

Emerging Scholars: Problem Solving Exploration

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Open drop-in hours: TBD in my office (Science Center 230).

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Class: Monday and Wednesday 1:30 – 2:45PM in TBD.

In this seminar, we will spend much of the time working in small groups. We will experiment and discuss solutions to problems together, so it is vital that you attend class prepared and ready to participate.

Course Homepage: <https://canvas.harvard.edu/courses/111810> On the course homepage, you'll find announcements, study tips, assignments, information on the project, and so on. Please check the course website regularly.

Course Description: In his seminal work from 1945, *How to Solve It*, George Polya introduced principles of mathematical problem solving that are widely applicable to problems in science and engineering. This year-long seminar focuses on building a powerful and portable problem-solving and modeling tool kit while bridging the divide between mathematics and science courses. Problems and projects in the first semester are chosen to highlight problem-solving techniques such as generalization, induction, analogy, variation, working backward, and specialization. Students will build mathematical models, critique arguments, analyze data, and present policy recommendations. The second semester will be organized around projects in areas of student interest. Students will engage with mathematics more deeply and come away with strong modeling skills and a portable understanding of calculus.

First Semester: In the first semester students will use the small class size to develop specific problem-solving skills in groups and delve deep into challenging problems. Sample projects could include modeling epidemic outbreaks, planetary motion, or cruise control in cars. Students will also analyze real datasets to build more accurate models. The course will also have a significant service-learning component where students will tutor students at local high schools. Throughout the semester, students will meet weekly for meals at which a specific topic of discussion is chosen in order to support reflection on issues relevant to our student and maximize students' Harvard experience, both in a general sense and in STEM fields in particular.

Second Semester: In the second semester, students will use the problem solving skills developed in the first semester to work on projects and problems aligned with student interests in science, technology, mathematics or engineering. Projects could range from population dynamics in marine biology to traffic flow in engineering. The course will culminate with a final project and project presentation in which students study a real-world problem relevant to their communities and areas of interest. Throughout the semester weekly shared meals focused on topics relevant to the group will continue.

Project: The project is an opportunity for you to explore and further develop some of the ideas in the course that are most interesting to you. You will choose a research topic that combines math and the STEM field you are most interested in pursuing. More information will be provided next semester.

Grading: Your class grade will be based on participation in seminar, attendance at lunches and seminar, and your final project. **Your attendance and participation will determine your grade in the first semester.** We understand that occasionally things come up, so you can miss two classes without any grade consequences. Please tell us if you need to miss class.