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Collaborative Research: Mathematics of Doing, Understanding, Learning and Educating for Secondary Schools

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MODULE(S²) Data Management Plan

1. Types of Data, Samples, Physical Collections, Software, Curriculum Materials and Other Materials

Data collected during MODULE(S²) include both quantitative and qualitative data. All data will be collected by the research team or the evaluation team.

- *Questionnaires/Surveys*: Adaptation of surveys used in Banilower et al. (2013) and Markow et al. (2012), as well as adaptation of the Coach Reflection and Impact Survey used in Yopp et al. (2010) will provide one set of questionnaires/surveys for administration to faculty/instructors and PSMTs. A pre- and post-questionnaire/survey will be administered to PSMTs to measure teachers' confidence in teaching a particular unit (Banilower et al., 2013) and value for improving students' learning (Markow et al., 2012). The Faculty/Instructor Reflection and Impact Survey (adapted from Yopp et al., 2010) will measure faculty use of materials including frequency and intensity.

At each institution piloting and implementing modules, we will administer surveys to faculty and instructors teaching the modules and PSMTs in courses implementing the modules once each semester. The questionnaire/survey will probe instructor's perceptions regarding module utility, challenges, and beliefs about mathematics teaching and learning. The questionnaire/survey administered to PSMTs will capture their perceptions of self-efficacy, confidence, and levels of preparedness. Data will be de-identified (adding research IDs so we can link pre/post questionnaire/survey data) and shared across our research and evaluation teams.

End-of-session/end of course questionnaires/surveys will be administered to professional development participants to gather feedback for formative purposes and perceptions of value and utility of experiences. Data will be de-identified and shared across the writing, professional development, research, and evaluation teams.

- *Observations*: Quality of instructional practice will be measured using MCOP² (Gleason & Cofer, 2014). This validated instrument contains 17 items intended to measure three primary constructs (student engagement, lesson content, and classroom discourse). Descriptive statistics, including frequency, means and distributions, will be reported. Data will be de-identified (adding research IDs so we can link pre/post questionnaire/survey data) and shared across our research and evaluation teams. Additionally, summer PD and online interactions will be observed and monitored to provide feedback to the professional development team regarding implementation, participant engagement, and unanticipated challenges to enhance future offerings. No identifiers will be applied to any of the observation notes.
- *Documents*: Documents collected will include: faculty/instructor memos / postings that identify challenges and successes experienced in implementing modules as part of a Networked Improvement Community completed on a regularly scheduled basis; modules; instructional support materials; PSMTs' course schedules and grades, and materials related to module implementation. More documents, including research design, data collection protocols, analysis of measures, and team meeting minutes (leadership, research, modules, and professional development) will be reviewed related to project goals and objectives.
- *Videotaped Lessons and Simulations*: During pilot testing of modules and during simulations of practice, faculty and PSMT teaching will be videotaped to allow the research team determine the quality of prioritized instructional practices using the MCOP². Consent forms and permissions will be secured for all faculty/instructors, and PSMTs that appear in any videos.
- *Interviews/Focus Groups*: Both interviews and focus groups will be conducted across a wide spectrum of roles, including PSMTs, faculty/instructors, team members, and project leaders. Interviews and/or focus groups will be audio-recorded.
- *Measures of Mathematical Knowledge for Teaching*: MKT will be measured using current valid and reliable measures that align with four content domains (Algebra, Geometry, Modeling, and

Statistics), such as Knowledge of Algebra for Teaching (KAT - Michigan State University) and Geometry Assessment for Secondary Teachers (GAST – University of Louisville). In other domains (Modeling and Statistics), measures will be based on other valid and reliable instruments and validated for use in MODULE(S²).

Curriculum Materials and Other Materials to be developed include:

- *Twelve collaboratively designed modules that focus on developing PSMTs' mathematical knowledge for teaching algebra, geometry, modeling, and statistics in grades 6-12:* Partner institutions will develop, pilot, and refine these modules.
- *Faculty instructional guides:* The guides will be developed for each of the modules to help support implementation of the modules.
- *Videos of module instruction:* These videos will be used in the professional development experiences.
- *Professional development resources:* The resources (professional development plans, tasks, and products) developed to support implementation of the modules.

2. Data and Metadata Standards

Faculty/Instructors and PSMTs will be assigned an ID code for questionnaires/surveys, measures for MKT, and observations; each campus will use official university student IDs to link questionnaire/survey data to university data such as grades and course registrations. Excel spreadsheets will be used to maintain the local codebooks for identities.

Questionnaire/Survey and measures of MKT data will be stored in Excel spreadsheets or Access databases, and analyzed using SAS, SPSS and/or MPlus.

Qualitative data will be analyzed for trends and used to validate and extend understanding of survey/questionnaire data, using methods explicated by Miles et al. (2014).

3. Policies for Access and Sharing, Provisions for Protection/Privacy

In compliance with IRB protocols, all data will be stored on secure servers (electronic) or in locked filing cabinets (hard copies or external hard drive), accessible only by project researchers and/or evaluators. Each university has a secure server PIs can access. Additionally, data acquired by RMC Research will be stored by RMC Research on a secure computer in a locked office and will be coded using numerical codes with no participant identification. Participant identification related to codes will be stored on a separate restricted computer. The project team retains the right to use the data for a period of ten years. Data collected will only be made public in aggregated or confidential fashions, except for videos, clips of which may be used in educational settings, including conference presentations.

Data about grades and course-taking patterns will never be reported for individual students, but only in aggregated forms, to comply with FERPA laws.

PI Strayer has experience with IRB protocols and conducting research in educational settings, so he will ensure the research teams comply with all IRB protocols in terms of data collection, storage, analysis, and reporting. Dr. Sutton will ensure the adherence to IRB protocols will be followed at RMC Research. Strayer will be in charge of coordinating the cross-campus IRB protocols (working with each campus to defer to Middle Tennessee State University, or else to submit a separate IRB protocol), submitting the initial IRB protocol forms for approval, and for submitting annual continuing review forms to maintain project IRB approval.

The twelve teaching modules, faculty instructional guides, and professional development resources (including videos of lessons) will be disseminated and made available to other institutions.

4. Policies and Provisions for Re-use, Redistribution and Production of Derivatives

Except for video clips, data will only be publicly reported in aggregated forms. This is to maintain confidentiality of research participants, particularly PSMTs. The video clips will identify people who are consented research participants.

Videos of instruction for professional development use will be made publicly available only if all identified individuals consent the video being used in this manner.

Universities and projects wishing to conduct additional analyses of module implementation and instructor professional development might be interested in the data. If MODULE(S²) is approached by an interested project who wishes to utilize any of the raw data, MODULE(S²) will talk with this project and determine a proper course of action, such as adding the other project team members to current IRB protocols, to allow them access to MODULE(S²) data, or providing a project with de-identified data.

5. Plans for Archiving and Preserving Data, Samples, and Other Research Products

Local servers used by the project and evaluation teams are backed up weekly, with the backup servers located in different buildings than original servers. While hard copies of data will be kept, papers will be scanned to serve as a backup. Electronic data will be stored on servers for 10 years after the end of the project. Physical data (including consent/assent forms as appropriate) will be stored in a locked filing cabinet in a PI or Co-PI's office for 10 years after the end of the project. Notes will be kept with the files describing what the files contain, and indicating how data have been analyzed to date. All electronic files associated with this project (grant proposal, research papers, etc.) will also be stored on secure servers. All consent and assent forms will be scanned and kept both on secure servers and in filing cabinets.

Once the 10 year point has been reached, after the end of the research project, all electronic files of raw data will be deleted/erased from the secure servers, and hard copies with any identifying information will be shredded; hard copies without any identifying information will be recycled. Strayer and Sutton (or their institutional designees) will be responsible for ensuring the destruction of the data.