CRITIQUE AND TRANSFORMATION IN RESEARCHER-TEACHER RELATIONSHIPS IN MATHEMATICS EDUCATION

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University-based mathematics educators typically rely on gaining access to teachers and students in schools or teacher education settings in order to conduct their research. In these circumstances, it is more common for mathematics teachers (or teacher education students) to be co-opted into the research agenda of the university academic than for genuine researcher-teacher collaboration to be realised. This paper examines spaces for critique and transformation in such relationships, drawing on examples from three of my own research projects. Taken together, these projects generate questions about the role of mathematics education research with respect to critique and transformation of the researcher and the researched.

Most university-based mathematics educators would claim that the aim of their research is to improve the quality of mathematics teaching and learning; yet education research is often criticised for its lack of impact on, and relevance to, classroom practice. This so-called "research-practice gap" has sometimes been explained by reference to the different processes used by researchers and teachers to improve educational practice, and the different forms of knowledge that result. For example, Wiliam (2003) compares the analytic rationality of formal research that seeks to develop generalisations about educational phenomena with the practical inquiry of teachers who need to address immediate day-to-day problems. Thus the object of research, unlike in teaching, is not to solve problems but to create knowledge that helps us to understand a problem (Labaree, 2003). This tension between the aims of formal research and the needs of teachers is also evident in the often unequal relationships between researchers and teachers who participate together in classroom based studies. Breen (2003) argues that true collaboration can only be realised if there is sharing of control and decision-making between the participants. However, this is an uncommon occurrence as teachers are usually co-opted into the research agenda of the university academic because they have greater access to power and resources.

The issue of researcher-teacher relationships has long been of interest to mathematics educators attending PME conferences, beginning with a *Teachers as Researchers* Working Group that first met in 1988. This was followed in later years by various Discussion Groups, Research Forums and in 2007 a Working Session titled *Teachers Working with University Academics* (Novotná & Goos, 2007). At that Working Session a framework was developed for analysing ways in which university academics and teachers might conduct research together (Figure 1). I use the framework in this paper to compare researcher-teacher relationships in three of my own research projects.

Beginning the partnership	Participants	Purposes of the research
How? • Seeking a teacher • Teacher seeks you • Enforced participation What motivates and initiates participation?	Roles Expectations Language Trust/relationships Communities Asymmetry between needs	Topic (who chooses?) Research questions (whose?) Benefits (for whom?)

Figure 1: Framework for analysing researcher-teacher relationships

The first project highlights the development and gradual transformation of a long term collaborative relationship between the university-based researcher and school teacher who carried out classroom research together. The second project was a longitudinal study of the transition from pre-service to beginning teaching, and the third project was commissioned by the government to support implementation of a new mathematics curriculum by working with teachers to expand their pedagogical and assessment repertoires.

A COLLABORATIVE RESEARCH RELATIONSHIP: PROJECT #1

Since 1994 I have carried out research with a teacher (Vince) who shares my interest in secondary school students' mathematical thinking (see Goos & Geiger, 2006; Geiger & Goos, 2006 for extended discussions of this collaboration). I conducted most of my PhD research in Vince's classroom, and we have since collaborated in other projects. *Initiation of the partnership* came about when we were introduced by our former pre-service teacher education lecturer, who had become my PhD supervisor. At the time, Vince had recently completed a Masters degree and was motivated to participate in my research by his desire to resume regular professional conversations with someone like his former university supervisor. Thus there was some equity in the partnership from the start in terms of its initiation and the underlying motivations of the participants.

As *participants*, although we agreed to keep our roles separate – myself as non-interventionist researcher and Vince as teacher – the nature and distinctiveness of these roles changed over time as we developed mutual trust. I was a novice researcher as well as a novice teacher, and thus I was conscious of the kind of respectful relationship that needed to be established with this very experienced teacher if the research was to be productive. Vince later explained how he valued my presence as "someone who can see with non-judgmental and different eyes who views the world of the classroom through an analytical lens that seeks to understand rather than to prescribe action" (Geiger & Goos, 2006, p. 256). However, my efforts to understand did eventually lead Vince towards specific actions so that over time I became more of a participant than a passive observer. For example, our post-lesson discussions about classroom events and my conversations with students often led Vince to modify his teaching plans for the next lesson. He explained: "The

interesting thing for me as a teacher was to think about what made it happen in that way, can we replicate this? … Could we manipulate what was happening to bring about particular types of learning and interaction between students?" (Goos & Geiger, 2006, p. 38)

Vince and I explicitly negotiated issues related to power and what each of us wanted to achieve out of the collaboration as we began to write and present papers together at research conferences. Vince believed that "teachers' voices … have to be heard if research is going to make a difference to teaching and learning in schools" (Goos & Geiger, 2006, p. 38), and he saw jointly authored publications as acknowledging his equal contribution to creation of the new knowledge reported therein. Likewise, I gained credibility with practising teachers through joint presentations at professional development conferences where Vince was well known because of his leadership and advocacy roles in teacher professional associations. This was how we introduced each other into the distinct sub-cultures of mathematics education to which we separately belonged – the community of educational researchers and the community of teachers – and how we learned to communicate with different audiences using the language of research and the language of practice. Thus our needs, although different, were mutually recognised and valued.

Initially the *purposes of the research* were determined by my own interests in that I proposed the topics and research questions. This situation has evolved into a more equal arrangement since Vince enrolled in a PhD, under my supervision, and later began to formulate his own research plans. He has now left his job as a school teacher and moved into a new position as a university academic.

CONTRASTING EXAMPLES: PROJECTS #2 AND #3

My two additional examples are typical of research conducted by mathematics teacher educators with their pre-service students or as part of the professional development programs they offer to practising teachers. The aim of project #2 was to investigate and compare the pedagogical practices and beliefs of pre-service and recently graduated teachers in integrating digital technologies into the teaching of secondary school mathematics. This was a longitudinal study over three years in which I followed three successive cohorts of my own pre-service students into their early years of teaching. Project #3 was a five month professional development project that supported a group of eight secondary mathematics teachers in planning and implementing mathematical investigations, consistent with the intent a new government-mandated curriculum. The design included three visits by the research team to work with the group of teachers for two consecutive days on each visit. (See Goos, 2005; Goos & Bennison, in press; Goos, Dole & Makar, 2007, for further details of the projects.)

In Figure 2 I have summarised features of the researcher-teacher relationships in these projects. I invite readers to undertake a similar analysis of their own research

collaborations with teachers and to consider the extent to which these created spaces for critique and transformation of the researcher and the researched.

Feature of researcher-teacher relationship	Pre-service & beginning teacher project (#2)	Professional development project (#3)
Beginning the partnership • How? • Movitation?	All students invited to participate in surveys; some selected for lesson observations & interviews based on research criteria. Participation may have been motivated by relationship with researcher-teacher-educator.	Participation coerced by government, but schools called for volunteers. Teachers said their participation was motivated by desire to improve teaching practice and student learning.
Participants • Roles • Expectations • Language • Trust/relationships • Communities • Asymmetric needs	Researcher in dual role as teacher educator. Trust & relationships established during pre-service course (ethical implications). Some participants continue in subsequent research projects (may signal that teacher needs are met by participation). Researcher participates in teacher professional communities but not vice versa.	Researchers in dual role as professional developers expected to bring about change in teaching practice. Explicit expectations re teacher commitment & outputs (units of work). Difficult to build trust over short time span. Joint researcher-teacher presentation at professional development conference; researcher-only papers at research conference.
Purposes of the research • Topic • Research questions • Benefits	Topic and research questions defined by researcher. Clear benefits for researcher (publications), continued participation in new projects may signal benefits felt by teachers.	Topic defined by government, but teachers carried out individual action research projects relevant to their school contexts. Teachers claim benefits in terms of greater understanding of mathematical investigations.

Figure 2: Comparison of researcher-teacher relationships in projects #2 and #3

SPACES FOR CRITIQUE AND TRANSFORMATION?

This brief analysis raises questions about the role of mathematics education, and especially researcher-teacher relationships, with respect to possibilities for critique and transformation.

1. How can pre-service teacher educators negotiate ethical issues (unequal power) in researching with their own students?
2. How can pre-service teacher educators develop a critical stance (distance and scepticism) towards the research they conduct with their students?
3. Who has the right to “transform” teachers and teaching practice?
4. How can researchers working with teachers balance critique with transformation in ethical and intellectually honest ways?

5. In communicating findings from research with teachers, who should speak for whom and to whom?

6. What conditions are needed for researchers and teachers to explore each other's roles and understand how their respective communities develop generalised versus particularised knowledge of teaching and learning?

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