

## Opening Gateways to Completion: Open Digital Pedagogies for Student Success in STEM (2015-2020; P031S150220)

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### About City Tech and BMCC

The City University of New York (CUNY) is the nation's largest urban public university, serving more than 270,000 degree-seeking students at 24 campuses. Opening Gateways brings together two of these institutions: New York City College of Technology (City Tech), CUNY's designated senior college of technology, located in downtown Brooklyn close to the Brooklyn Bridge, and Borough of Manhattan Community College (BMCC), across the river in lower Manhattan's financial district. Both colleges are open-access Hispanic-Serving Institutions that provide opportunities for educational advancement to students regardless of their economic circumstances or prior academic achievement, serving diverse student bodies totaling more than 40,000 undergraduates in a wide range of programs.

### What is "Opening Gateways"?

For many students entering STEM majors, gateway mathematics courses – the high-enrollment, foundational classes that are prerequisites for working in STEM fields – present a significant barrier to progress and completion. "Opening Gateways" was designed to support City Tech and BMCC students at this critical juncture by introducing open-source digital technologies, open educational resources, and active learning strategies into the sequence of gateway mathematics courses at each college. The project will directly touch dozens of faculty and thousands of students over its 5-year span, and many more in the years beyond.

"Opening Gateways" consists of two primary activities, the development of high-quality Open Educational Resources (OERs) and the implementation of an intensive annual faculty seminar, and additional projects including the development of open digital tools (WeBWork-OpenLab integration; City Tech) and enhancements to math laboratories (BMCC).

### Opening Gateways Faculty Seminar

*Marianna Bonanome, Laura Ghezzi (Co-Directors, City Tech); Annie Han, Jae Ki Lee (Co-Directors, BMCC)*

The Opening Gateways Faculty Seminar engages math faculty in bringing Open Educational Resources and active learning strategies into the classroom. Each fall semester a cohort of full-time and part-time



math faculty from two campuses come together to engage creatively with research-proven pedagogical strategies for active learning, employing open digital tools and OERs geared towards supporting these strategies. Seminar topics include high-impact educational practices,

flipped classroom approaches, problem-based learning, assessment and advisement best practices, open digital technologies and other active learning tools and techniques. Faculty fellows implement what they have learned in the spring semester; outcomes are analyzed and students and faculty provide feedback on the effectiveness of strategies and materials to enable continuous improvement.

### Making an Impact: High-Impact Practices and Open Digital Pedagogies for Student Success

New York City College of Technology, City University of New York  
U.S. Department of Education Hispanic-Serving Institutions (HSI) Programs  
New Project Directors' Conference, November 2-3, 2017

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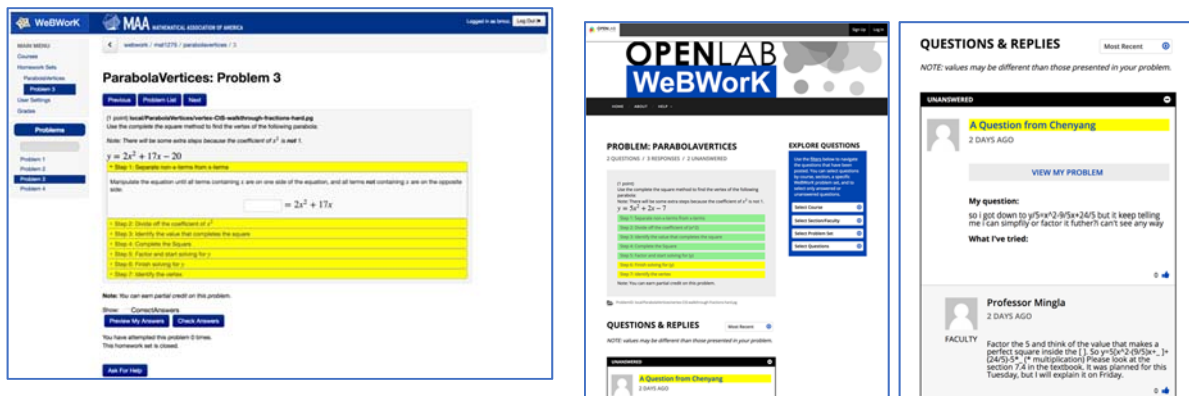
# Opening Gateways to Completion: Open Digital Pedagogies for Student Success in STEM (2015-2020; P031S150220)

## Open Educational Resources

Ariane Masuda, Andrew Parker (Co-Directors, City Tech)  
Stephen Featherstonhaugh, Oleg Muzician (Co-Directors, BMCC)

The rising cost of college education places a significant financial burden on our students. Opening Gateways is developing high-quality Open Educational Resources for our gateway mathematics courses and making them freely and publicly available.

**WebWork Development** WeBWork is a free and open source online homework system supported by the Mathematical Association of America and the National Science Foundation ([webwork.maa.org](http://webwork.maa.org)); it is an open alternative to the expensive proprietary systems provided by many textbook publishers. The Opening Gateways teams are developing comprehensive suites of WeBWork problems and problem sets tailored to the content of our gateways mathematics courses and aligned with the pedagogical strategies explored in the seminar. Completed problems will be contributed to WeBWork's Open Problem Library, a free public resource for educators.



Scaffolded problems provide granular support for students, breaking down complex problems into manageable tasks

**WebWork-OpenLab Integration** An exciting element of the project is the integration of WeBWork with the OpenLab ([openlab.citytech.cuny.edu](http://openlab.citytech.cuny.edu)), City Tech's innovative open source digital platform for teaching, learning, and collaboration (see OpenLab handout for more). The WeBWork-OpenLab integration project addresses the traditional one-on-one student-faculty dynamic for homework support. It replaces the "email your instructor" button in WeBWork, directing students instead to a community space on the OpenLab where they can ask homework questions, view existing questions, and engage with their classmates and instructors about the work. The code will be released publicly as a plugin for WordPress, the underlying architecture of the OpenLab, benefiting the mathematics education community worldwide.

**Video Resources, STEM Applications, and other OERs** In addition to WeBWork resources, Opening Gateways is producing a variety of OERs to support our math courses. These include aggregation of high-quality existing resources (such as video), compiled and aligned to course content. Seminar participants are also developing resources, including classroom activities and STEM applications supporting key concepts.

*The contents of this presentation were developed under a grant from the Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.*

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