Module 2 – Planning

Math 9 – 12

Initial Summary

Currently, I have two Algebra 2 classes, one Pre-calculus class, and two Algebra 1 Support classes. All of my classes have been working on topics that occasionally do not have real-world applications to engage students. The upcoming units have great potential to be extremely relevant to students, but I need to increase my understanding of those applications and thereby implement more relevant lessons. My end goal is to create units that are comprehensive, relevant, and get students to think critically while learning about a specific math concept. I want to be able to make real-world connections to the content and increase student desire to learn.

New Learning

My learning plan for this Planning module included reading Great Ways to Differentiate Secondary Mathematics Instruction by Small and Lin, researching Tomlinson's approach on student choice, discussing ideas with my mentor, and having discussions with colleagues about specific math concepts and the applications. I also participated in spearheading an interdisciplinary unit in which I collaborated with colleagues across the disciplines to learn a lot about planning and coordinating an interdisciplinary unit. The first concept I took away from all of my studies is assessing students' prior knowledge is essential when planning. It helps to determine how much your students know and also help mold the unit at hand. The second idea is the effectiveness of allowing my students some form of choice and freedom in their learning activities. The last new learning was how to implement an interdisciplinary unit and how

important communication can be to plan a successful unit. Each of these new learnings have shaped me into a better planner and have given me useful ideas to implement in future planning.

Before this module, I was struggling with identifying my students' prior knowledge. I learned that trying to activate and assess them prior to a unit can lead to a better understanding of their knowledge. Especially for an exponential growth and decay unit, some students might have a science background. Through conversations with my mentor and reading Great Ways to Differentiate Secondary Mathematics Instruction by Small and Lin, I found some ideas on pre-testing students to see what they know and also what they can tell me about other topics. Perhaps I find a student knows a lot about the science they are in and it can relate to math in the upcoming unit. Before a unit, I decided I can give a pre-test to see what students know about exponential growth and decay and this will help me plan my unit. I will be able to take that information and better challenge my students on what they know and extend their science classes to math class. Along with pre-testing and activating prior knowledge, I also learned how to give my students the appropriate freedom through my planning of a Pre-calculus unit.

While creating my unit to be more relevant for my students, I discovered upon the benefits of letting students have options and choice. "Some of the strategies that have been suggested for differentiating practice include the use of menus from which students choose from an array of tasks, tiered lessons in which teachers teach to the whole group and vary the follow-up for different students, learning stations where different students attempt different tasks, or other approaches that allow for student choice, usually in pursuit of the same basic overall lesson goal" (Tomlinson, 1999). In light of the research I found in favor, I learned that I could plan a unit that allowed my Pre-calculus students to research and create their own sinusoidal model

while providing them options and choice. Along with choice and freedom, the planning of an interdisciplinary unit is very intricate and I learned numerous things along the way working with other experienced teachers.

Before starting this module, I had not had much experience with interdisciplinary units. I was able to have the opportunity to be a part of an interdisciplinary unit with some of our freshmen teachers. We were asked to create a unit involving Mathematics, Social Studies, Science and English that ties together the essential question: Is the world a better place? The learning that I've taken from this unit is to plan a successful interdisciplinary unit, you need to have communication with teachers, administrators, and even students to get this off the ground and running. I've also learned how to implement other disciplines into Mathematics more often than normally would occur.

Impact on Practice

From my new learning, I have made numerous changes in the way I teach. The first important change is creating pre-tests and surveys that are general enough that I can activate and assess prior knowledge. The second important change is that of giving students choice and freedom and designing my units around the idea that students are able to pick their topic to research and see what they can get out of it. The other important impact on my practice is an increased understanding of the interaction between disciplines in my school and how to work together to form something great across all disciplines. All three of these changes have made my planning process much richer and have given me tips for the future on how to keep challenging not only my students, but myself.

In the book Great Ways to Differentiate Secondary Mathematics by Marian Small and Amy Lin, they discuss prior knowledge and ways to activate it. They are quoted by saying, "Despite the importance of prior assessment, employing a highly structured approach or a standardized tool for conducting the assessment is not mandatory. Depending on the topic, a teacher might use a combination of written and oral questions and tasks to determine an appropriate starting point for each student or to determine what next steps the student requires" (Small & Lin, 5). To assess and activate prior knowledge, I created a background knowledge survey for my Algebra 2 classes prior to starting our exponential growth and decay unit. The questions I created are meant to aide me in designing my unit and allow myself to adjust to any misconceptions that could occur. My questions are as follows: 1. We hear the phrase "That grows exponentially" often. What sort of things do you associate exponential growth/decay with? 2. How is an exponential function different from the ones we've recently studied? 3. What is your favorite class and why? 4. Can you write an exponential function? These questions are vague enough that it is not completely standardized but will still lend to some good feedback. Along with activating prior knowledge, I will be activating students' interest by creating units that leave them some choice in what they are studying or researching.

While planning my unit for Pre-calculus, I wanted to come up with a project where students could take off in their own direction, while still being guided. In my unit, we will work on sinusoidal applications for the first day and then after one day of instruction, students will be asked to work together and find data on a sinusoidal model. I would like their topics to include: tidal waves, temperature averages, suspension bridges, tuning forks, sunrises, springs, ferris wheels, but am open to anything they can find to model a periodic function. I want to leave students the choice to decide and find data that is interesting to them, while also guiding them in

case they are lost. The research states, “Students find project work more meaningful if they conduct real inquiry, which does not mean finding information in books or websites and pasting it onto a poster. In real inquiry, students follow a trail that begins with their own questions, leads to a search for resources and the discovery of answers, and often ultimately leads to generating new questions, testing ideas, and drawing their own conclusions. With real inquiry comes innovation—a new answer to a driving question, a new product, or an individually generated solution to a problem. The teacher does not ask students to simply reproduce teacher- or textbook-provided information in a pretty format”. From this research, I decided I want my students to have that choice to create something they have been inquiring about. I want to allow them that freedom, while still providing guidance and structure for them. I did not change my overall goal for my students, but I am working more with them and creating tasks that leave an option open. While some of the context of the problems may vary among the students, my use of frequent assessment will still let me address mistakes or misunderstandings, and modify my plans accordingly. The interdisciplinary unit I worked on touched upon student choice and freedom as well.

The interdisciplinary unit we created this semester took multiple meetings and many preps to fuse together the subjects of Mathematics, Social Studies, English, and Science. The planning process incorporated two teachers from each discipline meeting and figuring out how we can tie together statistics, the book A Long Walk to Water, the book Wonder, and how our Earth uses our resources. Our essential question was "Is the world becoming a better place?" We started by planning what we wanted our students to take away from this unit. We then got more core specific with each discipline and created topics that could be used for research. For math, while planning, I learned the importance of finding reliable information and making the

information relevant. We found statistics based on the percentage of access to clean water. We found other statistical data that we would compare to the access of clean water, such as percentage of people living with HIV, urban population rate, annual population growth rate, and infant mortality rates. We planned to have the students make four comparisons and determine which relationship was strong or weak, and how it affected the other. Did the annual population growth rate increase as access to clean water increase? That was our thought process in planning. It impacted my planning by making me more conscious of tying in other disciplines into my planning. I am constantly looking for more ways to relate to things that my students are learning in their other classes. The planning of this unit and working together as a team led me to gain a better sense of how to work with others in a group and also the time it takes to plan a unit of this nature. I also noticed the common theme of student choice and freedom and was able to learn more about how I can activate that freedom in an appropriate manner, without losing too much control over my planning.

Overall, I have grown as an educator and am able to implement more real-world connections to my planning and allow for more student choice and freedom. I am also more conscientious of interdisciplinary work and how we can mold different disciplines into each other. Also, I have discovered several useful ideas to assess prior knowledge and implement into the classroom.

Impact on Students

As far as the impact on students, I think my new learnings will allow me to better prepare and plan for the different types of students I will get in a classroom, while also helping them become self-sufficient citizens. Overall, all three of my new learnings will have some sort of

impact on my students, to be determined in the future when I actually execute my plans that have been created.

I think the background knowledge survey will aid students in connecting prior units to their upcoming unit, while also asking basic enough questions that they are not overwhelmed. The research on assessing and activating prior knowledge is generally positive and increases student achievement. “Prior assessment is essential to determine what needs different students have” (Gregory & Chapman, 2007; Murray & Jorgensen, 2007). I am hopeful that this will enhance my students’ desire to learn about the upcoming unit and also tie together their other disciplines. I am also hopeful that students will have a sense of what exponential growth/decay is from their science classes and will be able to provide insightful answers on their prior knowledge survey.

The impact I foresee on my Pre-calculus students when they are asked to research their own sinusoidal model is that they will be very open to the idea of getting to pick their own topic to study. I think they will be able to produce a great project and learn meaningful lessons within their groups. I am hopeful that they will take away a lot from this unit and will be able to apply the lessons they learn to their other classes. I also foresee an impact on the way they work in a group. They may learn things about themselves when put to the test of working with certain peers.

The interdisciplinary unit will hopefully connect all of our disciplines while getting students interacting in a different context. We will have a socratic seminar at the end, where my students will have become statistic experts on different topics including: HIV/AIDS rates, Income, Life expectancies, Infant mortality, Literacy, and Population just to name a few. Each

student will have something different to bring to the table at the end of the interdisciplinary unit and will be able to contribute in the socratic seminar. I am hoping that by creating this interdisciplinary unit and connecting across so many disciplines, the students will see the wonderful connections between the classes and be able to have a deep, meaningful conversation with each other about if the world really is a better place.

Conclusion

Even though my impact on students is not concrete at this time, I am confident in the fact that I have learned a tremendous amount about planning and I know that when I execute my plan in a classroom, it will be successful. I have learned a lot about myself through the process and was able to gain some great ideas for units to come. Overall, I think this module helped me see the importance of being prepared and planning a unit extremely far in advance to at least have an idea and an end goal rather than wait last minute to throw a lesson together.