Using MATLAB® to Teach Computational and Quantitative Thinking Skills in STEM Courses

Science Education Resource Center @ Carleton College | MathWorks

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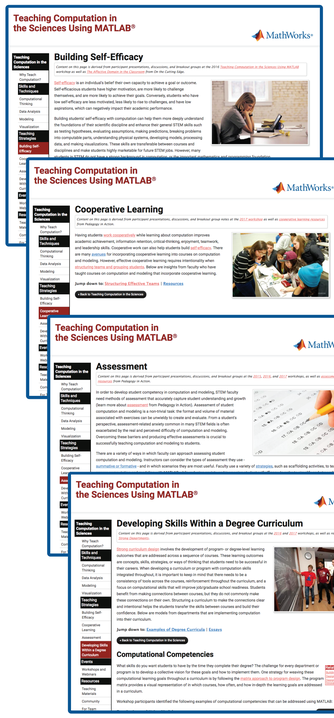
http://serc.carleton.edu/teaching_computation

Strategies for Teaching Computation

SERC and MathWorks have distilled strategies and recommendations for teaching computation contributed by participants in the Teaching Computation workshops.



Building Self-Efficacy

Instructors can build student self-efficacy by using focused learning objectives, providing low-stakes assignments, and illustrating the motivation behind using MATLAB.

Cooperative Learning

Group problem-solving, reciprocal teaching, and discussion (when combined with intentionally structured groups) can help to improve student achievement, critical thinking, and self-efficacy.

Assessment

Combining automated assessment tools with assessment strategies and effective pedagogy can help instructors accurately and efficiently capture student understanding and growth.

Developing Skills Within a Degree Curriculum

Structuring a curriculum to make connections clear helps students transfer skills between courses and build self-efficacy. Programs can use the matrix approach to weave computational learning goals throughout a curriculum.

Get Involved

Teaching Computation in the Sciences Using MATLAB supports a growing community of faculty in geoscience and other STEM fields interested in improving computation in teaching with MATLAB.

Workshops:

3 day, peer-led events for educators:

- share best practices
- develop curricula
- contribute activites

Sessions include panels, presentations, share fairs, and working groups.

Join the Teaching Computation Interest Group

Participate in the online discussion:

- Ask a question about teaching computation
- Share your experiences teaching computation with MATLAB
- Share your favorite add-ons or supporting resources

Join the community

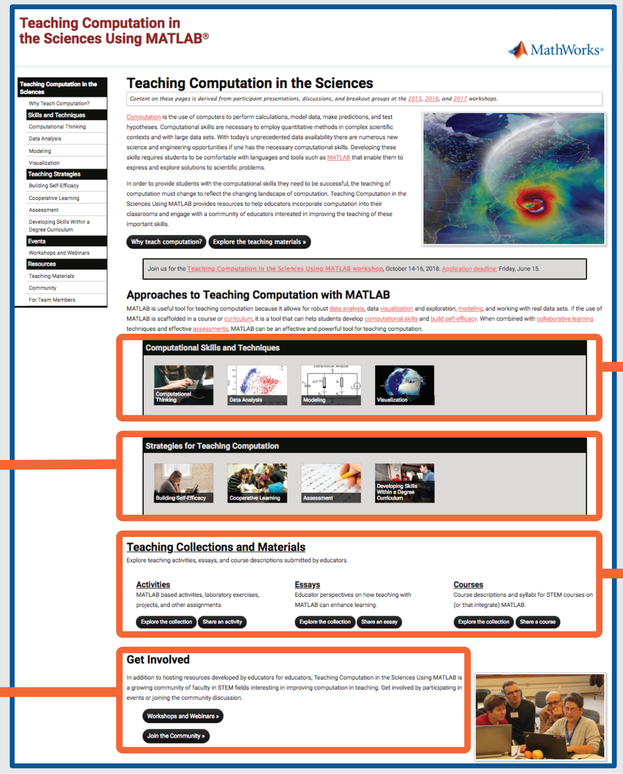
serc.carleton.edu/197277

Webinars:

Webinar events highlight exemplary peer-authored activities contributed as part of the annual workshops. Hear about the activities and strategies for implementation directly from the authors.

Peer-developed resources for educators

Developed by educators who teach and use computation in their courses, **Teaching Computation in the Sciences Using MATLAB** is a resource to help educators incorporate computation and MATLAB into their classrooms and engage with a community interested in improving the teaching of computational and quantitative skills. The website includes information, resources, and materials contributed through peer-led workshops hosted by SERC and MathWorks.



What is computation and why teach it?

Computation is the use of computers to perform calculations, model data, make predictions, and test hypotheses.

Computational and quantitative skills are key tools of geoscientists and other STEM professionals. Teaching computation can help students reinforce and improve their quantitative skills and gain a deeper understanding of scientific principles.

Building computational skills can help students develop:

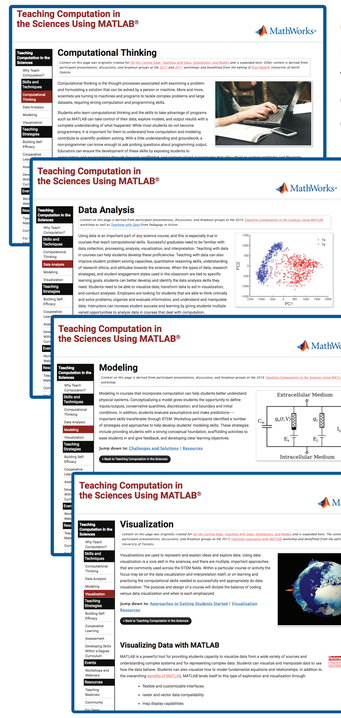
- quantitative self-efficacy
- problem-solving
- logic and reasoning
- data control
- science communication
- reproducible research practices

Why MATLAB?

Using MATLAB, students and educators can put the science at the forefront. With a user-friendly interface, diverse functionality, and robust user community, MATLAB is ideally suited to scientific learning and discovery.

Computational Skills and Techniques

Participants in the Teaching Computation in the Sciences Using MATLAB workshops identified key computational competencies that can be addressed using MATLAB:



Computational Thinking

Ensure development of students' computational thinking skills through focused, scaffolded, and contextualized assignments that allow them to explore problems and tools.

Data Analysis

Increase students' comfort with data and data analysis through diferent data types, research strategies, and engagement styles.

Modeling

Build students' modeling skills by using real-life examples, exploring system behavior, and using GUI's or coding environments.

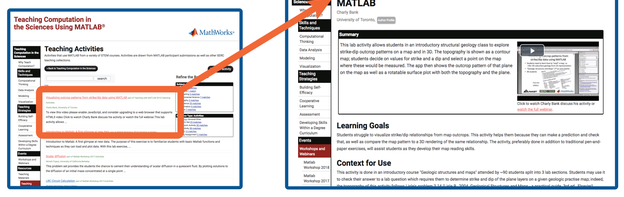
Visualization

Help students develop skills with creating and interpreting visualizations through scaffolded assignments that take advantage of MATLAB tools and resources such as MATLAB Live Editor, GUI's, and stand-alone runtime.

Teaching Collections and Materials

Activities, essays, and courses are contributed by workshop participants and community members. All of the contributions make use of MATLAB and cover a variety of STEM topics.

Teaching Activities



Coming soon: activity peer review

Activities will be reviewed by a panel of community members. Well-reviewed submissions will be highlighted in the activities collection and in a separate collection of exemplary materials. Submit an activity by August 15!

Learn more:

serc.carleton.edu/206208

Course Curricula