I endeavor to work against the cultural norm that says it is OK to be mathematically illiterate and perpetuates mathematical anxiety. I believe that all students are capable learners, and it is my role as a mathematics instructor to provide opportunities for college students and future teachers to develop their abilities to reason and think mathematically. To do this, I provide learner-centered instruction, use collaboration, incorporate critical reflection, and pursue professional growth.

Learner-centered Instruction

As a teacher, my role is to guide and coach students in constructing their own understanding of mathematical content by helping them to develop the ability to think and reason mathematically. Before I begin teaching, I first decide what I want my students to know and be able to do, setting short-term and long-term learning goals. Then, I design assessments that will provide evidence of students’ abilities to achieve these objectives. Students have opportunities in my classroom to interact with one another around rich mathematical tasks related to the goals for each class meeting and for the course.

As an example of this instructional style, consider my approach to teaching content courses for future elementary teachers. A course objective is to engage students in processes of mathematical reasoning by providing them with opportunities to think mathematically in ways similar to how mathematicians generate knowledge: exploring mathematical relations, generating conjectures, testing and revising conjectures, and producing informal or formal proofs. Therefore, when I select problem situations in which to engage students I aim to develop their ability to reason and prove. For example, early in the semester, when I teach geometry, students engage in the following task. First they look for patterns in the measures of angles created when two lines intersect. Then, students generate a conjecture that the vertical angles are always congruent and they produce a proof of the validity of their claim. As the semester continues, I pose different mathematical situations to provide opportunities for students to produce conjectures and prove or disprove their claims. On a summative assessment, then, I assess students’ understanding of mathematical reasoning by presenting a novel mathematical situation from which they are expected to determine a conjecture and provide a mathematical justification. Teaching the process of mathematical reasoning and proving requires students to think critically and discover important conceptual connections rather than memorize a collection of facts.

Collaboration

In community, mathematicians work together to solve problems and generate mathematical insights. Likewise, in my classroom, students often approach the study of mathematics together. In collaborative groups, students learn how to work together to solve problems and make decisions, skills that are critical for success in the world in which we live. My style of collaborative, learner-centered instruction is especially important when teaching prospective mathematics teachers. Since future teachers will build the foundation of mathematical understanding for K-12 students, they need to develop a deep understanding of the conceptual basis for the mathematical content they will teach. Furthermore, most future teachers’ previous mathematics learning experiences were rarely collaborative or student-centered. Participation in learner-centered college mathematics courses, therefore, provides an opportunity for future teachers to learn mathematics in a way that is akin to the instructional style that K-12 teachers are now often expected to employ.

Similarly as an instructor, I seek out peers and mentors, participate in course meetings, and share my ideas with others to continue to improve my curricular materials and assessments. Such collaboration leads to revised and improved instruction. I also learned about the benefits of collaboration by co-teaching a senior-level capstone mathematics course for prospective secondary mathematics teachers.
with Dr. Peter Magyar, a mathematics professor at MSU. We aimed to help the students make explicit connections between college mathematics and high school mathematics content. By planning together and alternating lead teaching we were able to offer a rigorous mathematics content course that incorporated theories about teaching and learning mathematics in the high school context. Through this experience, I came to realize how important it is to foster these types of partnerships, and I will strive to support such collaboration through my teaching, research, and advising of students at BGSU.

Critical Reflection

Reflection enables me to make sure that students are deepening their understanding of the mathematical concepts, skills, and abilities that they need to be successful. When I find something that is quite successful I reflect on what made it work so well and try to use it again in the future. I find it beneficial, for example, to work with my students to generate a review guide for exams that lists the mathematical learning goals that will be assessed and identifies specific class periods and tasks that were intended to address those goals. Constructing this list together helps me self-assess how well I am communicating my learning goals to the students and guides their preparation for assessments.

If, on the other hand, I find that something does not work well, I reflect on ways to make changes. For example, during the first class period for an undergraduate trigonometry course, I guided the students in reviewing basic function concepts. I thought this review opportunity would provide a basis from which students could build their understanding of trigonometric functions throughout the semester. Based on students’ questions during class and responses on initial assessments, however, I decided to explicitly make connections back to these basic ideas when applicable. For instance, we briefly reviewed algebraic identities before students explored trigonometric identities. Although connections between these concepts seemed obvious to me, they were less so for students. Intentionally talking about these connections provided opportunities for students to augment their understanding of algebraic functions rather than compartmentalizing trigonometry as disjoint from other mathematics.

To reflect on my teaching, I also regularly elicit feedback by asking students how the structure, content, and classroom environment are affecting their learning; making any necessary modifications to my teaching. In a class period of the capstone mathematics course, for instance, we unpacked terminology such as equality, equivalence, equivalent equations, and equivalent relations and tied these ideas back to isomorphic groups. After that class, several students indicated on an anonymous feedback form that they wanted more discussion on this topic. In response, I devoted 15 minutes at the beginning of the next class period to further discussion of ideas from group theory.

Pursue Professional Growth

As a teacher whose research is in mathematics education, I also stay abreast of research on teaching and learning to incorporate new strategies into my teaching and research. Consider Dr. Margaret “Peg” Smith and her colleagues’ research about five teaching practices. These are strategies that help teachers to anticipate and monitor students’ understanding during collaborative tasks, as well as to facilitate class discussions that include students’ work and explicit mathematical connections. To continue developing my ability to effectively use collaborative, learner-centered instruction, I attended a colloquium Dr. Smith led, acquired her professional development materials, and incorporated these strategies into my teaching. This link between my teaching and mathematics education research continues to propel me to advance my own teaching. As I seek to be the best mathematics education researcher and instructor possible, I will encourage and inspire my peers to strive to improve their own teaching and foster a generation of undergraduate and graduate students that experience mathematics in a new way.