

THE ART OF PROBLEM SOLVING: CRITICAL THINKING IN MATHEMATICS

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Problem solving and critical thinking are skills that transcend all subjects in the university life, and are skills that students continue to use throughout their lives. Critical thinking is considered a necessary ability for general success in life (Lockwood, 2007). This leads teachers in all disciplines to the question of how to encourage the development of these complex mental operations in students. Torres and Cano (1995) reported that student factors relative to the development of cognitive abilities included involvement, interest in and perceived value of the course, as well as motivation. In their study, they considered the division of individual learning styles into two classifications: 1) field-dependent, and 2) field-independent. As field-dependent, the learner perceives the world as a whole, finds problem solving difficult, favors a spectator approach to learning, and is more extrinsically motivated. In the other case, a field-independent learner views the world more analytically, finds problem solving easier, favors independent study, and is more intrinsically motivated. Many students who are enrolled in developmental mathematics courses may be more likely to be classified as field-dependent. Applicable problems and explorations into problem solving are avenues to generate more interest and to facilitate the use and development of critical thinking and independent learning skills.

Mathematics courses, at pre-college or college-level, offer excellent opportunities for students to engage in problem solving and critical thinking. By participating in problem solving, students are guided to use critical thinking skills in their analyses of the problems and in the synthesis and application of previously learned mathematical concepts. By noting differences or similarities and by using inductive reasoning, students can develop an ability to formulate viable conclusions. Furthermore, guiding students to focus on the solving and not the solution often frees the students to discuss and verbalize their ideas more comfortably in groups and in the mathematics classroom. A good opportunity to introduce problem solving often presents itself in the early units of a mathematics course. Early exposure to problem solving and critical thinking allows students to see mathematics as practical and applicable and, thereby, serves to encourage student interest and engagement in the course.

In the interactive session that we presented, we discussed various problem solving strategies; as well as provided activities to demonstrate opportunities to utilize critical thinking and problem solving skills in the classroom. Participants worked in groups and used critical thinking and problem solving skills to analyze and solve a variety of problems. These exercises were also developed as examples for faculty to incorporate into lesson preps and classroom activities. Also, participants were asked to participate in a discussion where they shared methods and activities that they use in their classrooms while teaching and encouraging students to utilize critical thinking and problem solving skills in math.

References

Lockwood, J. S. (2007). Motivating liberal arts math students through problem solving, In *Mathematical Excursions* (2nd ed., pp.41-42). Boston: Houghton Mifflin.

Torres, R. M., & Cano, J. (1995). Learning style: A factor to critical thinking? *Journal of Agricultural Education*, 36(4), 55-62.