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The 2010 Banff workshop on Teachers as Stakeholders in Mathematics Education Research

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Abstract: *The Banff International Research Station (BIRS) for mathematical innovation and discovery held a 5-day workshop entitled “Teachers as Stakeholders of Mathematics Education Research” from December 5-10, 2010. This workshop co-organized by Guenter Toerner (University of Duisburg-Essen), Bharath Sriraman (University of Montana), Klaus Hoechsman (Pacific Institute of Mathematical Sciences, UBC-Canada), and Sharon Friesen (University of Calgary), followed up a successful workshop organized in Oberwolfach, Germany in 2007, and brought together 25 participants from all over the world. Participants included key members of the American Mathematical Society, the German Mathematical Society and the Canadian Mathematical Society, in addition to key educational policy makers from Germany, Austria and Australia. One of the goals of the workshop was to unify approaches to mathematics content presented in textbooks aimed at teacher education, in addition to discussing sustainable models of longitudinal professional development that have been successfully implemented in Australia, Europe, Israel and North America. In this special issue of *The Mathematics Enthusiast*, the myriad approaches to mathematics teacher professional development are presented and discussed.*

Keywords: BIRS; Mathematics teacher professional development; Models of professional development; Mathematics education policy; Mathematics education research (MER); Professional development (PD)

Introduction

Mathematics education has long been concerned with the training of pre-service and in-service teachers. The origins of the field indicate that initially mathematicians like Felix Klein spent a considerable amount of time in producing coherent textbooks for teachers that focussed on the mathematical content (Sriraman & Törner, 2008). In the last three decades teacher training has been the focus of numerous initiatives not limited to the U.S but in different parts of the world. A considerable amount of mathematics education research has reported on start-up projects with teachers, models of professional development, summer workshops, design based approaches to professional development (Lesh & Sriraman, 2010). The discussion at Banff at this workshop centred on whether or not teachers were viewed as stakeholders in the burgeoning body of reported research, and whether or not extant mathematics education research (MER) had any effect on teaching practice when viewed longitudinally. The meta-issue surrounding MER in the discussion among the participants

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was to make the ensuing issues more teacher inclusive than researcher oriented. Not every agenda needed to be perceived as a research agenda! The issues discussed were:

Issue 1: Interest

How deeply do we expect teachers (as stakeholders) to have an interest in the process and the result of a MER project? How can MER help / address the current (de)professionalization?

Issue 2: Distrust - trust

How can we work together to build trust so that our combined work can be more effective and useful for both - researchers and teachers?

Issue 3: (De)Professionalization

Teachers are professionals but not viewed as such. Unlike other fields like medicine, law and others, apprenticeship/internship/mentorship is under-valued.

Issue 4: MER Researchers/Professionals as a Resource

Need to look at teacher's agendas both a priori and emergent if mathematics education researchers want to be accepted within the teacher's milieu.

Issue 5: Terminology

How do we conceive professional growth of teachers ideally?

Issue 6:

How can the relationship (evidence, scalability, sustainability) help enhance MER teachers' learning and transformation of teaching mathematics?

Themes and Issues

Participants were broken up into smaller groups to discuss the six issues listed above. The following themes emerged as a result of the discussion among the participants.

1. Teachers have interest in results that effect teacher's effectiveness.
2. Research results should have an impact on students.
3. Teacher educators have a direct relationship to teachers, but not to their students and teachers tend to just talk about their students' work. This makes communication difficult for the teacher educator.
4. Teachers in Canada are very interested in lesson studies.
5. We need a learning culture for teachers. Thereby most important is "learning in practice from practice".
6. Do we have examples of evidence-based teaching?
7. We do not have professionalism in math teaching when we compare it to other disciplines like medicine.

After lamenting on the current state of secondary math teacher preparation, time was spent discussing issues 3 and 5, namely addressing the current de-professionalization of teachers and models of pre-service education and ongoing professional growth. It was emphasized that mathematics teachers need to consider themselves as professionals with ongoing duties to the subject matter and continually striving for better pedagogical understanding and

reaching for innovation in their teaching strategies, as is supported by current research in mathematics education. They should have the confidence to consider themselves as mathematicians as well as possessing the multiple competencies required to respond to the dynamics in the classroom.

From this arose an ideal vision of the pre-service education of secondary math teachers: mathematics courses that are commonly taken by math majors, including the history of mathematics in concert with specialized math education courses. This will only be possible with the committed involvement of mathematicians in the math education of teachers.

With respect to professional growth, it was strongly felt that research on the current state of teacher knowledge (subject matter and pedagogy) must be undertaken. There were obvious institutional barriers to revealing this deficit and this would require respectful support from within the profession.

The workshop consisted of several teachers from Calgary Girl's School. The model of teacher collaboration at this school was deemed as admirable (e.g., Jarry –Shore & Sandra Mcneil, this issue). In this school, novice teachers were supported and professional development was handled in house and at the instigation of the teachers themselves. Collaboration with mathematics education professionals at the University of Calgary enabled innovation to be fostered at the school. The school was obviously a local centre of excellence but communicating and extending innovations to a larger scale was seen as problematic and would require enormous institutional change.

It was felt that teachers must take the responsibility to be aware of current research in mathematics education and also have input into the nature of math education research projects. Effective communication between mathematics education professionals and teachers is the start.

Discussion

The discussion began with outlining students' misperception of the discipline of mathematics as negative, tedious, and task-oriented (the slippery fish image). Influenced by Roger Howe's presentation on the deficits of mathematics education in the US, comments were made regarding a lack of understanding of symbolism, and incomplete understanding of operations, and no knowledge of the history of mathematics with the foundational deficits occurring at the earliest stage of instruction(primary school). The concern was how to help teachers communicate the beauty of mathematical ideas and their existence within a landscape of reason. We agreed that the subject needed to be humanized by communicating the enormous and often agonizing efforts of mathematicians throughout history.

Teachers needed help in focusing student understanding of key ideas and structures and building a foundation for their students to recognize and enter the 'corona of reasoning' themselves.

Suggestions with respect to professional growth and development were:

- Help primary teachers attain an adult view of elementary mathematics and their historical underpinnings.

- Help secondary teachers attain an epistemological view of mathematics to be more fully aware of the full landscape of the subject.

Mathematicians are ideally the ones to assist this. In addition, all teachers must have the opportunity to play and reflect on mathematics themselves, in the same manner that teachers encourage their students.

Teacher professional growth and development must enable teachers to uncover basic fallacies in their student's understanding and in their own teaching practice and resources must be present to enable them to remediate these. In addition, if teachers are able to critically evaluate curriculum and resources (specifically manipulatives), they will be able instead to refocus their students effectively on the core concepts at each level. The supporting professional development must have the following characteristics:

- long term and ongoing
- trusting open environment
- access to experts
- serious commitment on the part of the teachers expectations of a long front-end preparation before implementing any new innovations in the classroom continuous mentorship within the local instructional setting time in their working lives to collaborate in mentorship

Another major topic of discussion was: How can we (teachers, researchers, facilitators) work together to build trust so that our combined work can be more effective and useful for both/all? The following were suggested by the participants if we want to achieve a win for everybody (teachers, researchers, students).

- Focus on important maths
- Relevant to teachers' goals/concerns – considered worthwhile by teacher and researcher
- Everyone gets something relevant and valuable out of it
 - Certificate
 - Credits toward academic course
 - Research outcome
- Curriculum based
- Potential to enlighten teachers and researchers about practical issues of use to other teachers
- E.g. Co-authoring classroom materials
- Potential for the growth of knowledge e.g., re student learning, teacher learning ...

Necessary conditions for opening practice i.e. having a researcher in classroom:

- Need to know and understand each others' goals, motivations, constraints; match with own goals. Need to plan the relationship in terms of its beginning, middle and end
- Want to know what each will do, get and how it will be used

How do we achieve this kind of relationship?

- Individual conversations about what each wants
- Time for conversations and working together in less confronting ways
- Time for sustained interaction

- Teacher needs to be seen as the expert on teaching in this class
- Pace/staging of innovation mutually negotiated but ultimately controlled by the teachers and consistent with teachers' beliefs
- Compatibility of personality, thinking, beliefs
- Genuine partnership – shared development of the direction of the project

Barriers:

- Sharing experiences (e.g., publishing practices) can be 'embarrassing' threatening for teachers (and researchers); not part of culture of teaching profession; very exposing
- There is an asymmetry in terms of the risk to teacher and researcher when a researcher enters a teacher's classroom; researchers must be sensitive to this
- Researchers' being critical; fear of being judged
- Opening oneself up to one's peers can be more threatening than to someone perceived to be more skilled
- Comfort level depends on confidence with the particular topic or lesson
- Unrealistic expectation of an 'ideal' lesson
- Unreasonable expectations – e.g., conforming to someone else's model of teaching; trying something that is quite different from usual and unfamiliar and perhaps inconsistent with the teachers' beliefs or teaching styles
- Concern that project might interfere with achieving goals for which teacher is accountable e.g., scores on mandated tests

Teacher Issues

- The need to design their own programs
- Realize the potential to create change
- Mentorship
- Teachers mentoring teachers and provision of work time for teachers to collaborate on professional interests.
- No on the job time
- Restructuring time
- Teachers naturally reach to the curriculum or manipulatives as a crutch or a response to external pressures of PD

Concluding Points

At the end of the workshop, agreements were reached on the following aspects of mathematics teacher professional development.

- Substantial mathematical nucleus is needed
- Be more forward in admitting our own weaknesses
- Validity of the medical model
- Longer term PD versus one day things
- Follow up on long term projects
- Collaborating with a teacher in the same school
- Money thrown by policy makers is not aimed at the teachers that want the PD.
- Dichotomy between wanting and needing PD
- Teachers that want to be learners in the long term

The papers in this special issue focus on the themes outlined in this article and explore various aspects in the concluding points.

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