
The Mathematics of Doing, Understanding, Learning, and Educating for Secondary Schools¹

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Overview and Problem Statement

The Mathematics of Doing, Understanding, Learning, and Educating for Secondary Schools (MODULE(S²)) Research Action Cluster (RAC) is focused on the development of prospective secondary mathematics teachers' mathematical knowledge needed for teaching (MKT; Ball, Thames, & Phelps, 2008; Rowland, 2013) within upper-level content courses. The work of the RAC aims to address the identified problems that (a) prospective secondary mathematics teachers often do not find connection between upper-level mathematics content courses and teaching secondary mathematics (Goulding, Hatch, & Rodd, 2003; Zazkis & Leikin, 2010), and (b) prospective secondary mathematics teachers must deeply understand the mathematics they are going to teach and learn it in a way that is consistent with expectations of them as teachers (Banilower et al., 2013).

In response to these problems, the MODULE(S²) RAC has collaborated with mathematicians, mathematics educators, and K–12 teachers to design 12 educative curriculum (Davis & Krajcik, 2005) modules in the content areas of Geometry, Algebra, Statistics, and Mathematical Modeling. Each module includes opportunities for PSMTs to engage in mathematical tasks that are set in explicitly pedagogical settings, for the purpose of developing prospective secondary mathematics teachers' MKT. The MODULE(S²) RAC iteratively pilots and revises the materials in order to understand how to support instructors in implementing the materials, understand the ways in which dissemination of the modules across a wide range of institutions can vary, and improve the quality of the modules.

Current Progress

The MODULE(S²) RAC has made progress on our work in several areas over the last year: drafting materials, piloting materials, attending to issues of equity and social justice, and organizing Plan-Do-Study-Act (PDSA) Cycles to document and refine our progress. Both the Mathematical Modeling and the Statistics writing teams have created all modules for their materials. With a complete set of materials across all four content areas, the RAC spent time at the annual meeting in June discussing variations in common features (e.g, Simulation of Practice activities) across the materials and considering affordances for learning among the variations. Through this discussion, the RAC members developed a plan for cross-team review to work toward building more cohesion among the materials.

In June 2018, the RAC began its first pilot year with a professional development session for nine faculty implementing Geometry and Algebra materials. The RAC then supported these piloters throughout the 2018–19 academic year as they implemented the materials in their courses across the United States. In June 2019, the RAC began its second pilot year with professional development for 12 faculty implementing Mathematical Modeling

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and Statistics materials in the 2019–20 academic year. Piloting faculty are supported throughout the year through online discussion boards and video-conference meetings to discuss teaching practices along with specific questions about the materials.

In addition to drafting materials and supporting piloters, members of the RAC have engaged in PDSA Cycles focused on the development and implementation of activities focused on equity and social justice. These cycles were shared as brief reports at the 2019 MTE-Partnership Conference. This process has enabled RAC members to more effectively include equity-based activities and teaching practices in the modules. Other PDSA Cycles are planned to aid the RAC in (a) improving the Simulation of Practice activities and implementation, (b) taking up feedback from 2018–19 piloters to improve the materials, and (c) to improve the effectiveness of the planned professional development activities of the RAC.

Opportunities for Engagement

The MODULE(S²) RAC is excited to share materials with any interested educators. At the local institutional level, implementing any or all of our course materials can initiate and foster discussion between mathematicians and mathematics educators involved in teacher preparation programs. This discourse across disciplines can support partnerships and move a department toward its goals for program transformation.

For the 2020–21 academic year, we are seeking formal piloters to join the second piloting of our Geometry and Algebra materials. Every formal piloter joining this experience will be supported by a stipend, professional development, and communication with the RAC and fellow piloters throughout the academic year. In addition to formal piloting, we welcome anyone who is interested in informally piloting materials in all content areas. You can help the MODULE(S²) project move forward by reaching out to your colleagues about these opportunities. For more information regarding piloting, please connect with us on the MTE-Partnership MODULE(S²) webpage.

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