

Mathematics Teaching Assistant Preparation and Development Research

Abstract:

Teaching assistants (TAs) play vital roles in the mathematics education of undergraduates and may go on to become professors of mathematics. From the K-12 literature, it is clear that patterns of teaching practice, as well as beliefs about teaching and learning, form early in teachers' careers. Yet, while there is a large body of research about K-12 teachers, researchers are only beginning to consider the development of TAs. This discussion group exists to foster collaboration between K-12 and undergraduate mathematics educators in framing and carrying out research into the nature of TA experiences and professional development. This meeting of the research group will be devoted to discussion of participants' research projects at various stages of development. Participants will provide feedback on research in the planning, data collections, data analysis, and reporting stages. These discussions will serve as the basis for the group's goals of building a community of researchers interested in TA issues, the analysis of similarities and differences with K-12 mathematics education, and the development of an agenda for future work.

(a) History

The Mathematics Teaching Assistant Preparation and Development Research discussion group met during one previous PME-NA conference (in 2002). At that augural meeting, time was divided between two activities. First, participants shared backgrounds, involvement with, and interest in teaching assistant (TA) issues. This activity was designed to further one of the group's major goals of forming a community of scholars and assisting people in forging connections with colleagues in the field. During our second session, participants discussed issues and potential research directions in the organizers' conference proceedings paper. In addition to furthering community development by engaging in substantive discussion, this activity provided organizers with insight into the areas of most interest to participants. This discussion also served as the beginning effort toward identifying key research issues and beginning the process of forming a research agenda to which all group participants can contribute.

Since the last meeting, organizers have engaged in several activities building on what was begun in 2002. The organizers expanded on and published the conference proceedings paper (Speer, Gutmann, & Murphy (in press)). An email listserv of people interested in TA issues was established, including participants in the discussion group as well as others encountered over the years at TA-related events.

(b) Issues in the psychology of mathematics education to be focus of the discussion group:

Broadly speaking, the group's work concentrates on issues of teacher development and practices. More specifically, research centers on mathematics TAs and factors that shape their teaching and their learning to teach. The group's work has a broad focus in the psychology of mathematics education, from a variety of theoretical and methodological perspectives, reflecting the diversity of its participants. Rather than concentrating on a single issue or a particular perspective, this group exists to serve the needs of its members and to provide a forum for discussion and collaboration on research into TA preparation and development from the varied perspectives of the participants. One of the developing aims of the group, however, is to generate and pursue a coherent agenda for research that builds on existing research on TAs and connects to K-12 educational research.

(c) Plan for engagement at 2004 meeting and how proposed work builds on prior group activities:

Included below are five short descriptions of projects at different stages of development. Two projects are in the planning and theoretical conceptualization stage, two others are in progress with some data collection completed, and one is entering the publication stage. Working group discussion time will be divided in three parts for the dual purpose of considering how these specific projects may be advanced and for building on the ideas from the previous meeting about the development of an overall research agenda. During the first segment, projects summarized below will be presented in greater depth. In break-out sections, time will be devoted to discussions of data, assessment of projects as contributions to the field, and to consideration of how projects might be expanded upon or advanced. Finally, participants will outline important and attainable goals for a research agenda and discuss ways to encourage collaboration and to ensure multiple methodologies are employed so that research findings will be widely acceptable.

Eric Hsu (San Francisco State University): Planning stage

I'm planning to do a study of how TAs form communities of practice and, in particular, how online communications mediate and influence this formation. I want to revisit the original work of Lave and Wenger (1991) to mine it for important aspects community structure that I believe have been unfairly overlooked. I have developed the outline of a theory and methodology. I am interested in talking to other people to see if these ideas make sense in other settings, such as Ph.D. institutions.

Karen Marrongelle (Portland State University): Planning stage

The goal of the proposed project is to develop a model of professional development for TAs, where teaching is improved through the collection and analysis of classroom data. TAs will teach one section of calculus and participate, with colleagues teaching the same course, in a process of curriculum and teaching improvement.

The philosophical orientation of the proposed project is that beginning teachers need time to learn to teach rather than be expected to master the complexity of teaching during a short time (Hiebert, Glass, & Morrow, 2003). Studying their own classroom practices affords teachers one of the richest environments in which to learn to teach effectively (Ball & Cohen, 1999; Clark, 2001). Beginning teachers need support to navigate the complexities of teaching, particularly how to use student thinking in their instructional planning.

The following research question will be investigated: What types of activities provide effective professional development for TAs planning to teach calculus? I plan to collect data through surveys, interviews of individual participants, and observations of participants' classrooms.

Tim Gutmann (University of New England): Data analysis stage

An important aspect of new research into the professional lives of TAs is the extent to which existing results related to preservice and beginning K-12 teachers can guide our understanding of TA experiences, processes, and professional development needs. First year experiences of teachers have been well documented and investigated. Because the TA experience has significant similarities, it is important to understand how existing conclusions about beginning teachers might be appropriate and might be inappropriate for TAs.

Preliminary interview data was collected from TAs beginning Ph.D. programs in Mathematics. Interview data are related to two questions: reasons for entering graduate school and comparative ideas about teaching in different fields. Data include novice TAs talking about their mathematical biographies, their early interest in mathematics and their early thoughts about studying mathematics juxtaposed against their early thoughts about teaching mathematics.

Additional interviews are being planned and those data should allow rich descriptions of the backgrounds and ambitions beginning TAs bring with them to graduate programs and how their personal beliefs about mathematics and teaching might influence their work as TAs.

Maria Terrell (Cornell University): Data analysis stage

As part of our NSF supported “Good Questions” project we collected data from 11 TAs who chose to use, or declined the use of materials designed to help foster an active classroom learning experience in teaching calculus. The data include TA reported assessments of why they chose to use the materials, how the materials and the pedagogical approach affected the way they spend time in class, we may also learn something about whether these methods and materials affected TAs’ understanding of how students learn mathematics.

Help is needed in figuring out what to do with data collected through surveys and interviews of the TAs, and with their students’ exam performance and responses to surveys about their learning experiences. Assistance is also needed in identifying relevant literature and related work.

April Hoffmeister (The University of Memphis): Publication stage

I have four portraits of TAs and their experiences of teaching undergraduate students. The TAs were teaching either college algebra or calculus in the Merit Workshop at the time of the study. I would like to share these portraits and eventually submit them for publication.

In addition, I looked at the college algebra TAs and Merit Workshop TAs as a group. I met separately with each group once a week for one semester. I have results on these group interactions. I would also like to share my analysis of this research and submit it for publication.

(d) Anticipated follow-up activities

Compared to the number of school teachers and preservice teachers who might serve as research informants, the number of TAs available at any one site is often small. Further, each university has its own professional requirements and professional development programs for TAs. As a result, validity of research results in this field will require the collaboration of professionals across institutions, even across types of institutions. This working group aims to help interested researchers form partnerships that will lead to collegially-accepted valuable contributions to the field.

For future conference meetings, the projects summarized here should be advanced, either through collaborative analysis of data or through organized collection of further data with updates ready to present in 2005. Furthermore, it is hoped that in 2005 individuals participating in this year’s sessions will have findings to present that begin to address major themes and questions in the research agenda to be developed at this conference.

References

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