



Using Practice as a Site to Learn Mathematics for Teaching:

Developing Materials, Approaches, and Professional Community

Hyman Bass, Kara Suzuka, Deborah Ball
University of Michigan

Background: the mod4 project

mod4 is a materials development project at the University of Michigan focused on elementary mathematics teacher education. Its aim is to produce practice-based materials that support pre-service and inservice teacher learning with special attention to the mathematical knowledge and skills used in the work of teaching.

Research foundation

This branch of work is an extension of research we have been doing over the past decade that examines the practice of teaching mathematics to children. Through careful analyses of classroom videos and other records of practice, we have begun to identify common mathematical problems that teachers encounter and solve in their day-to-day work. We have also begun to develop a theoretical understanding of the mathematical knowledge (including skills, dispositions, etc.) needed to do that effectively (Ball & Bass, 2003).

mod4 materials

mod4 builds upon this analytic and theoretical foundation, developing materials to support teacher learning that—

- use records of classroom practice as contexts for learning
- target mathematical knowledge and skills needed for the work of teaching
- situate instructional activities in mathematical problems and tasks of teaching

In our materials development work, we also acknowledge and draw upon the fact that the tasks, activities, and materials we've developed are invariably adapted by the instructors and facilitators who use them. Adaptation is a necessary part of the work that teacher educators do and the materials are designed to support this work. Along with this, we've developed – and continue to develop – ways to capture and study these adaptations to better understand the issues and challenges of teaching mathematical knowledge for teaching, inform task design, and provide better supports for teacher educators.

mod4@umich.edu

<http://mod4.soe.umich.edu/mod4>

Learning from and with the professional community

Course instructors and professional development facilitators play a critical role in the development of the mod4 materials. One way they do this is through the ideas and suggestions they share that contribute to the improvement of the tasks, resources, and other facets of the materials. However, even more significantly, teacher educators using the mod4 materials provide an important glimpse into issues and challenges of teaching mathematical knowledge for teaching (MKT) in different contexts through the *adaptations* they make and suggest. Adaptations often surface in response to problems with the instructional designs or due to the lack of supports that are needed for the work. They serve as an important indicator, flagging features of the work of teaching MKT, the tasks/session designs, and the provided resources that are worth a closer look.

As part of its work, the mod4 project has created a variety of structures and processes for collecting information about these adaptations and using this information to learn about underlying issues and challenges.

Learning about adaptations made and sought

Three approaches are used to collect information about the adaptations made by teacher educators in their planning and enactment of the sessions as well as those they've come to see as potentially useful in reflection:

- One approach involves site visits to observe, document, and interview teacher educators who are participating in our materials pilot. mod4 team members interact with piloters around the observed sessions to surface decisions that instructors/facilitators made in their planning and enactment as well as to explore the reasons behind those decisions.
- Another approach enlists piloters in submitting a range of information and documentation about their use of the materials. This includes not only filling out surveys about their experiences with and feedback about the materials but also submitting records of practice – videos, audio recordings, samples of teachers' work, annotated plans, reworked slides and handouts, etc. – that were created for and during their sessions.
- A final approach engages a small group of piloters in a two-day "camp" at the University of Michigan where they participate in focus groups to provide detailed feedback, work with others to examine records of practice they've collected, and to collaborate with the mod4 development team to make revisions and create new resources for other teacher educators.

NOTE: The tag cloud below lays out some of the different types of information we collect.

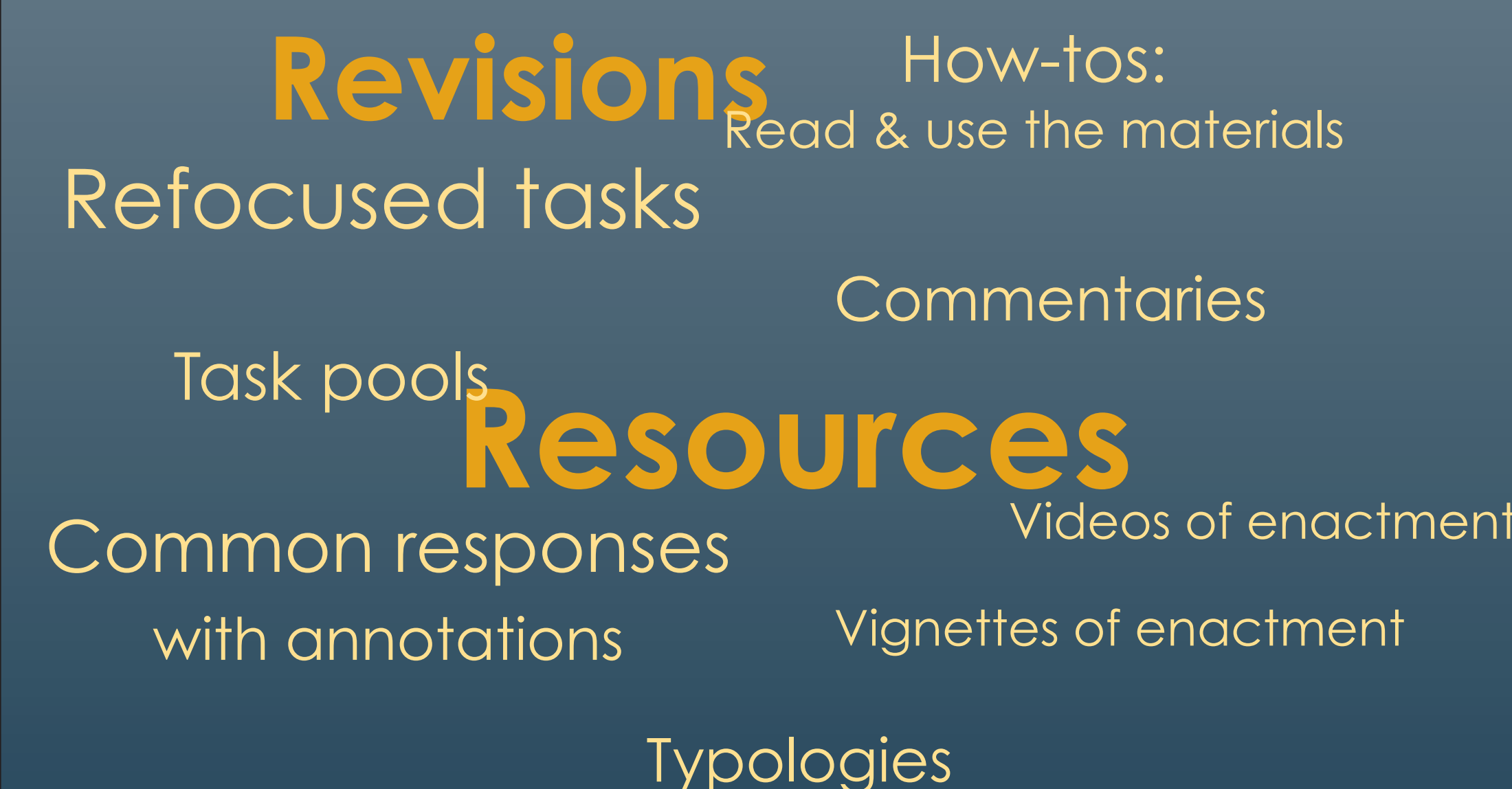


Uncovering and leveraging issues and challenges

Learning about adaptations is a useful starting point in our work with piloters. By exploring the rationales for enacted decisions and suggested changes – working to uncover the difficulties anticipated/encountered, the dilemmas faced, and the uncertainties that gave rise to the adaptations – we are able to better appreciate the needs of teacher educators and address the potential short-comings of the instructional designs and supports.

For example, uncovering places where instructors have needed to provide teachers with extended opportunities to work through mathematical issues – e.g. complicated calculations encountered in their solution approaches or incorrect solutions teachers could not initially see as incorrect – have resulted in revisions to the task design to refocus the work more squarely on mathematical tasks of *teaching*. It has also resulted in new resources to help instructors scaffold teachers' efforts as they work independently and collect information to use in later group discussions. Similarly, finding places where facilitators omitted sessions or cut them short because the content seemed to overlap with earlier sessions resulted in revisions to better differentiate the content of the different sessions as well as to strengthen and clarify connections between the mathematical work of the sessions and teaching practice. These connections are often difficult for teachers (and teacher educators) to see and nurture.

NOTE: The tag cloud below lays out some of the different types of revisions and resources that have resulted from our study of adaptations



mod4 materials

Using Definitions in Learning and Teaching Mathematics (2009-2010 pilot)
Exploring Fractions for Learning and Teaching Mathematics (2009-2010 pilot)
Revisiting Place Value (under construction)