The Mathematics of Doing, Understanding, Learning, and Educating for Secondary Schools (MODULE(S2))

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Problem Addressed and General Approach

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’ (PSMTs’) mathematical knowledge needed for teaching (MKT; Ball et al., 2008; Rowland, 2013) within upper-level content courses. The work of the RAC aims to address the identified problems that (1) PSMTs often do not find connection between upper-level mathematics content courses and teaching secondary mathematics (Goulding et al., 2003; Zazkis & Leikin, 2010) and (2) PSMTs 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 PSMTs’ 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, specifically in terms of develop PSMTs’ MKT.

Figure 1. MODULE(S2) driver diagram.
Work of this RAC is structured according to our driver diagram (see Figure 1). For the last two years, the RAC has focused on the development of materials and understanding how to support piloting instructors in the enactment of the materials. That work continues as new iterations of piloting occur. In addition, the RAC is turning attention to broadening the dissemination of the materials and supporting programs in implementing the MODULE(S²) materials as part of program transformation efforts.

**Current Progress**

In the 2019–2020 academic year, the Modeling and Statistics materials were piloted for the first time and the Algebra and Geometry materials were revised based upon piloter and team member feedback. With the interruptions in instruction due to COVID-19, the team has re-evaluated timelines and made plans to re-pilot with some of the instructors whose terms were interrupted due to moves to online teaching. The team has also decided to limit additional piloting for the 2020–2021 academic year, anticipating that many universities will be continuing in online formats. Instead, the 2020–2021 academic year will provide an opportunity to prepare for support of the materials after piloting is complete.

At the MODULE(S²) RAC meeting during the MTE-Partnership conference, discussions focused on future considerations for how the work of MODULE(S²) could help support program transformation through attention to mathematics content courses. Participants in the discussion acknowledged that the RAC’s aims of connecting MKT theory and teaching practice could help to better connect teacher preparation and practice, increase prospective teacher retention, and create coherence within teacher preparation programs. In addition, discussion participants pointed out a sweeping issue of low-enrollment in secondary teaching-focused content courses. The MODULE(S²) RAC is positioned in such a way to address this problem by advocating for these types of courses and for materials with similar aims as those created by the RAC. A final suggestion for supporting program transformation focused on ways the MODULE(S²) curriculum material creation process could act as a model for material creation for other courses within teacher preparation programs.

After discussing support for program transformation, the RAC considered supports for instruction that may be needed in order to aid content course transformation. In order to support instructors in leading discussion-based courses, it was suggested that this RAC could aim to make mathematics education literature on the topic of discussion-based courses accessible to instructors and programs. Programs might then choose to provide this literature to instructors who are not yet convinced of the value of discussion-based teaching. It was also suggested that a variety of supports could be added to the already established professional development for the MODULE(S²) materials such as using collected data to demonstrate how an instructor may anticipate a student to respond to certain tasks.

Finally, the RAC discussed how MODULE(S²) could support program transformation with attention to social justice and addressing issues of racism. In developing the MODULE(S²) materials, participants pointed out that it is crucial that we consider a variety of viewpoints and inner conflicts of prospective teachers and that we provide support for instructors in becoming ready to have these conversations in their classroom. Within the materials themselves, it was suggested that more authentic tasks that go further in addressing social justice and racism could be added to each content area. Bringing in historical contexts of the mathematics content would allow students to see faces and hear voices that are similar to their own, and making certain that the suggested participation structure does not skip over minoritized voices. These discussion points and suggestions will provide direction for MODULE(S²) as the RAC moves forward.
Resources

A selection of the MODULE(S2) materials are available by request in each of the content areas. In the 2020–2021 academic year, the MODULE(S2) team will publish components of materials in each content area through the Mathematics Teacher Education Partnership Canvas page. Institutions and/or faculty interested in access to the sample materials will be asked to share contact information in order to access materials so that the MODULE(S2) team may contact potential users. If you would like access to materials prior to that publication, please email Jeremy.Strayer@mtsu.edu.

Opportunities for Engagement

The MODULE(S2) RAC invites members to join conversations about the future work of this RAC. Please contact Alyson.Lischka@mtsu.edu if you wish to be included in these conversations. In addition, we will be seeking piloters for all content areas in the future. If you or a colleague are interested in future piloting opportunities, please visit the MODULE(S2) webpage at https://www.mtsu.edu/jstrayer/modules/modules2.php and complete the form found there to indicate your interest.

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References


