Module 3 – Instruction

Math 9 – 12

Initial Summary

With the addition of two new classes to my workload this year, I wanted to focus on flex grouping and differentiated instruction to increase student achievement in all of my classes (geometry, algebra 2, and precalculus). This module brought me to the beginning of the school year, so I had to first get to know my students before I could collect any data. I also was brought into the Medical Careers Academy, which brought me 2 classes of Algebra 2 full of students who are interested in working in the medical field. This drove me to research different ways to incorporate medicine into the curriculum to increase their achievement.

New Learning

My learning plan for this instruction module included reading Great Ways to Differentiate Secondary Mathematics Instruction by Small and Lin, researching Carolyn Coil and Carol Tomlinson's ideas of differentiated instruction, and discussing with my mentor about parallel tasks and increasing student achievement. My goal is to learn ways to use flex grouping, data, and differentiated assignments in order to increase student achievement.

The first idea that I was introduced to was flex grouping and the benefits for my students. At the beginning of the school year, I had new classes, new students, and most importantly a new subject, Geometry. In order to prepare for both of my Geometry classes, I needed to immediately get to know my students in order to differentiate my instruction to best suit them. My mentor introduced me to the idea of flex grouping. According to Carolyn Coil, "You should think of any instructional group as variable not permanent. Flexible grouping means planning for students to

work together in a variety of ways and configurations depending on the classroom activity and desired learning outcomes. Look at assessment data, test results, and student needs to determine the arrangement size and students in your group." According to Coil, I should be using data to create groups based on the task, students' previous performance, interests, learning styles, and reading skills in addition to other characteristics. Flex grouping is absolutely dependent on knowing my students. It could not work if I did not know their strengths and weaknesses.

Another discovery during this module's work was that of parallel tasks. Small and Lin state, "Parallel tasks are sets of tasks, usually two or three, that are designed to meet the needs of students at different developmental levels, but that get at the same big idea and are close enough in context that they can be discussed simultaneously". Parallel tasks could be used in my classes to address each individual students' needs and levels. This concept was very intriguing to me. My first exposure to them was when my mentor showed me two different problems for trigonometry that addressed the same simple concept, but differed in details. Small and Lin state, "Parallel tasks need to be created with variations that allow struggling students to be successful and proficient students to be challenged". This strategy could offer me a way to challenge everyone in the classroom at their zone of proximal development.

I am currently teaching math as part of the medical careers academy in our high school. In this academy, students are exposed to the medical field and we are asked, as teachers, to incorporate topics related to the medical field into our classes. I have researched a variety of ways to integrate my instruction with current topics in medicine. I hope to find ways to include my research into my lesson plans to better relate to students and therefore increase their understanding and motivation.

Impact on Practice

In order to implement flex grouping, I needed relevant and valid data. At the beginning of the year, my students had completed a test on congruent triangles. I knew that this content was connected to my next unit and I needed to correct student misconceptions as I moved on. After reflecting on and examining the test data, I was able to group students in a way that let me differentiate the amount of support provided to different groups. This improved comprehension was necessary to succeed in the next unit.

Another class that was affected by my research of flex grouping was my Pre-calculus Honors class. Intuitively, I knew these students had a wide variety of background knowledge and skill levels. The data from the NWEA testing program used in my school and their PSAT scores supported my observations. As a result, I began to form pairs based on this data. The pace of work for each pair varied, but the content expectations were comparable.

I have been implementing parallel tasks in Pre-calculus to help my struggling students understand the same concept as other students in my class who have mastered the concept already. When I was creating my unit for solving logarithm equations, I used many different types of equations based on student readiness. Some students were ready for multi-step equations at the beginning of the unit and other students needed more repetition of introductory equations. The creations of these tiered assignments connected to my use of data to determine students' strengths or weaknesses. I was careful to scaffold steps as I created these problem sets.

My learning and research on medical applications in high school mathematics resulted in a variety of problems. In Algebra 2, for students interested in public health, I was able to incorporate the following problem:

> Bottled water and medical supplies are to be shipped to victims of an earthquake by plane. Each plane can carry no more than 80,000 pounds. The bottled water weighs 20 pounds per container and each medical kit weighs 10 pounds. Planes can carry a total volume for supplies that does not exceed 6,000 cubic feet. Each water bottle is 1 cubic foot and each medical kit also has a volume of 1 cubic foot. Each container of bottled water will serve 10 people and each medical kit will aid 6 people. How many bottles of water and medical kits can we send to maximize the number of people we can help?

I found other problems similar to the above on topics such as knee and hip replacement surgeries, pH levels of human blood, interpreting data on health-care expenditures, and dosages of anesthesia. I have found multiple connections between medicine and Algebra 2 and have been able to implement them into my instruction and assignments successfully.

Impact on Students

In my geometry classes, the effect flex grouping had on my students was seen through their test scores at the end of the second unit. After retrieving data and creating my groups based on their previous test, I saw a significant increase in student comprehension. In one of my classes, the class average on our Congruent Triangles quiz was a 66 percent. After flex grouping, their second quiz on Parts of a triangle was a 78 percent. In my other class, their average on our Congruent Triangles quiz was a 58 percent. After the implementation of flex grouping, this group increased by 23 points, earning a class average of an 81 percent. This 12 and 23 point increase alone shows the effects flex grouping had on my students' understanding. In the future, flex grouping will be my means of grouping for reviews and collaborative work to ensure student understanding.

In my pre-calculus class, students were paired according to NWEA scores and SAT scores. This allowed them to work with an individual of similar ability. I could see an increase in student learning throughout the entire semester as they worked on their extra practice in pairs at their own pace. Although students were not at the same place at the end of the study, they did take away very important skills to use in the future. They were more confident in their math ability and also more comfortable with the students in our class.

Along with flex grouping, I used parallel tasks to help students. During our introduction to logarithms, I let students work at their own pace and start at different places. In allowing students to work at their own pace, they were able to comprehend in their own time. The results were successful. On their logarithm quiz, the class average was an 85, with 10 out of 19 students receiving a 90 percent or better.

Implementing medical applications into Algebra 2 has increased student motivation and understanding in both classes. Both Algebra 2 classes are in the medical academy and observations from colleagues and coaches have verified that students have comprehended concepts in Algebra 2 that normally are difficult for a student to understand. I can see a significant increase in student understanding from my previous classes last year. Although this is a different set of students with a better background in algebra, I can see the improvements our students are making throughout Algebra 2 and to be able to tie together their interests helps them in being more excited to learn Algebra 2 rather than dreading it. Observations from coaches and evaluators who have expressed they could see the students clicking with the material is an accomplishment in itself. It has helped my students and also helped me grow as an educator to understand students' needs and interests.

Conclusion

So what have I learned? I have learned the importance of flex grouping and the impact it can have on a group of students. It has guided me to become more mindful when creating groups within my classroom and has caused me to think about the purpose of using groups effectively. I have learned a variety of interesting applications to connect my math curriculum to medical fields. I have also learned that by creating parallel tasks, I have opened the door for students to build their confidence in math and access the material.