EMERGING AGENDAS AND RESEARCH DIRECTIONS ON MATHEMATICS GRADUATE STUDENT TEACHING ASSISTANTS' BELIEFS, BACKGROUNDS, KNOWLEDGE, AND PROFESSIONAL DEVELOPMENT: WORKING GROUP REPORT

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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. Here we document an emerging body of scholarly inquiry into the TA experience and the professional development needs of TAs. The working group exists to foster collaboration between K-12 and undergraduate mathematics educators in framing and carrying out this research. Meeting time 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 continued work.

Introduction

Mathematics graduate student teaching assistants' (TAs) professional lives and development represent an area of growing research interest within the mathematics education community. As summarized in Speer, Gutmann, & Murphy (2005), TAs provide the lion's share of teaching contact hours for undergraduate mathematics students and go on to become faculty members teaching mathematics. Thus, TAs' importance as current and future educators and the importance of providing informed professional development opportunities for them cannot be denied.

Researchers have begun to inquire into various aspects of the TA experience from several theoretical perspectives. Some, working within socio-cultural traditions, are examining characteristics and the nature of identities of beginning TAs. Others seek to understand the structure and features of the communities in which TAs participate. Taking more cognitive approaches, others are investigating TAs' knowledge and beliefs, particularly those related to student thinking. Another area of current activity is curriculum development for TA professional development (PD) and the adaptation of PD materials and programs from K-12 contexts for use with mathematics graduate student TAs.

In addition to continued work on the research and development programs described above, the TA researchers are furthering their goals by expanding on traditions from K-12 research and pursing new methodologies. For example, development of traditional PD is now being augmented with videocases, opening up new issues for design and research on TA development.

Studies of knowledge are being extended to include investigations of how TAs acquire the pedagogical content knowledge necessary for teaching. Studies of teaching are now being augmented with studies of how TAs plan for teaching and how knowledge and beliefs shape the decisions TAs make while planning their classes. The agenda of understanding the TA

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experience is being extended to include more detailed examinations of the challenges faced by first-year TAs as well as more extensive inquiry into the complexity of the context in which TAs work. In addition, while the TAs in most researchers' studies are teaching or preparing to teach calculus, recent contributions take the work into the arena of statistics education.

Against this backdrop of developing interest, the Mathematics Teaching Assistant Preparation Working Group has attempted to fulfill three main goals: (a) to help mathematics educators interested in the TA experience and TA professional development to connect and collaborate; (b) to provide critical, informed support and feedback for researchers considering TAs; and (c) to organize a research agenda of relevant, common concerns. Here we summarize the work of the group to date and present a list of five central issues that constitute the research agenda as determined during the 2004 meeting. Further, this paper includes summaries of ongoing projects from several contributing authors to be discussed in detail at the 2005 meeting.

The working group met during two PME-NA conferences. In 2002, time was divided between two activities. First, participants shared backgrounds and interests in TA issues. Second, participants discussed issues and potential research directions. In addition to furthering community development by engaging in substantive discussion, these activities provided organizers with insight into participants' areas of interest. The discussion also began our efforts to identify key research issues and to form a research agenda to which all group participants can contribute. At the 2004 meeting, time was devoted to individual project presentations and whole-group discussion of cross-cutting issues. Individual presentations were "working sessions" where participants presented plans for research or artifacts from research-in-progress. Participants received feedback on plans, data collection instruments, theoretical approaches, and data analysis methods. Discussions focused on assessment of projects as contributions to the field and consideration of how projects might be advanced.

Issues in the Psychology of Mathematics Education for 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 and sociology of mathematics education, from a variety of theoretical and methodological perspectives. Rather than concentrating on a single issue or a particular perspective, the group exists to serve the needs of its members and to provide a forum for discussion and collaboration on research from their varied perspectives. One of the developing aims of the group, however, is to generate and pursue a coherent research agenda building on existing TA research as well as connecting to K-12 educational research.

The following five points summarize the 2004 group's progress toward defining a research agenda:

1. In creating professional development (PD) experiences for TAs, we need answers to questions related to (a) the nature of TAs' thinking about teaching and learning, and (b) how TAs process and learn from PD experiences and curriculum materials. What experiences and materials do they need and want?
2. We should develop baseline information about how TAs work and learn as part of a community and what motivates them. We need to understand the norms related to valuing teaching and studying mathematics and how these norms are communicated. In doing so, our theories must address TAs' backgrounds and their long- and short-term goals. We should not assume all TAs are Ph.D.-bound. Rather, we must also develop models to

explain the cultural implications of being a transient TA—a TA planning to become something other than a research mathematician.

3. Research should exploit the discipline-specific nature of being a mathematics TA. While many universities have PD programs that assume teaching is teaching, whatever the discipline, we should emphasize ways in which this is not true for mathematics TAs and incorporate ideas specific to the learning of mathematics. How are mathematics TAs challenges and needs different from those of TAs in other fields?
4. Our work will be done with, for, and in support of faculty and TAs in mathematics departments. As such we have a special responsibility to (a) meet their needs and (b) set our work solidly within psychological and epistemological frameworks that guide mathematics education. Doing so, we must be mindful of how the two communities define *validity*. Results must be presented in frameworks acceptable and useful to both client communities.
5. Existing mathematics education research related to preservice and in-service teachers' thinking and practices is rich. In working with TAs, an important task is to consider what pre-K-12 teacher research has to tell us about TAs and to consider what this research does not address.

Current Working Group Projects

Members of the working group have contributed synopses of seven projects to be discussed during the group meeting time. These projects fall into four categories, with some in multiple categories: creation of curriculum material for professional development (Hauk et al, Noll); examinations of TAs' knowledge and/or beliefs about student thinking (Kung, Noll, Speer et al); investigations of TAs' planning practices (Winter, Speer et al); and study of characteristics of TAs and their adjustments to challenges encountered in their teaching (Meel, Belnap).

During the group meeting each researcher will share the project as described below and solicit feedback. For each project, the researcher(s) describes the work, indicates what "stage" of development the project is in (planning, data analysis, reporting, etc.), and sets out how they intend to structure their portion of time during the working group meeting. Projects in earlier stages of development (e.g., planning) are described first, followed by those in later stages.

Video Cases for Novice College Mathematics Teacher Development

Shandy Hauk, David T. Kung, Nikita Patterson, Angelo Segalla, & Natasha Speer

This project addresses two major challenges facing undergraduate science, technology, engineering, and mathematics education: building college students' understanding of mathematics and enhancing the teaching efficacy of new college faculty. The proposed work folds together cognitive and psychological theories on mathematics learning and teaching with lessons learned from successful K-16 practice to encourage growth among undergraduates in mathematics service[1] courses and sustainable professional development among the graduate students who teach them.

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[1] "Service courses", (representing 85% of mathematics course enrollment nationally (NCES, 1999), are mathematics courses taught to non-mathematics majors. Usually referred to students as "the last math course I'll ever take", they include prospective elementary school teacher content courses, college algebra, finite mathematics, elementary statistics, business calculus, and other courses that satisfy general education/breadth requirements.

As the undergraduate population grows more diverse, so do the graduate student and faculty populations (NCES, 1999). This project, grounded in attention to acculturative issues, supports the expansion of a diverse professoriate. One strand of basic research will center on the evolution of novice college mathematics instructors' cultural repertoires and resolution of cultural dissonance. Additionally, applied research, via teaching experiment, will aim to improve college mathematics teaching and learning through teacher-scholar development of participating TAs and through self-regulatory development among TAs and their students. The research strands will inform the design and use of video-case materials.

The FIPSE-funded Boston College Case Study (BCCS) Project produced a book of 14 fictionalized written accounts of college mathematics teaching interactions (Friedberg, 2001). Building on this project, and the proven efficacy of case use in K-12 teacher preparation, the project's curricular goal is to create a collection of video cases from college mathematics classes. Video-cases will be chosen for their power to illuminate or stimulate reflection and discussion. Accompanying materials will include notes on case use for TA trainers, problem sets, writing and grading rubrics, comments by and for TAs, and an independent reflective learning guide to facilitate distance course use. Field-testing of case materials will inform an annual reflective cycle of development, field-testing, evaluation, research revision and reimplementation.

The DVD created will be similar to the Integrating Mathematics and Pedagogy (IMAP) Project materials for K-12 teachers (Phillips & Cabral, 2005). Differences between IMAP and the proposed cases are: (a) the video-case tools and accompanying text will be for an audience with mastery of mathematics but little or no formal training in pedagogy; (b) case tools organization will allow use in distance-learning; (c) materials will include in-class video-clips and video vignettes and/or textual materials about out-of-classroom interactions such as office hours, email communication, undergraduate and graduate student advising, communicating with junior and senior colleagues about teaching, and interview clips with TAs.

Status. The research strands of the project are still in development. To strengthen a grant proposal to the NSF for a three-year project combining research and curriculum development, pilot video-case materials are being collected and a pilot DVD interface created in Summer 2005. Some field-test agreements are in place, as are initial publication agreements with the Conference Board for the Mathematical Sciences and the American Mathematical Society.

Working group plans. The grant proposal associated with the project will be developed and available for comment by the working group members. In addition to feedback on the grant proposal, the working group can provide support for this project in several ways:

- Viewing and commenting on pilot video-clips and DVD user-interface.
- Reviewing, discussing, and offering suggestions for pilot textual materials.
- As a potential source for volunteers to join the project as researchers, evaluators, video-case data generators, and/or field-testers for materials.

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Teaching Assistants Learning How Students Think

David Kung

The goal of this project is to understand the process by which TAs gain knowledge of student thinking about calculus and how they use that knowledge in the course of teaching. We take a cognitive perspective shared by much of the work on teacher cognition and pedagogical content knowledge (Borko & Putnam, 1996; Shulman, 1986). In particular, we assume instructors' teaching decisions are influenced by their understanding of student thinking. Improving teacher knowledge of student thinking has proved to be a powerful tool of professional development (PD) at the elementary level (Fennema, Carpenter, Franke, Levi, Jacobs, & Empson, 1996; Cobb, Wood, & Yackel, 1990). We hypothesize that the same holds true at the college level, and that improvements can be made in college calculus teaching by finding ways to improve TAs knowledge of student thinking. We see this project as laying the groundwork for research-based PD materials for TAs.

In trying to better understand the process of TAs learning about student thinking, we focus our work around three main questions:

1. How do calculus TAs' various experiences contribute to their learning about student thinking?
2. What types of knowledge of student thinking are gained and through what types of activities?
3. How do calculus TAs use their knowledge of student thinking in their day-to-dayteaching activities?

Status. In an initial study, eight former Emerging Scholars TAs were interviewed about their knowledge of student thinking and how they gained that knowledge. Those interviews indicated that different activities lead to different types of knowledge. For instance, observing students working on problems provides very fine-grained information about their thought processes (including their misconceptions and solution strategies), but grading exams and homework led to knowledge of what students perceived to be the correct answers – knowledge not available in the process of observing students.

This work has been submitted for publication, but several parts of the main questions remain unanswered. To what extent were TAs' recollections an accurate portrayal of their actual learning process? Was their knowledge gained through a few specific incidents, or was it gained more gradually through years of teaching? What types of knowledge of student thinking do TAs already possess when they enter graduate school? The question of how TAs use their knowledge of student thinking in the course of teaching remains completely unanswered.

Working group plans. Several people are working to provide insights into the questions posed above. This working group will allow us to coordinate our efforts more fully. This might take the form of simply informing our research more fully or even sharing instruments and assessment tools. In addition, I would like feedback and assistance about planning the next step in this research program. What instruments are needed to detail the learning process TAs go through *while* it is happening? What types of studies could determine how calculus teachers are using their knowledge of student thinking while they teach?

Using a CGI Professional Development Framework for Improving Statistics TAs' Pedagogical Content Knowledge

Jennifer Noll

Probability and statistics education and the promotion of statistical literacy have received increased attention in the mathematics education community in recent years (National Council of Teachers of Mathematics, 2000). Undoubtedly the increased use of statistics and graphical displays of data in today's media is one of the driving forces behind the mathematics education community's concern with the teaching and learning of probability and statistics. Furthermore, at the college level more and more undergraduates are being required to take introductory statistics in their degree programs. In fact, enrollment in elementary statistics courses (non-calculus based) at four-year colleges and universities rose 18% from fall 1995 to fall 2000 and by 45% from 1990 levels (Luzter, Maxwell, & Rodi, 2000). At many universities, TAs teach the bulk of the introductory statistics courses or teach recitation sections for large lecture classes. Thus, TAs have the potential to play a vital role in undergraduate statistics education and the promotion of statistical literacy among college students.

Unfortunately, many colleges and universities lack professional development (PD) opportunities for TAs. Beginning TAs typically participate in orientation programs, where the focus is to help them become acquainted with the university, fill out paper work and provide them with general rules of thumb in the classroom (Speer, Gutmann, & Murphy, 2005). However, PD is and should be different than orientation programs. Whereas orientation programs provide students survival skills, PD should provide opportunities for TAs to examine and discuss course content, teaching practices, and theories of learning and teaching before and during their first teaching assignments.

Misconceptions in reasoning about probability and statistics are common even for those with considerable statistical training (Kahneman & Tversky, 1972; Konold, et al., 1993; Tversky & Kahneman, 1971). Thus, because PD opportunities for TAs are lacking and TAs are susceptible to these common misconceptions, an understanding of how TAs think about statistics, and their beliefs about how students learn statistics is badly needed. Additionally, PD programs are needed to create opportunities for TAs to examine, discuss, and reflect on their own understanding of statistics, how students come to learn statistics, and practices for teaching statistics.

The overarching goal of my project is to broaden the developing base of research concerning graduate teaching assistants by initiating research on the statistical knowledge of TAs. I plan to investigate the impact of a PD program on TAs' knowledge of statistics, their beliefs on the nature of statistics, and their beliefs on teaching statistics to undergraduates. In particular, the following research questions will be investigated:

If TAs participate in a PD course that focuses on research-based studies on how students learn and think about statistics:

1. Will TAs' beliefs about teaching statistics and their role as teacher change?
2. Will TAs' understandings of the role of statistics in undergraduate education change?
3. Will TAs' pedagogical content knowledge of statistics change/grow?
4. Will TAs who participate hold a different view of statistics (what it is and why it is important) than TAs who do not participate?

Using elements of the Cognitively Guided Instruction (CGI) framework I plan to develop a PD course for TAs grounded in research on students' thinking in statistics in three content domains: center and variation, bivariate relationships, and sampling and sampling distributions.

The PD course will provide TAs the opportunity to reflect on their own understandings of these concepts, learn how students understand these concepts, and reflect on methods for teaching these concepts.

Working group plans. During the working group session I would like feedback on (1) instruments for measuring teaching assistants' beliefs about the teaching and learning of statistics (2) refining and narrowing my content domains (3) ideas for developing PD activities centered around my three content domains, and (4) refining my research goals.

Influences of College Mathematics Teachers' Knowledge and Beliefs about Student Understanding on their Plans for Instruction

Natasha Speer, Sharon Strickland, & Nicole Johnson

The goal of this project is to use findings from K-12 research in the design, implementation, and research of professional development (PD) for TAs. Elements of PD programs with proven results at the K-12 level, such as Cognitively Guided Instruction (CGI), will be adapted for use with TAs. CGI approaches PD by emphasizing development of teachers' knowledge and beliefs related to student understanding for particular mathematics concepts. The PD activities in our project will create opportunities for TAs to learn about student understanding of college mathematics concepts, focusing on limit, derivative, and function.

We are currently in the first phase, focusing on the development and refinement of data collection methods and materials. The long-term research goals center on understanding and improving the development of mathematics TAs' teaching practices and examining how development of such practices shape the learning opportunities of students. Hence, we aim to develop methods permitting us to coordinate the data we gather on TA learning, TA instructional practices, and student learning opportunities.

The objective of the development of these methods is to enable investigation of the following research questions: (1) What knowledge and beliefs do TAs possess and how do those factors shape their teaching practices, particularly their planning, instructing, and reflecting? (2) How do TAs engage with PD activities and, as a result, are TAs able to learn about student understanding of mathematics concepts? Does this learning change TAs' planning, instructing, and reflecting practices? (3) As TAs attend more to issues of student understanding, how is that reflected in students' learning opportunities?

Status. We have conducted pilot interviews with TAs to document their knowledge and beliefs related to student understanding of our focal concepts by engaging them in discussions of related tasks. These interviews probe TAs' general understandings of the concepts, their solutions to the tasks, their planning for a lesson or lessons to introduce students to these concepts, and their knowledge of student understanding related to the concepts and tasks. In addition to these task-based interviews, we also interviewed TAs as they planned for teaching an upcoming class, observed that lesson, and conducted a post-teaching videoclip-based interview.

Working group plans. During the working group session, in addition to providing more details on our methods, analysis, and preliminary data, we will focus on the data collected during the planning portions of the interviews. We are particularly interested in identifying aspects of lesson planning and teaching where TAs decisions appear to be based on their knowledge and beliefs about student learning. We are seeking feedback on how to modify our interview procedures to obtain richer data on TAs' use of their knowledge of student learning while planning lessons.

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Lesson Planning Practices of Graduate Student Instructors in Mathematics

Dale Winter

The mathematics department at the University of Michigan is well known nationally for its large-scale, innovative introductory mathematics courses (Brown, 1996) and for the student-centered style of teaching encouraged in these courses (DeLong and Winter, 1998). The current project seeks to understand the lesson planning practices of TAs as they learn to function within this instructional environment.

The decision to focus on planning is rooted in research conducted with K-12 teachers suggesting improvements in planning can lead to enhanced classroom learning environments and improved student learning (Zahorik, 1970). In fact, some research into teacher decision-making (conducted with high school teachers) suggests most of the decisions instructors make to substantially affect the quality of the classroom environment are made during the "pre-active, planning phase" (Bush, 1983). Several research studies on beginning teachers (including K-12 teachers and novice graduate student instructors) have noted that novice teachers do not always implement innovative courses and pedagogies optimally (DeLong & Winter, 1998; LaBerge & Sons, 1999), and studies of teacher planning at the K-12 level have linked teachers' difficulties with innovative curricula to their planning processes (Yinger, 1980; Zahorik, 1970).

Finally, the Ph.D. program in mathematics at the University of Michigan typically graduates between 20 and 30 students per year. Of these, more than 80% accept an academic position with a substantial undergraduate teaching component as their first appointment. What seems clear from these statistics is that the instructional practices of TAs at an institution like the University of Michigan are also the instructional practices of individuals for whom undergraduate teaching will be a major, lifelong occupation (Speer, Gutmann, & Murphy, 2005).

This project is being conducted using clinical interviews of novice and expert TAs, and content analysis of the interview transcripts. The principal research questions that the project will attempt to explore are as follows.

1. What do novice TAs in mathematics actually do when they prepare for their lessons?
2. Are there any typical planning procedures that TAs in mathematics follow when preparing their lessons? If so, what are they?
3. What sources of information and resources do TAs use when they prepare for their lessons?
4. Do TAs consider assessment of student learning as a part of their planning process?

Status. We have conducted seven pilot interviews with beginning TAs. In this pilot study, the TAs were each interviewed once. The current study is in the data collection stage. In this larger study, fifteen TAs have been included and each TA will be interviewed three times during the course of the semester.

Working group plans. During the working group session, I will present the interview questions that my group has been working with, along with some of our pilot data and preliminary plans for data analysis. I am seeking feedback on how to integrate the responses from individual TAs over the course of a semester. For example, what forms of additional data could prove helpful in trying to distinguish between genuine shifts in TAs' approaches to lesson

planning and habitutation to the questions asked during the interviews? I am also seeking participants' thoughts on our plans for analysis and suggestions for additional approaches for examining our data.

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Exploring First-Year TA Experiences Through Weekly Reflective Writing Assignments

David E. Meel

TAs hold an important role in undergraduate student development. Bender (2004) stated, "Whether they want to be or not, TAs are important role models for undergraduates and often serve as influential mentors for the students in their classes. TAs make a significant difference in the lives of undergraduates. An enthusiastic and committed graduate student can help to transform an undergraduate student not only into a major in the field but also into a potential graduate student. The reverse is also true: when graduate students fail in their teaching duties, undergraduate learning suffers. A disorganized, ill-prepared, and ineffective classroom instructor can undermine the hopes of even the most dedicated undergraduate to pursue the discipline in future semesters" (p. 267). Gaining an understanding of issues that novice TAs face when entering an undergraduate mathematics classroom for the first time is essential to developing ways of enhancing development programs to help them anticipate their role as a future faculty.

One possible way of gathering information on the struggles TAs face is to engage the TAs in journal writing activities. Not only can journal writing elicit information on problematic issues encountered by TAs but journal writing has been found to impact understanding (Birken, 1989; Porter & Masingila, 2000; Powell & Lopes, 1989; Pugalee, 2001; Shepard, 1993; Wahlberg, 1998) and enhance metacognitive abilities (Kreeft, 1984; Linn, 1987; Nahrgang & Petersen, 1986; Stanton, 1984). In particular, Linn (1987) identified that journaling actively involves participants in their own learning process, forces synthesis of information, and causes reflection on strengths and teaching and learning styles. Evoking reflection on effective practice was the goal of incorporating journal-writing activities into TA training activities for novice TAs.

The project began in Fall 2004 with 19 new TAs entering the graduate program at a Midwest regional state university. Each week of the Fall semester, the TAs were expected to provide an email journal response to one of the following four prompts: (1) This week in teaching I struggled with…; (2) I was flabbergasted when I read a student's response which said…; (3) I have to tell you what my student did… and (4) A really great conversation was created when… Another part of the data collection, although not necessarily a component of this particular study was the requirement that the TAs observe one novice TA and two experienced TA's or instructors and then provide written observation reports on what they saw and what they might consider doing differently. Seventeen of the 19 participants provided the requisite number of journal entries and therefore analysis will be restricted to their responses. Specifically, analysis of the data will focus on the issues and problems the TAs have in their classrooms, preparing for class, or balancing teaching and school work. The goal is to determine the coping strategies these novice TAs bring to problematic situations they encounter and to continue to develop a repertoire of techniques to help novice TAs build appropriate coping mechanisms prior to becoming involved in such problematic situations.

Status and working group plans. The research is in the data analysis stage and there are three tasks for which I would like feedback and assistance during the working group session: (1)

reacting to current framework for analysis; (2) reflecting on appropriate coping mechanisms; and (3) exploring possible linkages between TA struggles and their observation reports. In particular, item (3) focuses on whether the observation of other TAs and instructors helped the novice TAs to reflect on their own teaching practice and whether they gleaned useful coping strategies from such observations. As the working group assists in addressing these three tasks, I believe they will help in obtaining better analysis of the data, improved insights, and enhance future TA training.

Illustrating the Complexity and Variety in the Graduate Mathematics Teaching Assistant Experience

Jason Belnap

Over the past decades, many programs and methods have been developed to prepare TAs for teaching responsibilities (Feiman-Nemser & Remillard, 1996; Friedburg et al., 2001; Gray & Buerkel-Rothfuss, 1991). Recent research raises the question of whether these programs are having an impact and if so, how (Shannon, Twale, & Moore, 1998; Defranco & McGivney-Burelle, 2001).

As many of us are now focusing on these concerns as specifically related to mathematics TAs, it becomes important that we understand the challenges and factors that TAs in other fields experience, what differentiates mathematics TAs from other TAs, and how these impact the development of TAs' teaching views and practices. To begin to describe the mathematics TA experience and the complexity of this context, I conducted an investigative, year-long qualitative, multi-case, dissertation, interview study involving seven TAs who differed by gender, teaching background, and area of study; interview results were substantiated by observations and written assignments (Belnap, 2005).

The study demonstrated the complexity of the TA experience and illustrated the diversity of the TAs we seek to prepare. Several TA prototypes were identified with diverse views and backgrounds, responding to and implementing the preparation they received quite differently. Consequently, a variety of challenges and factors were identified influencing and impacting their teaching development.

Status and working group plans. This study has been completed and planning for subsequent research is now underway. From the working group, I seek ideas and feedback in two main areas. First, I seek ideas on research directions that would build on this study and its results, including possible collaborative efforts. Second, I welcome ideas regarding publication and other venues for dissemination of results, and ideas on ways of breaking-up the results for publication.

Conclusion

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 PD 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.

The 2004 working group meetings moved the group forward significantly beyond where it had been after the discussion group meetings of 2002. While the 2002 meetings served to help members of the community meet, the 2004 meeting marked a point where researchers were able to draw upon a more involved community and present projects, both theoretical and applied, with specific goals. In 2005, the working group expects to be able to track how projects underway in

2004 have developed and to identify which areas are proving especially fruitful. Furthermore, as a more established working group, the organizers hope graduate student members of PME-NA will now see more opportunities to build on promising projects discussed at the conference.

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