

Scholarly Teaching in School Mathematics

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In 2010/11, the Math Council of the Alberta Teachers' Association (MCATA), in partnership with researchers at the University of Alberta, invited members to participate in an online survey and follow-up interviews on scholarly teaching in mathematics education. The survey asked teachers to provide information about activities related to professional reading, inquiry into teaching and dissemination of knowledge to the profession. It is our hope that this report will provide insight into how we can enhance and support the scholarly activities of teacher leaders in mathematics education.

Background to the Inquiry

In schools, teachers' work has traditionally taken place behind classroom doors, hidden from view. More recently, the work of teachers has shifted to public forums as shared reflection and inquiry have become expectations of teachers' professional practice (Shulman 2004; Smith and Smith 2006). A similar shift is occurring in postsecondary institutions, supported by Scholarship of Teaching and Learning (SoTL) initiatives. The growth of SoTL comes, in part, from viewing teaching as scholarship, along with more traditional forms of scholarly activity, such as basic research (Boyer 1990).

From the SoTL perspective, excellent teaching and scholarly teaching are not the same. Teaching becomes scholarly when one engages in reflection and inquiry and when one studies, documents and analyzes issues of concern with the purpose of enhancing student learning and improving practice. The scholarship of teaching occurs when evidence-based inquiry is shared, is subject to critique and has the potential to contribute to existing knowledge on teaching within a discipline (Hutchings 2002; Hutchings and Shulman 1999; Kreber 2001).

The words *scholar*, *scholarly* and *scholarship* are typically associated with academe. Yet, the origin of *scholar* is the Latin *schola*, meaning "school."¹ Although originally used to refer to a student or someone

taught in a school, *scholar* is now used most often in reference to the professoriate. Regardless of whether one is a student or a teacher, an apprentice or an expert, a scholar is someone who is devoted to learning, who acquires knowledge through focused inquiry and who communicates knowledge to others (Andresen 2000). This description points to three types of scholarly activity supported by the SoTL literature (Richlin 2001; Trigwell et al 2000):

- Engaging with the literature on teaching and learning to improve practice
- Engaging in critical inquiry into and reflection on practice
- Communicating results to contribute to the scholarship of teaching and learning

While the work of elementary and secondary school teachers is only occasionally referred to as scholarly (Diezmann 2005; Hatch 2006), we see many similarities between the scholarly activities identified in the SoTL literature and the emphasis on inquiry in the public school system. Although the impetus behind the SoTL movement was to bring "recognition and reward" to teaching in higher education, SoTL shares goals applicable to teaching at all levels, including improving student learning and enhancing the practice and profession of teaching.²

Our study was designed to identify the range of scholarly activities in which educators in school mathematics engage and the perceived impact of these activities on their practice and professional communities.

Our Study

Recruitment for the study was based on the assumption that educators are more likely to engage in scholarly activities if they are members of a professional or research association, if they have authored articles in research or professional journals, or if they have undertaken graduate studies focused on mathematics education. We used these criteria to identify

currently or recently active schoolteachers and invited them to participate in the project.

Data collection for the project included both an online survey and semistructured interviews. Sixty participants completed the online survey, which consisted of both closed- and open-ended questions to collect demographic information and data on the three scholarly activities of reading, inquiring and disseminating. The open-ended questions were coded. Frequencies were generated, and descriptive statistics were used to analyze survey responses.

Telephone interviews with a subset of 14 self-selected survey participants occurred approximately two months after the close of the survey. During the interview, participants were asked to clarify and expand on their survey responses. Afterward, they received electronic copies of the interview transcript and were given an opportunity to make revisions. A thematic analysis (Boyatzis 1998; Braun and Clarke 2006) of the interview data was used to identify key assertions in relation to the participants' scholarly activities and the impact of those activities on their professional practice in mathematics teaching and learning.

Results

The 60 survey participants were primarily female (72 per cent) and over the age of 45 (50 per cent), with more than 15 years of teaching experience (43 per cent). Two-thirds (67 per cent) of them were employed as classroom teachers, with 31 per cent of that group teaching elementary, 24 per cent teaching junior high, 26 per cent teaching high school and the balance (19 per cent) teaching at more than one level. Participants identified themselves as curriculum leaders (17 per cent), consultants (17 per cent), school administrators (10 per cent) and coaches (5 per cent), often in addition to being classroom teachers.

The 14 interviewees from this sample represented a similar demographic in terms of gender, age, experience, teaching position and leadership roles.

Reading the Literature

Participants were asked what resources they used to inform their practice in mathematics teaching and learning. They identified specific websites (44 per cent), authors or books (44 per cent), journals (35 per cent) and textbooks (33 per cent) most often.

Online sources were a primary means of engaging with the literature. The types of websites mentioned most frequently were activity sites or question-and-answer forums for both teacher and student

audiences (for example, virtual manipulatives, applets, and homework or test help) and sites with lesson ideas for teachers. One participant noted an online National Council of Teachers of Mathematics (NCTM) position statement on the use of calculators,³ because "it's backed by research, and . . . you can share it with parents and you know you can trust it." Two interviewees referred to TED.com, a site devoted to inspiring speeches across all domains; one stated that "it makes beautiful connections to other subjects."

Participants also frequently referred to specific book titles and authors (Marilyn Burns, Marian Small, John Van de Walle and Grayson Wheatley, to name a few). Most of the books identified were teaching resources in which authors mediated current theories of learning and provided activity-based applications. Only one participant referred to literature about mathematics content (specifically in the areas of probability, number theory and the history of mathematics). Print journals (specifically, NCTM professional journals and the MCATA journal) were mentioned most frequently. These journals are peer-reviewed, and the articles primarily focus on applications of research and shared teaching experiences. One interviewee said, "I used ideas from *Teaching Children Mathematics*. I'd flip through those every once in a while." Another said, "A coworker of mine had some activities that he pulled from an older copy of the *Mathematics Teacher*, and I'd seen a couple of things from articles that were in there that I thought were really good." Only one participant mentioned a research journal.

Finally, authorized textbooks were identified frequently by survey participants, particularly by those teaching junior or senior high.

Inquiry into Practice

Survey participants were asked to complete a series of Likert scale questions to determine the impact of a variety of professional activities on their practice. The professional activities teachers rated as most significant were postsecondary coursework (95 per cent) and collaborative planning or lesson study (78 per cent). Other initiatives viewed as significant or very significant by the majority of respondents included school-based collaboration, workshops, self-initiated classroom research, mathematics study groups with colleagues, mentorship of student teachers or beginning teachers, coaching of colleagues, and research investigations.

In follow-up interviews, most participants mentioned collaborative inquiry with colleagues as being

particularly meaningful. The inquiry usually had a practical aspect, such as marking provincial examinations or preparing lesson plans, but conversations around these practical tasks led them to reflect on their practice.

Participants also spoke about the ways student understandings of mathematical ideas spurred them to inquire into and improve their practice. Several participants pointed to observation of teaching coupled with conversation as being meaningful to their practice.

Dissemination to the Profession

In an open-ended question, survey participants were asked to describe how they shared their experiences in and knowledge of mathematics with others through presentations, publications, online dissemination and other forums.

Of the 87 per cent of participants who responded, 65 per cent indicated that they shared their knowledge through formal presentations at their school, in their district or at provincial conferences, and 54 per cent shared knowledge through formal or informal collaborations in their school or district. Other means of disseminating knowledge included contributing to print publications (15 per cent), participating in online discussions or lesson-sharing (13 per cent), coaching colleagues (12 per cent) and mentoring student teachers (12 per cent).

While most interview participants acknowledged that presentations at teachers' conferences were important, they consistently talked about the significance of collaborating with other colleagues. One stated,

I've worked with small groups of teachers, have done some in-servicing at other schools. . . . When teachers have seen a presentation, often they'll email me and they'll ask me for more, and I invite them to come to my classroom. . . . And that's more powerful even than doing a session at convention.

Another participant mentioned recently doing an interactive whiteboard presentation and said, "I'm getting to the point where I could probably do something at a teachers' convention."

As in findings on reading and inquiry, most participants spoke about extending curriculum resources by creating and sharing teaching ideas. For example, one participant developed a project for kindergarten teachers that incorporated a variety of centre ideas from an authorized textbook. Only one interview participant mentioned publishing her work in a research journal.

Conclusion

The teachers engaged in all three forms of scholarly activity: reading current literature on teaching and learning in mathematics education, inquiring into their own practice and into the practice of colleagues through collaboration, and publicly communicating their ideas in both formal and informal ways.

However, contrary to much of the SoTL literature, the teachers' activities did not follow a reading-inquiry-dissemination cycle to a pre-specified issue. That is, the teachers' selection of literature was often based on recommendations from colleagues and was discussed and critiqued collaboratively, with the broad goal of challenging taken-for-granted notions of what it means to teach and learn.

The teachers in this study perceived the impact of their scholarly activities on their professional practice as being significant—but only when the activities were integrated and occurred in collaboration with others. It was the interactions among teachers in their "communities of conversation" (Shulman 1993, 6) that allowed them to analyze aspects of their own practice that had previously gone unexamined.

While the educators' aim appeared primarily to be improving students' learning experiences and their own professional practice, they did so by sharing knowledge and experiences in their local communities of practice. In this integrated process, they framed themselves both as teachers with an ongoing desire to learn and as scholars devoted to teaching and learning who engaged in active inquiry and communicated their knowing to others.

Recommendations

Teachers emphasized the importance of collaborative learning, in which knowledge is not necessarily owned by any one individual but, rather, is shared, taken up and modified within local contexts. Based on the survey and interview results, we believe that the following actions would contribute to the vitality of MCATA and teacher professional development in our schools:

- Online materials and professional books authored by workshop presenters were primary sources for teacher reading. We recommend that MCATA post on the council website current links to literature that explores emerging topics of interest. This could become a responsibility of one of the executive members.
- Teachers' inquiry into practice was affected most by participation in contextual, long-term lesson study with colleagues. We recommend that schools

and professional development consortia replace one-time workshop presentations with teacher release time devoted to collaborative development of lessons. We recommend that MCATA introduce study groups as part of the annual conference to provide teachers with opportunities to begin such study initiatives. We envision a space where teachers who are interested in the same topic could meet for a time of sharing and collaboration. We believe that MCATA could facilitate a connection between teachers with similar passions.

- Most teacher leaders in mathematics considered sharing their ideas as the result of encouragement from colleagues. We recommend that MCATA actively recruit conference speakers from within the membership. We believe that such encouragement will help teachers engage in scholarly activities. We believe that teachers should be recognized for the scholarly work they are doing in schools and that they should be supported in sharing this work.

Notes

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1. From the Oxford English Dictionary Online (www.oed.com).
2. See www.carnegiefoundation.org/scholarship-teaching-learning (accessed September 13, 2012).
3. See www.nctm.org/uploadedFiles/About_NCTM/Position_Statements/computation.pdf (accessed September 13, 2012).

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