

Computational Thinking and Problem Solving in Mathematics Classrooms

Jinfa Cai

Mathematical Sciences, University of Delaware

jcai@udel.edu

Description

Computational Thinking is not a new idea, but only in recent years, it has received increased attention to integrate computational thinking in mathematics classrooms. While there is not a unified definition about computational thinking, the essence of computational thinking involves breaking down complex problems into more familiar/manageable sub-problems (problem decomposition), using a sequence of steps (algorithms) to solve problems, reviewing how the solution transfers to similar problems (abstraction), and finally determining if a computational tool can help us more efficiently solve those problems (automation).

Therefore, computational thinking is not only a way of thinking, but also a way of solving complex problems.

A primary goal of mathematics teaching and learning is to develop students' ability to solve a wide variety of complex mathematical problems. Therefore, computational thinking and problem solving have their special importance in mathematics classrooms. For example, the Common Core State Standards includes eight Standards for Mathematical Practice, which describes the expertise that mathematics teachers should seek to develop in their students. Most of these practices are fundamental aspects of problem solving, including making sense of problems and persevering in solving them, constructing arguments and critiquing others' reasoning, modeling with mathematics, and strategically choosing appropriate tools to solve problems.

This seminar is designed in such a way that the Fellows will be able to:

- (1) Understand what computational thinking is and how computational thinking can be integrated into mathematics classrooms;
- (2) Distinguish computational thinking and mathematical thinking using specific problem-solving situations;
- (3) Use problem-solving approaches (with increasing confidence) to investigate and understand mathematical content; and
- (4) Apply integrated mathematical problem-solving strategies and computational thinking to solve problems from within and outside mathematics;

The design of this seminar is content-focused, aligned with both the Common Core and DE state standards. It builds on student learning and thinking. We will present problems to fellows and facilitate discussion about student thinking, focusing on solution strategies that their students might use and errors that their students might make. In addition, the seminar will also include discussion of issues related to assessing both computational thinking and problem solving.