Describing experiences that enrich mathematics teacher learning

Peter Sullivan

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This editorial considers two perspectives on the task of mathematics teacher education: the first relates to the nature of our professional community, and the second to the overall challenge of offering prospective and practising teachers experiences that can enrich their subsequent teaching.

With regard to the first perspective, the publication of rigorously peer-reviewed research and reflection makes an important contribution to mathematics teacher education and to our professional community. The aims of the *Journal of Mathematics Teacher Education* are published on its website, and the record of the quality of the contributions to the journal is evident in the 11 previous volumes, and in the issues of volume 12. I wish to acknowledge some particular contributions to this, and to inform readers of changes to the editorial team.

We have previously acknowledged the wonderful contribution that Terry Wood made not only to this journal but also to mathematics teacher education in terms of edited collections, scholarly articles, and conference presentations.

I now wish to acknowledge the wonderful contributions made by Konrad Krainer and Dina Tirosh who are now standing down as editors. Konrad started as associate editor with the then editor Tom Cooney from the very beginning of the journal (1998, Vol 1, No. 1) and has worked continuously since then. Dina began with the second editor, Barbara Jaworski, in 2004 and has been an editor since. In addition to this work, both Konrad and Dina have also made distinguished contributions to mathematics teacher education in their own writing, publishing, and work with teachers. Many contributors have benefited from their insights, their sensitivity, and their commitment to encouraging authors. We thank them for the many hours of their personal time that they gave of so generously in the interests of the discipline of mathematics teacher education.

I have previously welcomed to the editorial team Olive Chapman and Anne Cockburn, who are both highly recognised for their research and writing. They have now been editors for over a year and have made a wonderful and active contribution. Contributors have benefited from their insights and attention to the standards of the journal.

P. Sullivan (✉)
Monash University, Melbourne, Australia
e-mail: peter.sullivan@education.monash.edu.au

I now welcome João Pedro da Ponte and Orit Zaslavsky as new editors. Both are distinguished active researchers and authors, and will be well known to many readers of the journal. They have already started on the process of seeking reviewers and evaluating reviews of articles. We look forward to working with them as editors and colleagues.

The second perspective relates to the type of experiences that are appropriate for mathematics teacher learning. I use the example of a teaching prompt that can be used over and over again by mathematics teachers, whatever the mathematical focus and level. This particular prompt is:

What is the same and what is different about ...?

A teacher might be interested in comparisons of:

- two fractions, or two decimals, or one of each;
- two slightly different expressions, such as $2x + 2y$ and $2(x + 2y)$;
- two shapes, such as a regular and a tessellating pentagon;
- two graphs, or a graph and a table of values;

and so on. The teacher might even challenge students to say what is the same and what is different about two word problems. An example of such a pair of problems is: (a) If I share 12 sweets between 2 students, how many sweets do they each get? and (b) If I have 12 sweets, to how many people can I give 2 sweets each?

In each case the teacher can get valuable information about what the students see in the items being compared. The questions prompt students to think differently, to describe their thinking and reasoning, and to examine concepts in new ways. Hearing the responses from other students also opens up possibilities. Posing such a prompt requires little planning, the nature of the responses can be anticipated (although not necessarily the scope), and the whole episode takes only a few minutes.

One suspects though that such prompts are not included in the everyday practices of many mathematics teachers. Part of the challenge of mathematics teacher education is to evaluate whether such prompts are useful additions to the repertoire of teachers. Let us assume for the purposes of this discussion that such prompts can be useful. Another part of the challenge for teacher educators is how to encourage teachers to see the potential in such prompts, and to incorporate them into their practice.

Of course, we have to recognise that teachers who choose to use such prompts are taking some risks. The students might not see anything, they might not say anything, what they say might not be about the mathematics (“they are different colours”), the responses might be on a different topic, or only superficial. There is also a risk is that the students will say something that challenges the teacher’s thinking.

This journal explores experiences necessary to encourage prospective or practising teachers to consider something different, of which such a prompt might be an example. Clearly, there is nothing sophisticated about creating any specific prompt of this form. Any two objects or ideas will do for comparison. There is also nothing complex pedagogically about posing such a prompt. Basically, all that is needed is to pose the prompt, to record the students’ responses in some way, to facilitate the discussion on the responses, and finally to synthesise the responses and emphasise any key issues raised.

With such a prompt, and indeed with any teaching approach which may be new to the prospective or practising teachers, there are some key elements:

Awareness: The teachers need to be aware that such prompts exist, and indeed most articles in this journal and, one suspects, most teacher education programs are replete with such examples.

Potential: The teachers need to experience the potential richness in the proposed experience. Usually they need merely to respond to such a prompt as part of a group to see the potential.

Risk: The risks in using such approaches need to be considered explicitly, along with ways of moderating those risks.

Inertia: The tendency to teach the same way day after day and year after year must be addressed, along with the way that the prevailing culture in some schools also constrains innovation.

Mathematical knowledge: One of the advantages of mathematically “scripted” lessons is that the mathematics is either known or can be learnt by the teacher in preparation. Of course, we hope that all teachers would know any mathematics that might arise. But all of us have a level at which posing a prompt such as the one above can be threatening. At least one way to reduce teachers’ concerns is to give them “permission” to say to their students, “I am not sure. I will find out.”

What it means to teach mathematics: An assumption in the above prompt is that learning can occur through learners thinking for themselves, by seeing things in new ways, and by listening to the thinking of others. If a teacher believes that mathematics teaching involves only clear explanations followed by practice, then the above prompt will have little value. This is perhaps the most challenging hurdle for teacher educators to address.

In other words, the challenge of mathematics teacher education is how to encourage teachers to at least try such alternate approaches to teaching. This issue of the journal has three articles which are exploring ways of doing this.

Amal Hussain Alajmi, in the article titled “Addressing computational estimation in the Kuwaiti curriculum: Teacher perspectives” confronts the challenge of expanding teachers’ perceptions of what constitutes estimation. Amal found that teachers predominantly equated estimation with rounding, and also found that the teachers felt that emphasis on estimation might interfere with instruction of formal algorithms. This suggests that these teachers might need enhanced awareness to consider the potential and risk associated with a broader view of estimation, and to connect this with their own mathematical knowledge and perceptions of what it is to teach mathematics.

There are similar challenges for teacher educators in Ji-Won Son and Sandra Crespo’s article entitled “Prospective teachers’ reasoning and response to a students’ non-traditional strategy when dividing fractions”. There seems to be an interesting paradox in the results in that it suggests that those respondents who were teacher focussed were more likely to appreciate the mathematics underpinning the non-traditional strategy. The consideration of the value of non-traditional strategies is another important perspective for teacher education.

Interestingly, the third article offers a structure in which the necessary experience and support can be provided. Catherine Lewis, Rebecca Perry, and Jacqueline Hurd, in their article “Improving mathematics instruction through lesson study”, outline a perspective on an adaptation of Lesson Study as a way of facilitating the experiences that are likely to offer teachers the chance to reflect on practice that can facilitate the consideration of practice. Catherine, Rebecca and Jacqueline describe four lesson study features and the way that lesson study influences instruction through encouraging reflection on beliefs, through the community interactions, and through ways of reviewing teaching.

The three articles illustrate the process of identifying key issues for teacher learning and offer a mechanism for providing experiences that have the potential to connect practice with those issues.