Standard One
Subject Matter

Growth toward standard

There was a front-page article in the *Star Tribune* while I was student teaching about the math wars taking place in our nation. It quoted a mother, who was mentioned as a mediocre math student in high school, reporting, "math is memorization." I continued reading the article until I realized that the author was agreeing with this quote and using it as a piece of evidence in the discussion of the math wars. I set the paper down and reflected what this piece of journalism meant to me as a math teacher.

At first I was outraged by the idea that a newspaper, such as the *Star Tribune*, would put such emphasis on a quote from someone other than a mathematician. Then I was saddened by the notion that anyone could believe that math is memorization. What are we doing wrong as math teachers, to project this idea onto the students? One reason is that we encourage students to memorize procedures and concepts, due to lack of time and resources, instead of understanding their validity and derivation. My last emotion consisted of motivation and determination. Students need to learn how to think mathematically. If they cannot do this, then yes, math is memorization. If they learn how to think mathematically, memorization goes by the wayside, and understanding takes over. When the students genuinely understand a math concept, they can use it to further understand and discover another concept. However, if the concept is memorized instead of understood, using it to learn other concepts becomes a difficult task. It is my job as a teacher to help the students think mathematically, and in turn, forget about memorization.

Mathematics is a subject that is built from previous concepts. Once a concept is learned, it will be used continuously in the further study of math. Also, there are frequent incidences when the procedures for one concept can be applied to another concept. This really became evident to me while in Maple Grove. We would be covering a new concept and the students were doing just fine until they ran across a manipulation with a fraction. The students have a recurring difficulty using fractions. Instead of learning how to deal with fractions, the students continue to depend on the teachers to tell them the answer and hope they will not have to work with fractions again.

From my observation of the Maple Grove math department, I found two reasons, besides student effort, for the students' insufficient abilities with the operations of fractions. The first was the curriculum used. The textbooks do not require the students to develop a complete understanding of the function of fractions. The second reason is that the teachers reinforce the students' inability by constantly reminding the students "they cannot do fractions." The teachers have discovered the shortcomings of the curriculum, have tried to fix it, but reverse any attempts by verbally implying that the students will not be able to do fractions. If a person is continually told they cannot do something, they will accept it as a truth they cannot change. From this I have learned that it is extremely important as an educator, to evaluate the present curriculum and develop any supplements that may be necessary to insure a complete and quality education for the students. Also, while implementing any new material or observing any insufficiencies, it is necessary to verbally encourage and express confidence in the students' abilities. It makes a world of difference if the teacher expresses confidence in the students' success instead of reminding them of their shortcomings.

From my own experience as a student and my experiences as a tutor and a teacher, I have come to realize the importance of different viewpoints and explanations. Not everyone has the

same knowledge bases, and not everyone looks at math concepts the same way, which is perfectly fine. Math is a subject that can be approached from many different angles. This first became very evident to me when I arrived at Maple Grove during my observation time. I noticed that some of the students did not understand the approach the teacher was using. However, when I showed them another approach, their eyes lit up with understanding. From this I realized that I need to incorporate different approaches and viewpoints in my lessons. As I did this throughout my student teaching, I found that it not only helped more students understand the material, it also helped challenge the students to think critically and make connections between the different approaches.

A popular question heard in math classes around the country is, "why do we have to learn this?" It is a teacher's responsibility and one of my goals to never let this question go unanswered. By the time a student graduates from high school they should have a fundamental understanding that once math is learned and understood, it is applicable everywhere. Not only is the math applicable, but also the connections in the brain made when learning math provide avenues for thinking and problem solving later on in life.

Evidence

Included in my evidence is a Calculus I test. This test shows my ability and mastery of Calculus. It is imperative to have a firm handle on Calculus since the class is taught more frequently in high schools as the years progress. I find Calculus to be one of the best indicators of a person's understanding of previous math subjects. Trigonometry, geometry, and algebra are used extensively in Calculus, and without a firm grasp of these subjects, Calculus becomes exponentially harder. As can be seen by the specific problems in the test, I understand the characteristics and applications of the graphs of functions and the use of Calculus to solve real-world problems such as problem 3. The reason I chose this exam for evidence was not only because of its demonstration of my ability with Calculus but also because it shows that I can effectively use Mathematica. Mathematica is an important computer program that can be used to solve problems in Calculus, among other subjects. As can be seen by the title page of the test, there are a few problems that would have taken too long to solve by hand, and so I used Mathematica to solve these problems. I have found Mathematica to be a most useful tool in the last four years. I have used it to solve difficult Calculus problems and to view the plot of complex graphs. It can be used in high schools to show a better picture of graphs than what can be drawn by hand. It can also be used to allow students to solve difficult problems much easier, thus giving them more time to spend on the higher-level thinking related to the subject. Although Mathematica may not be available everywhere, it is very similar to other math programs and so I will have little difficulty adapting.

My second piece of evidence is a series of lesson plans I used while student teaching in Maple Grove. The first item to notice on the lesson plans is the section for establishing set. I found that establishing set is very important for introducing new ideas and concepts. Using what the students already know, it becomes a smooth transition and an easy connection for the new material. During these lessons, it was important to me that the students could connect all the information of the three days. To do this, I asked the students at various times to work on their own to either practice using the new material or to make a connection on their own. This not only allowed the students to think independently, but it also gave the students a chance to share their ideas and see other viewpoints. The activities were very useful in that it allowed students to find a way that made sense to them and explore it further. In fact, my goal as a teacher is to find

a way that everyone can understand the material, which many times means that I teach the different viewpoints and perspectives that accompany the concept.

My third piece of evidence is a worksheet I collected from Maple Grove that can be used as a supplement for celebrating Pi day. I am including this worksheet as evidence because it is a really good example of a way to include other disciplines into class. To celebrate Pi day, which is March 14th, the students can fill out the worksheet, which has them find related words in other languages, and also includes the history of Pi. There are many other activities that can be used to celebrate Pi, such as writing a poem and creating artwork. The entire school at Maple Grove got involved with Pi day, which was fun to see. It is important to find ways to find interdisciplinary exercises that help students find connections in their classes and find answers to why they are learning the material in the first place.

Goals

I am excited to continue learning new things within mathematics. Some day in the future I may return to school to get a masters in mathematics. This is only a possibility and not a definite goal because I may want to get a masters in education instead. Another way I am going to continue my learning is by subscribing to a mathematics journal. I will most likely subscribe to The College Mathematics Journal. This is the journal that I have had the most exposure to and I find the articles and research very interesting. It may not be entirely useful for the math classes that I will be teaching, but once in a while there are ideas for problems that can be used at a high school level, especially an AP Calculus course. The journal contains various research articles, ideas for added research, challenge problems, ideas for math projects, and much more. Some of the many articles include the golden ratio, the history of Calculus, and the mathematical theory behind chess. Other magazines include the Mathematic Magazine and the Mathematical Gazette. I have no doubt that a mathematics magazine will be an excellent tool for me to continue learning about the many wonderful theories and ideas in mathematics.

I am also looking forward to improving some of the content I bring to class. Of course I will be teaching the math involved, but I also want the students to be exposed to the history of math and some of the most important mathematicians of the past and present. To do this, I plan on reviewing my notes and book from the history of mathematics course I took while at UMM. I hope to compare this information with the curriculum so that I can incorporate the appropriate history into my classes. Besides incorporating history, I would also like to never leave my students wondering why they are learning the material. To do this, at the beginning of the year I will address the reasons students learn math. As the year progresses, I would like to set aside time for each unit in which the students and I explore how this math is useful to not only them but other professions in the world. It is important that students always know why they are learning something.

Standard 1: Subject Matter

Growth and Progress

Kindergarten provides the perfect palette for the art of subject matter development and integration. Because the children do not pigeonhole an experience into a specific subject area, wise teachers must find creative ways to blend multiple areas of study into exciting, applicable learning experiences. I have learned much about subject matter and its application during my time in the classroom. Although my main areas of growth and progress intermingle, it is possible to divide them into four main areas for the sake of an organized analysis. First, I will discuss my growing understanding of the importance of resources. Second, I will examine the blossoming of my instructional flexibility. Third, I will consider my understanding of the role of conceptual frameworks and misconceptions. Finally, I will explore what I feel to be my most important area of growth—the integration and application of subject matter to real-life learning experiences.

First, I will reflect on my growing understanding of the importance of using a wide array of resources and teaching materials. Even though I had taught preschool for several years before I entered the teacher education program at UMM, I felt intimidated by the massive amounts of resources that suddenly became available to me. Instead of feeling freed by the endless possibilities embodied by the curriculum library, the Internet, and beyond, I felt overwhelmed. It seemed as if I would never be able to master ERIC, Lightspan, Marco Polo, and other resources to a degree where I could use them with ease in my lesson planning. There was so much that I felt like I had to know to be a good teacher that I did not know where to start.

Through time, I have become more comfortable with my ability to extract applicable subject matter information from a multitude of resources. This ease came over the course of many months, as I realized the incredible importance of quality, reliable resources to my teaching. I discovered that I *had* to go the extra mile to be the best teacher possible. Gradually, throughout my practicum experiences, I began to "think outside the basal" and I realized that this wealth of available information is a good thing, and that I do not have to know everything about every subject before I can be an effective teacher. Indeed, I recognized the importance of lifelong learning for my students and myself. Now, I gladly seize new opportunities to learn about new resources—human, technological, written, and more—to enhance my understanding of a variety of subject matter and to improve my teaching. This leads to my next point, which concerns the increasing flexibility of my use of subject matter.

Second, I will discuss my increased flexibility in dealing with subject matter. When I began the program, I did not have a true understanding of the variable nature of subject matter. I would research a subject extensively when planning a lesson, and then I would come into the classroom with my lesson plan and assume that I knew enough to adequately teach. When students asked questions that stemmed from the topic but were not in my plan, I did not readily see the relevance to the lesson. Now, I realize that the fluid nature of knowledge is such that one cannot anticipate where a discussion of any topic may lead or what questions may arise. Indeed, the importance of questions that

arise from a discussion often outweighs the value of a preplanned lesson. This understanding shows in the nature of my lesson planning. I still research topics extensively, but my lesson plans demonstrate qualitative differences. My plans are incredibly fluid in nature, leaving ample room both for meeting the individual needs of learners, and for following the natural flow of the learning process. For example, the science curriculum I wrote, called "Earthworms," directs the teacher to follow the interests of students and to provide resources that inform those interests. In summary, I have learned that a teacher does not have to sacrifice preparedness for the sake of flexibility.

Third, I will explore my increased understanding of conceptual frameworks and misconceptions. This represents a huge area of growth for me, considering that I did not even know what these words meant four years ago. I went from not even considering misconceptions to anticipating them, planning for them, and centering learning experiences on them. For example, when I wrote a preprimary unit on water last year, I did not even take misconceptions into consideration. Looking back on that unit, it seems inadequate without that important piece. This year, on the other hand, when I wrote a unit on sight and touch, I researched possible misconceptions and prepared for them. Since I got to teach several lessons from this unit during my student teaching experience, I know that my provisions for alternative conceptions helped many students accommodate new information. I now have a more sophisticated understanding of how alternative conceptions must be consciously deconstructed in an inquiry-based manner in order to clear a path for new understandings.

Finally, I will illustrate my understanding of the importance of integrating subject areas. As stated earlier, students do not experience one narrow subject at a time. A child would not categorize a visit to the vet clinic, for example, as "social studies." She would instead experience it as a complex interaction of language, animals, sensory stimuli, technology, community, and many other components. Therefore, it does not seem natural for teachers to segregate subject matter into separate areas of the curriculum. Throughout my study of teaching methods and my experiences in the classroom, I have grown in my understanding of the importance of creating holistic learning experiences that are modeled after real life. My lessons have been fairly integrated since the beginning, but my increased understanding of brain research and effective instruction has heightened my commitment to blending subject areas and real life. Kindergarten has been an excellent place to implement integrated curricula, such as my 2-week unit on the five senses, because these young students have not experienced much departmentalized instruction, and they still see experiences very much as wholes. My experience has been that integrated instruction works very well, and my hope is that it will spread throughout P-12 education.

Evidence

All three pieces of evidence that I selected to illustrate my understanding of subject matter are lesson plans that I taught in kindergarten at Lincoln Elementary School in Alexandria during my student teaching experience. All three lessons demonstrate my progress in understanding and implementing a variety of subject matter areas.

I taught the first lesson, which is called "Seeing is Not Always Believing," as a part of my two-week unit on the senses. During the lesson, students begin to understand that their sense of sight is not always reliable when identifying how something will taste. Students made hypotheses about what the four mystery substances were, and then tasted them to find out. This lesson demonstrates my growth in understanding of subject matter for several reasons. First, it displays my understanding of alternative conceptions. I designed this lesson specifically to challenge students' alternative conception that one can identify a substance by appearance alone. The success of this challenge is evident in the student assessment. Second, this lesson connects multiple subject areas and applies them to everyday life. I integrated math, science, art, cooking, writing, and reading into this lesson, which itself has great relevance to real life. Third, this lesson caters to many different learning styles through its inclusion of multiple subject areas and methods of instruction. Finally, this lesson engages students in generating knowledge and testing hypotheses according to methods of inquiry and standards of evidence used in the disciplines of math and science.

The second lesson I included, "Home Free: Why Do We Need Sight?" was also a part of my five senses unit. In this lesson, students explore the sense of sight through hands-on activities and discover what it would be like to be visually impaired. This lesson exemplifies my understanding of subject matter in several ways. First, this lesson is interdisciplinary and relates to real life. Students learn about their sense of sight through science, math, art, social studies, language arts, and physical experiences. Additionally, students glimpse what it would be like to be visually impaired—a real life experience. Second, this lesson covers a variety of subject matter but remains open and flexible to new areas of discussion and student interest. Third, this lesson uses varied ways of knowing (including tactile/kinesthetic) and methods of inquiry to teach the subject matter concept. Finally, this lesson encourages students to understand, analyze, interpret, and apply ideas from various perspectives (including that of a person with a visual impairment).

The third piece of evidence I included is a math lesson called "How Big Is A Foot?" which I designed to teach non-standard measurement. In this lesson, students read *How Big Is A Foot?* which chronicles the creation of the standard foot measure, and engage in a variety of non-standard measuring activities. This lesson displays my growth in understanding subject matter because I took a dry, one-subject lesson from the kindergarten mathematics curriculum and turned it into an engaging interdisciplinary activity. I combined history, mathematics and language arts and applied these subjects to the real-life task of measurement. Additionally, I implemented a variety of teaching strategies (storytelling, writing, measuring, discussing, etc.) and used them to reach a diverse group of learners.

Goals

I have two major goals concerning Standard 1: Subject Matter. My first goal is to develop a multifaceted and thorough understanding of the subject areas related to library science and media studies. I have always been very interested in the knowledge, skills, and methods of inquiry involved in these pursuits. I believe that a comprehensive understanding of the issues surrounding literature, media, and technology is valuable to

any educational professional. I will have the opportunity to advance toward this goal in the fall when I begin working toward a M.S.E. in Instruction and Library Science at the University of Wisconsin-Superior.

My second goal relating to subject matter is to continue to be a lifelong learner. I hope to "stay fresh" on subject matter long after I have finished college. I hope to maintain an up-to-date understanding of the major concepts, assumptions, debates, and the latest research in the field of education. Not only is lifelong learning essential to a successful teaching career, but it also shows students that learning is an intrinsic pleasure to be pursued and enjoyed ad infinitum. I hope to accomplish this goal continually throughout my life by actively seeking out new opportunities to learn and grow in graduate school, my career, and beyond.