were a helpful resource for my classes as well. We had enough for each student to use them on their own. It made it easy to graph functions quickly to look at their characteristics.

I could show the class the effects of shifts and scaling in just a few seconds. I would have loved to use more technology in my classroom, but the environment did not provide many more opportunities for it.

8. Uses information in Individualized Education Programs (IEPs) to plan strategies for integrating students with disabilities into general education classrooms.

A few of the students in my college level algebra I class were on Individualized Education Programs. Some students required extra time for assessments while others needed calculators for basic calculations. I worked with my mentor, Heather Farrington, to figure out the best ways to stick to the students' IEPs.

One of my main goals when working with students with disabilities, was to make sure that the students did not stick out in anyway. They were treated like everyone else, but their IEP requirements were still fulfilled. Since some students needed extra time on exams, I would gauge the length of time for the exams by how the students were progressing. If many students were not done by the end of the class period I would give them another day to work on it. I had extra work for students who finished early, but everyone had a fair amount of time to get the exams done. If students still needed time after that, I was always willing to stay after school with them or give it to their other teachers to work on it during their free periods.

When it came to calculators, I only gave them out if the students asked for it. I placed them nonchalantly on their desks and did not make a scene about it. They were able to use calculators during class and exams without it being very apparent to the rest of the class.

My algebra I class had a very diverse set of students on varying levels. I was able to include all of them in education by tailoring my teaching to their needs and always being available for help.

Having a diverse group of students can often make it more difficult to plan rigorous and affective lesson plans. I was diligent in creating lesson plans with a variety of content, clear objectives, and effective assessments to ensure that every student had an equal opportunity to succeed. Planning affective

lessons and assessments is vital as an educator, and my practicum experience at Burncoat High School truly helped me develop those skills.

Chapter 3: Delivers Effective Instruction

Delivering effective instruction is an enormous component of being a successful educator. A teacher must be able to deliver and communicate clear expectations and standards throughout the entire lesson as well as when extending the lesson and evaluating students. This standards is broken out into four subsections, each reflecting a different piece of the lesson.

1. *Communicates high standards and expectations when beginning the lesson.*
 - a. *Makes learning objectives clear to students.*
 - b. *Communicates clearly in writing and speaking.*
 - c. *Uses engaging ways to begin a new unit of study or lesson.*
 - d. *Builds on students' prior knowledge and experience.*

Engaging students at the beginning of the lesson as well as giving a clear outline of expectations for the day is very important. Each day I wrote the objective for the lesson on the board. These ranged from “Students will be able to solve systems of equations using the elimination method” to “Students will be able to compose functions and state their domain and range.” These objectives allowed students to have a clear understanding of topics to be covered as well as what they should be able to accomplish by the end of the lesson.

Evidence from observations that I can communicate clearly

Every time I began a new lesson, I connected it with previous topics. I told the students what prerequisite knowledge was necessary and how it was related to the new ideas we would talk about. I broke down the title of the new unit into simpler language. For example, at the beginning of the substitution lesson, I asked the students what they thoughts substitution meant. What is a substitute? What does a substitute teacher do? How does this relate to math? And then we dove into the subject with a firmer grasp on the vocabulary and concepts.

2. *Communicates high standards and expectations when carrying out the lesson.*

- a. *Uses a balanced approach to teaching skills and concepts of elementary reading and writing.*
- b. *Employs a variety of content-based and content-oriented teaching techniques from more teacher-directed strategies such as direct instruction, practice, and Socratic dialogue, to less teacher-directed approaches such as discussion, problem solving, cooperative learning, and research projects (among others).*
- c. *Demonstrates an adequate knowledge of and approach to the academic content of lessons. (See license-specific questions in Guidelines, pp. xx-xx)*
- d. *Employs a variety of reading and writing strategies for addressing learning objectives.*
- e. *Uses questioning to stimulate thinking and encourages all students to respond.*
- f. *Uses instructional technology appropriately.*

Not only is planning an effective lesson important, but carrying it out to the highest standards is just as necessary to educate students on subject matter. During my time student teaching, I experimented with different teaching techniques to find the most effective ones for my students. Most of my lessons included some form of direct instruction, where I introduced new topics or guided the class through example problems. I used less teacher-directed strategies for the entirety of some class periods but also usually at the end of each lesson. Students are able to better understand concepts when they have a chance to learn from each other or themselves. I did a lot of group work with my classes, giving them worksheets or activities to figure out together. Their writing assignments typically led to discussion and problem solving as well. With the guidance of my mentors, course textbooks, and content standards, I was able to make sure all materials were accurately covered in a meaningful and engaging way.

Asking students questions is one of the best forms of informal assessment and a way to gauge the appropriateness of the pace being used on particular topics. With many classes, certain students are always willing to answer questions, but others tend to fade into the background. Those students may know the answers, but are not necessarily comfortable with raising their hand. One technique that I used to engage every student was traveling around the classroom, asking each student a different question. I made up many questions while planning lessons so that each student would have one or two questions that tested their knowledge. By making sure each student got a question, I could see just how much each

individual, as well as the class as a whole, knew. Sometimes there were challenges – other students yelling out answers, or students refusing to answer their assigned question – but for the most part the students actively participated in the exercises. I also frequently asked students to come to the board, write out their work, and explain how they go their particular answer to a problem. This forced students to do the work as well as understand the topic enough to explain the steps to others. I also used the ELMO to project student answers, which often saved time in class. Making sure every student was paying attention and engaged in the class was one of my top priorities.

3. Communicates high standards and expectations when extending and completing the lesson.

- a. Assigns homework or practice that furthers student learning and checks it.*
- b. Provides regular and frequent feedback to students on their progress.*
- c. Provides many and varied opportunities for students to achieve competence.*

Following up on lessons through homework and providing feedback to students is vital in completing the most effective lessons. I gave homework assignments to students almost every night to solidify the concepts they learned in class. Whether it was completing classwork assignments at home, memorizing unit circle values, or trying more complicated versions of class assignments, the students had a variety of opportunities to further their learning outside of the classroom.

Some students frequently asked me about their progress in class, from missed assignments to grades. I kept all students up-to-date with progress reports, especially those who were struggling. I was available after school at least once a week for extra help and also helped students during my free periods.

4. Communicates high standards and expectations when evaluating student learning.

- a. Accurately measures student achievement of, and progress toward, the learning objectives with a variety of formal and informal assessments, and uses results to plan further instruction.*
- b. Translates evaluations of student work into records that accurately convey the level of student achievement to students, parents or guardians, and school personnel.*

Assessment, both formal and informal, helps educators adapt to their students and create personalized plans to engage each student. I used quizzes, tests, and homework assignments scored as quiz grades as formal assessments. The problems on these assessments were similar to worksheets we had done together in class or previous homework assignments. Basically, if the students could do the work in class and at home, they should have had no problem scoring well on the quizzes and tests. My college level algebra I class was allowed to use their notes on quizzes. This was to ensure that they could do the work, without having to worry about memorizing equations or processes. If students did not score well on certain problems, we went over them as a class, clearing up any confusion or misconceptions.

Informal assessments were very useful in my classroom. I always walked around the room checking in with students as they worked independently. I asked questions throughout the lessons to make sure that the students were paying attention and retaining material. On some occasions I would be teaching and then ask a question, with no response from the students. That is when I knew to slow down, repeat the last thought and regain the students' attention.

I kept an accurate and up-to-date gradebook throughout my time at Burncoat. If any students, administrators, teachers, or parents had questions about a student's grades, I was able to deliver that information to them. I used a paper grade book as well as one on the computer. I was often asked for summaries of students' grades for IEP meetings or for concerned parents. My organization made it easy to reference student grades and progress throughout the course.

Chapter 4: Manages Classroom Climate & Operation

Educators must be able to create a classroom climate that allows for the most progress in learning. Students have to feel comfortable asking for help in order for them to get the most out of school. If a classroom does not operate smoothly, students may become lost and learning may be limited. This standard is broken down into four subsections:

1. *Creates an environment that is conducive to learning.*
2. *Creates a physical environment appropriate to a range of learning activities.*
3. *Maintains appropriate standards of behavior, mutual respect, and safety.*
4. *Manages classroom routines and procedures without loss of significant instructional time.*

With the help of my mentors, I was able to create a learning environment where students could flourish. From personal interactions to physical layouts, the students could feel comfortable in my classroom. For example, one of my students, Katherine, was very upset when I started teaching. She did not like that her teacher was changing or that things would be a little different. It was difficult to deal with at first, but I learned how to make her more comfortable in class. I gave her more challenging problems, since that is what she seemed to like. I helped her with her work when she needed it. I asked her about her life outside of school to help her warm up to me. About half way through my time at Burncoat, Katherine was finally able to see me as someone she could look up to and trust. From then on, she paid more attention in class and even got the other students more engaged with her positive attitude.

Seating arrangements in a classroom can define the success of the students and those around them. My mentors had their classrooms set up before I got there, which worked out well for a while. However, I ended up having to switch seating for two of my classes throughout the course of the year. In my honors Algebra I class, there was a group of three students who sat next to each other and fed off of each other's negative energy. If one stopped trying in class, the others stopped trying. Eventually, I got so

tired of their lack of focus that I moved one of them across the room. From then on, they all became better students. Of course, initially they were pretty annoyed, but once they got used to the new arrangement, they started to thrive. I had not realized how much the physical environment of the classroom mattered until I made that decision.

Maintaining composure, respect, safety, and routines are especially important in a high school classroom. If students do not feel like they are in a stable environment and treated with respect, it is harder for them to learn. I had to deal with some difficult situations throughout my time at Burncoat that truly tested me and made me a stronger person. One of my students, Samantha, had very strong opinions about school. She did not respect authority yet demanded it from others. If she did not want to be doing something in class, she would not do it. If she was not happy that day, no one could be happy. When I first met her, I was hoping that I would be able to guide her and help her grow. I wanted to be her mentor, to figure out what was wrong and how I could fix it – but she never let me in. I will use an example to illustrate her behavior and my approach to it. One day, I was going around the room asking each student to answer a different question on the board. Everyone had their own question and if they were struggling, I helped them through it. I was using a no-opt-out strategy. When it got to Samantha's turn she stared blankly back at me. She refused to answer the question. I prompted her, breaking the problem down one piece at a time. She still did not want to participate. I did not let other students give up, so I was determined to get her to persevere through the problem. It came to the point when I was asking her, "What's 2+3?" "I don't know," she replied. At that point I gave her two options – she could answer the question or she could leave. She chose to leave. I called the principal's office to let them know to expect her and that was the end of that. It was difficult have that type of confrontation in the classroom, and even worse, I had to calmly proceed with class directly afterwards. I was glad that I was able to keep my composure and continue on like nothing had happened. All of the other students answered the questions they were given and we moved on.

If I had not enforced the no-opt-out strategy, I would have upset other students in the class who I got to answer the questions. Samantha would have lost respect for me and assumed she could choose when she wanted to participate and when she wanted to sit back and relax. That moment showed the entire class that I was a strong leader and that I would not take nonsense from any of them. There were many other instances in which I maintained a classroom environment that was beneficial for all students. Whether it was sending disruptive students out of class, comforting a student who had fainted, or helping struggling students after school, I was able to hold myself with poise and keep the respect of the students and professionals around me.

Chapter 5: Promotes Equity

Every student has the right to a complete and equal opportunity for education. It is the educator's job to ensure that this is carried out to its fullest potential. This standard is broken down into four subsections:

1. *Encourages all students to believe that effort is a key to achievement.*
2. *Works to promote achievement by all students without exception.*
3. *Assesses the significance of student differences in home experiences, background knowledge, learning skills, learning pace, and proficiency in the English language for learning the curriculum at hand and uses professional judgment to determine if instructional adjustments are necessary.*
4. *Helps all students to understand American civic culture, its underlying ideals, founding political principles and political institutions, and to see themselves as members of a local, state, national, and international civic community.*

Many students have the misconception that they are either born into intelligence or have to do without it. They do not realize that it is their effort that can truly make a difference. Yes, school comes easier to some students, but that does not mean that they are the only students capable of learning and succeeding in school.

When in the classroom, I encouraged all of my students to try their hardest. Even if they were struggling with one concept, that did not give them any reason to give up. I usually operated my classroom under a no-opt-out policy. If a student was asked a question, they needed to answer it. I prompted them, restating and simplifying the problem each time until they got it, but they did not have the option to give up. I noticed that this got students to try harder in class and truly attempt to understand the material, rather than passing off the question to the “smart kids.” Often times students would refuse to come to the board to write up their solution to a problem. I encouraged them to try it, promising that I would help them break it down if they got stuck. Any little effort mattered, and they learned that.

I also had students who wanted to just sit back and relax in my class. As a hard-working student myself, this was hard to deal with. I did not really understand how someone could sit in class and just appear not to care. I had to put myself in their shoes – see that they thought the work was impossible, that other students could answer faster anyway, that they did not seem to think they were capable of getting anything right. I dealt with these students mostly on a one-on-one basis. When students were doing work alone or in groups, I sought out the students who did not like to participate and guided them through more problems. With my scaffolding, they were able to solve more and more problems.

Rasheem was one of the students that seemed to have the most difficulty believing in himself. When I was next to him, he could do any problem he set his mind to, but as soon as I walked away, everything became impossible. He did not want to put in the effort, just to sit back and relax while the rest of the class did the work. By the end of my time at Burncoat, I was able to get Rasheem to see that when he put in effort, his grades improved. The more his grades improved, the more he seemed to see how much effort was required for him to understand things.

Whenever any student needed help, I was an open door. I was available for any questions or support my students needed. No matter which student, what time of day, or what kind of question they had, I was always there to help. Even though some of my students were more motivated than others, I made sure to spend time helping each and every one. I helped any student who was struggling and supported any student who was making satisfactory progress. It did not matter whether the student had a learning disability or if English was not their first language, I helped them all equally.

I used my knowledge of the students in my class to assess how much time certain lessons needed and how to approach new curriculum. The best way to describe this is to compare my honors and college Algebra I classes. Many students in the college level class had IEPs, difficult situations at home, and other issues that changed the rate at which learning could be accomplished. I slowed down my lessons for them because I knew they needed more time to take in more material. If students missed days of school, I

allowed them to make up work and exams without any loss of credit, up to a certain deadline. My honors level class, for the most part, was pretty average. There were some students who were ELLs and others who had difficult situations at home. These students did not make up the majority of the class, but I still tailored instruction to help them. The honors class moved more quickly than the college level class, but I always took extenuating circumstances into account.

While teaching at Burncoat, I had something very out of the ordinary occur in my Pre-Calculus classroom - one of my students, Gary, passed away. This was a huge challenge for me. It affected me personally and also affected the students in my classes, the teachers around me, and other members of the Burncoat community. I slowed down the pace of my instruction to allow students time to mourn and to build our classroom dynamic back up after the tragic event. We took some time to remember Gary the day after we found out he passed away. We sat together and talked about our happy memories with him, coming closer as a class. It was difficult to decide when most of the students were ready to learn again. Eventually, though, I had to start teaching again, still keeping in mind the fragile emotional state of most of my students. I never thought that I would have something like this happen during my teaching practicum, but it was an experience that I definitely learned a lot from.

Chapter 6: Meets Professional Responsibilities

Completing a student teaching practicum is not just comprised of being an effective teacher. Maintaining professional responsibilities and following school policies is also very important. The professional responsibilities standard is broken down into seven subsections:

1. Understands his or her legal and moral responsibilities.

An educator has many moral and legal duties. They must treat all student fairly, teach appropriate and challenging material, follow all school rules and guidelines, respect students' IEPs, and much more. I worked my hardest to fulfill all of these requirements and more. I gave every student an equal opportunity to learn. If a student was struggling, it did not matter what their ethnicity, race, background, gender, social status, etc. was – I was always willing to help. I treated every student with respect on a daily basis. I learned a lot about Burncoat's school policies from being late to class to cell phone use. I followed through with the rules by sending late students to the cafeteria to check in and standing by the procedure for students using cell phones in class. If an issue came up, I checked with my mentors to make sure I was going through the appropriate measures to deal with it. Some of my students had IEPs, so I had to be sure to comply with them at all times. If an IEP said the student could have a calculator or extra time on quizzes that is what they got. Living up to these expectations helped me to realize all of the little nuances that come with being a public school teacher.

2. Conveys knowledge of and enthusiasm for his/her academic discipline to students.

3. Maintains interest in current theory, research, and developments in the academic discipline and exercises judgment in accepting implications or findings as valid for application in classroom practice.

Without personal enthusiasm for a subject, it is hard to get students to buy into it. Many students are faced with the question “When will I ever use this stuff?” It is part of the educator's job to tell them

why the material is important and answer another question, “Why should I care?” My enthusiasm for math started at a young age and I still have not lost sight of it. Math can solve so many different types of problems; ones that you see every day. Math always has an answer – if you know what to do, you can find the best possible solution. I tried to convey this enthusiasm to my students. I made math jokes during class, connected topics back to real life, and overall tried to make the experience fun. Adding in extra challenges and incorporating activities got students more involved and motivated to learn math. I rarely had a student ask me why the subject was important because I had already told them.

As a WPI student, I am always finding more and more math and applications around me. I am broadening my horizons in the field and building my repertoire of knowledge. Since I was still taking classes at the time of my practicum, it was easy to make connections. I will discuss these connections in Chapter 7.

4. Collaborates with colleagues to improve instruction, assessment, and student achievement.

I used my mentors and others around me to bounce ideas off of throughout my experience at Burncoat. We can learn a lot from trying things out for ourselves, but we can learn even more with the guidance of others. When I first started teaching, I took a lot of direction from my mentors. I conducted the class as they normally would. As I became more comfortable with my role, I made some changes in the classroom, adding my own personal touches to the lessons. I touched base with my colleagues frequently, bouncing ideas off of them and asking for advice. I consulted with them when it came to students’ progress, classroom dynamics, new topics to cover, and much more. I ran the quizzes I made by them to make sure that they were the appropriate length and were covering the most important topics. If things were not going well in my classes, my mentors would point them out and work on ways to improve the situation.

For example, one of my students sat in the front row of the class and always asked me a million questions. I was glad that she was so invested, but her questions took time away from other students.

When the class was doing independent work, she would call me over every five minutes to check her work and lead her in the right direction. I knew this was not the best for her – she needed to learn how to solve problems herself – but I did not know how to fix it. I went to my mentor for advice. She advised me to talk to the student about how to work on her own and explain that other students needed my attention just as much as she did. My mentor also said to try to answer less of the questions and give more guidance when help was asked for. I really appreciated this advice and tried it out. By the end of the year, the student was doing her work independently and had increased her grades dramatically. She had become one of the best students in the class. If I had not taken my mentor’s advice, the student may not have improved as much or learned the topics as well.

5. Works actively to involve parents in their child’s academic activities and performance, and communicates clearly with them.

I did not have direct interactions with parents, but I did communicate with them through my mentors. I would tell them when I thought a student was struggling or when they were not doing their homework, and the mentor would communicate with the parent. I had a student who barely paid attention in class and hardly ever did homework. His grades were slipping, so we needed to reach out to his parents for support. Ms. Doyle emailed them and we ended up communicating weekly about the student’s progress. I would have liked more personal interactions with parents to see what they were like, but it did not fit into the circumstances I found myself in.

6. Reflects critically upon his or her teaching experience, identifies areas for further professional development as part of a professional development plan that is linked to grade level, school, and district goals, and is receptive to suggestions for growth.

I took every possible opportunity to reflect on my experiences and the progress I was making while teaching at Burncoat. I learned a lot about disciplining high school students, procedures and protocols, and teaching techniques while I was there. I met with my mentors once a week to discuss how things were going and any changes that needed to be made in the upcoming days. I found this time to be

most valuable. We had real conversations about my strengths and weaknesses. I learned that I connected well with motivated students, but needed to work harder to get uninterested students engaged. I know that is something that I will constantly need to work on. When I met with Ms. Doyle and Professor Goulet after each of my observations, we talked about even more topics that helped me to grow. I am very thankful for all of the feedback that I received and plan to look for more as I continue on with teaching so that I am always growing as an educator and as a person.

7. Understands legal and ethical issues as they apply to responsible and acceptable use of the Internet and other resources.

In math classes, it is not that typical to find plagiarism as an issue. However, some of the written assignments that I gave came from old MCAS exams. To combat the idea of students “googling” the answers, I used the actual questions as the practice in class and made problems with different numbers for homework. That way, if students were looking for answers online, my problems were different enough that they could not easily copy solutions from other places. I understand how serious plagiarism is and know that it is not acceptable in the classroom.

I used many resources while developing lesson plans for my classes. These ranged from textbooks to online sites with worksheets and practice problems. I learned one valuable lesson from this – you cannot always trust what you find online. I found an activity for the students to do in class on the internet and decided to use it without double-checking it. The students went to do the activity in class, and it did not work out. Some of the problems had the wrong answers, so they could not find the matching pieces to the puzzle. I talked to my mentor about it and she told me that she always double-checks those types of sources because she had run into those issues before. After that I made sure to check all of my online sources before bringing them to class. Overall, though, I found many valuable resources online and in books that strengthened my lessons and brought more perspectives to my students.

Chapter 7: My WPI Education

WPI's motto is "theory and practice." My teaching practicum was a perfect example of living out this motto. I took the knowledge I gained from my coursework at WPI and applied it during my practicum. From mathematics classes to pre-teaching required courses, all of the knowledge I gained became applicable during the practicum.

As a mathematical sciences major at WPI, I have gained a broad background in mathematics, which I was able to use while teaching at Burncoat. Though the classes I have taken at WPI are much more advanced than those I taught to high school students, the basic properties were the same. I was able to inform students of the uses of the topics we covered. I took classes, such as linear algebra and linear programming, which incorporated systems of equations. The problems I completed in my courses were obviously more complicated than the systems I introduced to my algebra classes, but the basis of information were the same.

I introduced a lot of basic trigonometry concepts to my pre-calculus class that are used in higher level math courses. All of my math courses at WPI have assumed that I have a solid background in trigonometry. I made sure that I highlighted the importance of understanding trigonometry to my pre-calculus class. Through my experience as a Peer Learning Assistant for Calculus I and Differential Equations at WPI, I have noticed how many high school students do not have solid backgrounds in trigonometry. My goal was to help my students gain the knowledge they will need to be successful in the future. I was able to come up with interesting applications for problems based on the classes I have taken at WPI.

The required courses for the teacher preparation program were even more applicable to my practicum. The teaching methods course gave me insight on different ways to reach out to students, deal with tough situations, keep students engaged, and more. I used the lesson planning techniques that I

learned to keep organized throughout my practicum. I used the “No-Opt-Out” strategy and “Peppering” to keep students engaged and ensure that all of them were involved in the classroom. I learned how to deal with disruptive students and developed that skill even more throughout the practicum. I received useful advice from the professors and was able to reach out to them for help during my practicum.

The Sheltered English Immersion course that I took helped me interact with many different types of students. I learned the importance of knowing background knowledge, explaining vocabulary, and using varying examples in class. I always tried to use word problems that all students could relate to, no matter what their cultural background was. I introduced new vocabulary with examples, breaking down the terms into simpler words that students could all grasp. I caught all students up to speed on prerequisite material and slowed down when gaps occurred. Teaching students who did not speak English as their primary language was challenging, but the SEI course I took made it easier.

One of the large ways I have broadened my teaching knowledge while at WPI is observing professors and teaching assistants. I have had a wide variety of educators during my time at WPI – some good and some bad. My favorite professors were the ones who went out of their way to help students, so I have adopted that sort of mentality with my students. I strive to create relationships with each of my students so that they feel comfortable coming to me for help with coursework as well as advice in life. I have learned that lectures that go for the entire duration of class are not as effective as a class that is broken up by activities. Showing excitement while teaching is contagious and can get students excited about almost anything. I have learned that it is important to give students some leeway when it comes to assignments and deadlines. I have had professors who were understanding with extenuating circumstances and others who have not. It is much easier to respect a professor who respects their students and is willing to go the extra mile to help them succeed. Pacing is also very important in the classroom. If a teacher is going through material too quickly, it is hard for students to keep up and understand new concepts. I checked in with my students as I taught so that they were all on the same page

and following my instructions. One of the best ways to learn how new and effective methods is through observing others, which I had many opportunities to do at WPI.

Chapter 8: My Classroom Dynamics

Period 1: College Level Algebra I

When I first sat in on Ms. Farrington's Algebra I class I noticed that there was a wide variety of students in the room. From those who paid attention and did very well, to those who disrupted learning, and everyone in between, the whole scene had a lot going on. At first the students seemed to fall into distinct categories, but as I got to know them more, I learned that they all had many sides to them.

Alexis and Katherine are strong students. They understand the material most of the time and were usually willing to help out other members of their class; at least that was my first impression of them. When it became my turn to teach, they started to fight back. Neither of them liked change, and I was a change. They stopped participating in class and gave me attitude during my lessons. They fed off of others' negative energy and if they were having a bad day, everyone knew about it.

Julia, Taylor, and Johnelle have learning disabilities that allowed them to use calculators to solve problems and get extra time on assessments. That is about where their similarities end. Julia has Asperger's and never liked being called on. She almost always knew the answer or at least most of the steps to get to it, but refused to participate in class. She would give me attitude if I tried to get her to participate and did not like working in groups. Taylor was very talkative. I could easily find out all of the gossip in the school by listening to her in the ten minutes before class began. She had a different boyfriend every week and loved to talk about them. When it came to school work, she struggled. Her motivation just was not there. If kept on task, she could usually accomplish a lot, but that was the hardest part. Her social life clearly took preference. Johnelle loves Justin Bieber. If class covered Justin Bieber as a topic, she would be a straight A student. However, when it came to math, she did not want to put the effort in. She had attitude and gossiped with Taylor most of the time. She had little respect for authority and failed almost every assignment. Her negative attitude was often magnified or reflected by Samantha.

Samantha was the largest source of problems in my class. She did not know what respect was, but demanded it from everyone around her. If she was having a bad day, no one else was allowed to have a good day. Samantha loved to be the center of attention and cause drama all around her. Once when I disciplined her, she said “Good, I wanted to put on a show.” She was a few times larger than me and a pretty intimidating angry person. Confrontation with her did not go lightly. She wanted everyone to take her side and felt nothing was ever her fault. Amber often fed into these scenes.

Amber, when she came to class, was a great student. She was compassionate and loved to help others succeed. However, about half way through my time teaching Amber stopped showing up to class. She would make it to about one class a week, putting her in danger of not passing any of her classes. She did not understand why we were moving so fast, but it was because she missed key lessons in between egged on and encouraged by other students in the class. Her attitude was almost unbearable. Amber was one of my favorite students to work with because she was so helpful to other students, but by the end of my time at Burncoat, her attitude had changed so much that she became a detriment to the class.

Kingsley was quiet and hardly ever noticed in class. He was a strong student who preferred to work alone, but would work with others when asked. English was not his primary language, but he truly excelled in math. I learned as my practicum bore on, that Kingsley and Samantha had a history. She had cheated off of him multiple times in the past and he did not do anything about it. He was a kind soul who did not want to confront another student, let alone one as tough as Samantha, and was scarred by the experience. When I was rearranging seats, I did not know of this history, so I put the two of them next to each other. It seemed like a logical step since he was quiet and she was loud – it separated Samantha from her friends. On the first day of the new arrangement I noticed his discomfort. I spoke with Ms. Farrington about it and she filled me in. I ended up moving Kingsley’s seat to make sure that the classroom environment I was creating was productive for all students.

Jessica was an average student. She could do well if she put her mind to it and checked her answers. We developed a relationship quickly since I sat near her during my observation hours. She would ask me for help or to check her work frequently. She was often on the right track, but had made algebra mistakes along the way. She was caring and helpful and seemed to truly enjoy school. She was a blessing in the classroom of craziness.

My class contained many other students that added to the dynamic. Some joined late or left early due to their foster care situations or behavior issues. Others stayed but did not contribute much to the classroom dynamics. They were either quiet, sleeping, or never there. Pulling this diverse group of students together to learn was a challenge for me. I had not imagined such a wide variety of students in one room all reaching toward the same goal. I learned a lot from this group and would not have changed a single thing about it.

Period 3: Honors Level Pre-Calculus

My pre-calculus class was made up of juniors looking to take advanced placement courses and seniors completing their math requirements. Most of the juniors were motivated to learn, while most of the seniors struggled and were losing hope. It was my job to pull these two groups together into a cohesive classroom environment that met the curriculum goals.

Zaidimary was the typical overachiever. She knew everything almost before I taught it and was always willing to answer questions or solve problems. She was one of the people who made me have to ask “Is there anyone else who can answer the question?” She was a pleasure to have in class because she propelled us forward and asked more though-provoking questions, but it was hard to keep her entertained and everyone else up to speed.

Crystal and Rufina sat on the opposite side of the room chatting. They were social butterflies who never came to class on time and were never afraid to ask for help. I spent most of my time while students were doing independent work at their desks. They just needed some guidance and a confidence boost.

Once they got going, they could typically keep the momentum going. But every day, I found myself at their desks repeating what I said at the board and asking them to put their cellphones away and pay attention.

Brian and Matthew sat in the middle of the room whispering back and forth. No matter how many times I told them to stop, they would continue on. Sometimes their conversation was about the work at hand, but most times it was not. There was a constant hushed whisper coming from their direction. Matthew usually had the material down, though he was attached at the hip with his calculator. He did not understand why he could not use it all of the time. Brian hardly ever did any work, or showed up to class, for that matter. The two of them brought each other down, but I tried to bring them up. I would call on them frequently in class to make sure they were paying attention. I stopped by their desks to help them with problems. I contacted Brian's mother when he was failing to turn in any assignments.

Morgan, Caroline, and Allison sat in the back of the room and worked together frequently. They helped each other out, and for the most part had positive outlooks. They asked for help occasionally, but mostly relied on each other for learning. They were an independent team that needed little attention or guidance. About halfway through my time at Burncoat, Caroline got a concussion. I learned about the difficulties of students missing class due to medical reasons. I provided her with make-up material and helped get her up to speed when she returned to school. Even though she came back, some of her symptoms remained. She was not able to take tests or sit in class for too long. One day she even had to be taken to the nurse. This experience provided a good example of how students' needs come first, and although it may not be convenient, helping them catch up is extremely important.

Alexis was a very social student with a large personality. She commanded the room and made friends with everyone. She completed her work quickly to make time for conversation when she was done. She helped her friends out, but did not believe in herself as much as she could have. She was a joy to have in class and always lightened the mood.

Overall, this class was a well-behaved group. They were quiet most of the time, but also knew when to have fun. On March 25th everything changed. Gary Abaka Amuah, a dedicated member of our class, passed away. His death was sudden and it took the whole school by surprise. Gary was a quiet student, but one who stayed on task. He played on the basketball team and even went to elementary school with my brother. I never thought that this would be the type of situation I would be dealing with during my practicum. There were memorial services and our class took some time to heal. It was a tough road, but one we had no choice but to go down. I learned a lot about classroom dynamics at this time and do not regret teaching this group of students one bit.

Period 4: Honors Level Algebra I

This class had quite the cast of characters. From hardworking, dedicated students to complacent teenagers to delinquents who skipped class regularly, we had it all. Managing the overall class dynamic was a challenge, but each student brought their own personal touch and challenge to the classroom.

A majority of the students were strong in mathematics. Linzi, Sarah G, Sarah M, Manny, and Alswell grasped concepts quickly, no matter what they were. Sarah G transferred into the class later in the year, but picked up on everything right away. She finished every assignment before everyone else and was willing to answer any question I asked. Alswell was a sophomore in a class full of freshmen. However, he truly excelled. His English was not perfect and he was shy most of the time, but his work showed how much he improved and continued to grow over time. Manny was a rusher. He wanted to get everything done, prove he knew the most, and work on homework for other classes. He knew that he knew the material and did not like to take time to check his work. This sometimes meant he lost points on tests for silly mistakes, but he did not really care.

On the other end of the spectrum stood Honesty, Rasheem, Angel, and Veronica. None of them wanted to put in any effort to learn. Honesty was always talking about her boyfriend or the latest gossip, turning around to talk to anyone nearby. Rasheem struggled a fair amount. He needed constant

encouragement. Even when he knew what to do, he would doubt himself. It seemed like he spent a lot of his life being told that he was wrong or being led to believe that he was stupid. Angel, when he came to class, was disruptive. He riled up the group and never stopped talking. Most days he skipped class and then would be completely lost when he came back. I had to learn to guide him into the next steps, reviewing a bit of each class along the way. I had to write him cut slips many times, which was another lesson to be learned.

Veronica may have been the most difficult student in the class. She had less motivation to be in school and learn than I have ever seen. She refused to do classwork, homework, and sometimes even quizzes. It was hard for me to watch someone who did not care as much as she did. She was rude during class and often distracted those around her. When other students were working, she was telling them stories or trying to show them pictures on her phone. One day, she was taking a quiz and decided that she did not know how to do the problem. I knew that she knew it, since I had seen her solve a similar problem the day before. It got to the point where she continually refused to answer the question, though I kept prodding her. She wanted to hand in her quiz incomplete and I had to let her. It went against my instincts to let a student give up, but there was truly no hope in fighting her. Many notes went home to her mother attempting to make an impact, but very little progress was made while I was there.

Tyler and Brett sat in the back of the room. Tyler never talked during class, but seemed to be trying during independent work. It was difficult to get him to engage during discussions and when I approached him individually, he never seemed to have much to say. He was one of the students that I focused on getting involved. My goal was to get him to raise his hand once in class. He worked well with other students, such as Rodney, so I let the two of them work together frequently. Brett let his mind wander on a daily basis. Unless I was standing next to him watching him do work, he did nothing. He needed constant prodding and redirecting. He missed classes for fieldtrips and always fell behind. I eventually came up with the strategy that while I was helping other students with their work, I would say

“Brett, how’s it going?” This got his attention enough to get him more focused and at least looking at his paper and attempting to solve problems.

I formed a great relationship with this class. Krystal and Tamara always asked me personal questions about my life because they wanted to get to know me. I answered some of their questions, but had to field some of them when they got too personal. Overall, even though this class was challenging, it was a very fun group. I learned from each student and was able to make relationships with them by the end of my time at Burncoat.

Conclusion

I have demonstrated that I have achieved competency in each of the five professional standards: Plans Curriculum & Instruction, Delivers Effective Instruction, Manages Classroom Climate & Operation, Promotes Equity, and Meets Professional Responsibilities. My experience during my teaching practicum at Burncoat Senior High School has given me insight into how to be a successful educator. I fully intend to continue to learn and to grow from those around me and myself throughout my journey as an education in Massachusetts.

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Appendices

Lesson Plan

Multiplying Polynomials – Algebra I

Multiplying Polynomials

Period 1: Algebra I

4/28/14

Do Now:

Distribute.

1. $4(3x^2+2x+1)$
2. $4x(7+2x^2+3x)$
3. $8y(2x+4y)$

Motivation:

Before vacation we learned how to add and subtract polynomials. Now we'll learn to multiply them. This will take our exponent rules and combine them with our knowledge of polynomials.

Instructional Objectives:

Students will be able to

1. Make connections between exponent rules and polynomial multiplication.
2. Multiply polynomials using
 - a. distribution,
 - b. column multiplication, and
 - c. FOIL.

Development of the Lesson:

- Multiplying a monomial and a polynomial
 - Just like Do Now – just distribute
 - Let's try another
 - $2x^3(x^3+3x+4)$
 - $x(4x+7)$
- Multiplying polynomials
 - Distribution
 - $(b^2+6b-7)(3b-4)$
 $= b^2(3b-4)+6b(3b-4)-7(3b-4)$

$$= 3b^3 - 4b^2 + 18b^2 - 24b - 21b + 28 \quad (\text{combine like terms})$$

$$= 3b^3 + 14b^2 - 45b + 28$$

- Column Multiplication
 - $$\begin{array}{r} b^2+6b-7 \\ \times \quad \quad 3b-4 \\ \hline -4b^2-24b+28 \\ + 3b^3+18b^2-21b+0 \end{array}$$
 - Multiply like normal numbers
 - We get the same answer as before
- Try another problem with column and distribution methods
 - $(2x^2-5x+1)(4x-3)$
 - $(6x-4)(10x^2-2x+7)$
- Multiplying binomials
 - FOIL – way to distribute
 - First
 - Outside
 - Inside
 - Last
 - $(2x+3)(x-4)$
 - Try these on your own
 - $(x+5)(3x-2)$
 - $(4x+2)(7x+1)$

Accommodations:

As always, gauge student understanding as lesson progresses. Go through more examples together if students are not getting it. Give more advanced students the extra problems if they finish quickly. May not get to FOIL method, save for next day so students aren't overwhelmed.

Material of Instruction:

Chalkboard, chalk

Summary:

Now we have learned a little bit more of what we can do with exponents, binomials, monomials, and polynomials. Students should be confident on their homework with the many examples given in class.

Homework:

Worksheet started in class with examples. Complete odds for homework.

Activities/Homework

Substitution Writing Assignment – Algebra I

NAME _____

Sarah and Mary are going to walk in a fund-raising event to raise money for their school.

- Sarah’s mother promised to donate to the school \$5 per mile that Sarah walks, plus an additional \$40
 - Mary’s father promised to donate to the school \$3 per mile that Mary walks, plus an additional \$60
- a. If Sarah walks 10 miles during the event, what is the total amount of money her mother will donate? Show or explain how you got your answer.
 - b. Write an equation that represents y , the total amount of money Sarah’s mother will donate if Sarah walks x miles during the event.
 - c. Write an equation that represents y , the total amount of money Mary’s father will donate if Mary walks x miles during the event.

After the event, Sarah and Mary compared their results. Sarah had walked the same number of miles as Mary. Sarah’s mother had donated the same amount of money as Mary’s father.

- d. Using your two equations from parts (b) and (c), determine the number of miles Sarah and Mary each walked during the event. Show or explain how you got your answer.
- e. Using your answer from part (d), determine the total amount of money Sarah’s mother and Mary’s father **each** donated. Show or explain how you got your answer.

Binomial Multiplication Scavenger Hunt

Set-Up:

- Cut apart each row of expressions and place on different desks throughout room
- Give students paper and break them into pairs

Directions:

1. Pick one desk to start at
2. Write down the binomials on the left and multiply them together
3. Once you find their product, write it down and find it on another desk in the room
4. When you find it, write down the binomials there and repeat
5. Activity ends when you have visited all desks and multiplied all binomials

$(x + 2)(x - 3)$	$6x^2 + 31x + 28$
$(2x - 6)(x - 1)$	$x^2 - x - 6$
$(4x + 7)(2x + 3)$	$2x^2 - 8x + 6$
$(x - 5)(2x - 6)$	$8x^2 + 36x + 21$
$(3x + 1)(x - 8)$	$2x^2 - 16x + 30$
$(x + 6)(x + 4)$	$3x^2 - 23x - 8$
$(5x - 4)(x - 2)$	$x^2 + 10x + 24$
$(x + 4)(6x + 7)$	$5x^2 - 14x + 8$

Quizzes/Tests

Verifying Trigonometric Identities – Pre-Calculus

Verifying Trigonometric Identities – Quiz

NAME _____

Verify the following trigonometric identities.

$$1. \frac{1}{\tan\theta + \cot\theta} = \sin\theta\cos\theta$$

$$2. \sin^2x - \sin^2x\cos^2x = \sin^4x$$

$$3. \tan\theta\cot\theta - \cos^2\theta = \sin^2\theta$$

$$4. (\cos x - \sin x)^2 = 1 - 2\cos x \sin x$$

Chapter 8 Exponent Rules – Quiz

NAME _____

Simplify the expression. Write your answer using exponents.

1. $8^2 \times 8^3 =$

2. $(-3)^4(-3)^2 =$

3. $(6^3)^5 =$

4. $[(-2)^2]^5 =$

5. $(16 \times 7)^4 =$

6. $4^3 \times 4 \times 4^5 =$

7. $\frac{9^{12}}{9^5} =$

8. $\frac{2^7 \times 2^8}{2^3} =$

9. $\left(\frac{3}{2}\right)^6 =$

10. $(5^3 \times 5^4)^2 =$

Simplify the expression.

$$11. x^3 \times x^7 =$$

$$12. -(y^7)^2 =$$

$$13. (a^2)^4(3a^5) =$$

$$14. \frac{1}{x^2} \times x^{17} =$$

$$15. \left(-\frac{y^5}{2}\right)^4 =$$

$$16. x(3x)^3 =$$

$$17. (2x^6y^5)^4 =$$

$$18. \left(\frac{a^5}{a^2}\right)^5 =$$

$$19. (2x^3)(3y^2) =$$

$$20. \frac{x^7y^{10}z}{x^2y^6} =$$

$$\text{Bonus: } \left(\frac{4a^3t^5}{at^{-1}}\right)^2 \left(\frac{-2at^2}{t}\right)^4 =$$