Boundary crossing by science teacher researchers in a PhD program

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HIGHLIGHTS

- Boundaries exist between the community of teachers and the community of educational researchers.
- Teachers doing PhD research might bridge the so-called research-practice gap.
- Sixteen teacher researchers were interviewed as well as their professors and their school principals.
- Two success stories of teacher researchers who seemed successful in crossing boundaries between the two communities.
- Personal and contextual factors influence boundary crossing activities of teacher researchers.

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ABSTRACT

The boundaries between communities of teaching and educational research are very persistent. Boundaries can be conceptualized as sociocultural differences, leading towards discontinuity in action or interaction. Boundary crossing refers to the efforts made to establish continuity. The purpose of this article is to provide a better understanding of how these boundaries can be crossed by teachers who are also PhD students in a national PhD program for educational research in the context of science education. Sixteen teacher researchers as well as their professors and school principals were interviewed. Additionally, two stories were studied of two teacher researchers who seemed successful in crossing boundaries between the two communities. Many differences were found between the two communities, not all of them being boundaries. Specific personal characteristics - such as communication skills and flexible switching — seemed to facilitate boundary crossing, just like particular contextual factors such as school teams with open learning climates and supportive supervisors. All 16 teacher researchers contributed to better science teaching in their own practices, while eight teacher researchers had been able to share insights from their PhD projects with others.

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1. Introduction

Findings from educational research can contribute to the improvement and innovation of educational practices. However, there seems to be a lack of productive interaction between academic education research communities and professional practices of teaching, leading to the so-called research-practice gap (Vanderlinde & van Braak, 2010) or a cultural barrier (Carr, 2002). Educational research might lead towards valid and relevant knowledge, but it does not seem to contribute to the improvement of educational practice in a high extent (Bakx, Bakker, & Beijaard, 2014). This may be caused by the fact that outcomes of educational research are not practice-based and often cannot be used by educational practitioners. It might also be that research findings *do not reach* educational practitioners like teachers and therefore are not used to their possible full potential. Also, more alignment between the knowledge building (in the academic community) and insights needed for practice (community of educational practitioners like teachers) is needed in order to bridge the perceived relevance gap (Starkey & Madan, 2001).

The gap might be described in terms of boundaries between two communities of practice, not profiting from one another's expertise because of certain boundaries between the two communities. One possible way for overcoming these boundaries is connecting the

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two communities by teachers conducting educational research. By carrying out educational research, teachers might be able to improve their own practices or those of their colleagues, based on their own research findings and those of others. In turn, teachers doing educational research embedded in an academic community may also emphasize concerns and experiences of practitioners to this academic community. Despite this suggested potential for overcoming boundaries by having teachers conducting research, the literature is scarce on how teacher researchers might contribute towards narrowing the gap between the two communities and improving their educational practice at the same time.

In order to overcome the boundaries experienced between both communities, a Dutch, nation-wide PhD program in educational research was set up for (science) teachers in secondary schools. This program enabled teachers to conduct educational research, aimed at improving their educational practice. The (full time) teachers in this program conducted a PhD project for three days a week during four years, whilst still teaching the other two days a week. This PhD program provided us an opportunity to study teachers doing research, what possible boundaries they experienced and, if so, how they could contribute towards the improvement of educational practice. This PhD program took place within Dutch schools and universities, but is internationally important especially in the light of the current discourse about evidence-informed practice, for example in Western Europe, Australia and USA (Vanderlinde & van Braak, 2010). The aim of our study was to gain more insights into possible boundaries between the academic community of educational researchers and the community of educational practitioners (teachers). More specifically, we were interested in how the teachers doing educational research succeeded (or not) in crossing possible boundaries between these two communities, while aiming at an actual improvement of (their) educational practice.

2. Teacher research as strategy for narrowing the research-practice gap

The gap between educational research and practice has been a topic of concern for many years (e.g., Biesta, 2007; Nuthall, 2004). This gap can be seen as a barrier to education reform, because teachers seem to miss out the increasingly enhanced theory required to adequately address teaching and learning processes, for example in the field of science education (Duit & Treagust, 2003). The other way round, from the scientific community it is argued that teachers' practice-oriented expertise is a critical factor in sustainable curriculum reform (e.g., Barab & Luehmann, 2003; van Driel, Beijaard, & Verloop, 2001). Narrowing the research-practice gap in education reform might be realized by establishing more connections between theory based on educational research and the practice-orientation from the perspective of teachers.

It is known that small scale teacher-based action and design research are types of research which can result in insights usable for educational reform (e.g., Feldman & Minstrell, 2000). These types of research can potentially contribute to teachers' professional development and, for example, to a better understanding of particular curricular domains by addressing the complexity of educational settings (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003). In research collaborations with academic researchers, it is likely that teachers somehow contribute to narrowing the research-practice gap (Smit & van Eerde, 2011). However, hardly any background or study on this assumption could be found. In this study, we used a conceptual framework on boundary crossing in order to thematically study teacher researchers and their (im)possibilities to contribute towards narrowing this gap, while working in two different communities (Akkerman & Bakker, 2011).

2.1. Boundary crossing as a lens to study teacher research

Researchers and teachers work in communities of practice or activity systems with different subjects, goals, tools, division of labor, and rules. Communities of practice can be seen as "shared histories of learning" (Wenger, 2007, p. 3), referring to groups of people going through the same learning experiences. In activity theory (Engeström, 2001), so-called activity systems are not studied in isolation but in relation to each other. Interaction between such communities or activity systems can be challenging, a phenomenon often conceptualized in terms of boundaries (Engeström, Engeström, & Kärkkäinen, 1995; Wenger, 1998). Akkerman and Bakker (2011, p. 139) defined boundaries as "sociocultural differences that give rise to discontinuities in interaction and action." The problems summarized as in the research-practice gap are exemplary for discontinuities in interaction (between researchers and practitioners) and action (e.g., using research findings in practice). In activity theory such boundaries are considered the tensions that may lead to transformation of existing activity systems, and in some cases can even lead to the formation of new systems. For example, biophysics can be seen as a boundary practice, evolving from the interaction between biology and physics.

It is assumable that teachers who combine the profession of teaching and the profession of research might be able to connect both communities in a way that might narrow the research-practice-gap for some extent. People who interact in two different kinds of communities can bring something from one to the other community. People who actually do this, and by doing so connect two communities, are called *brokers* (Wenger, 1998). A combination of two jobs, combining research and education may thus create brokers who can cross the boundaries between research and practice.

The challenges for the teacher researchers in this study are multiple, because the school context in which they work is very different from the university context, often with a lack of research culture in the schools (Anderson & Hogan, 2010). In addition, PhD research needs much time for study and reflection, while working with students as a teacher mostly asks for quick responses and immediate actions (e.g., Korthagen, 2010). Differences between the cultures in schools and universities might actually be boundaries, but could also be seen as differences between two work contexts.

2.2. Boundaries, brokers and boundary objects

Thinking in terms of boundaries has been quite common for a long time, but in science education this is more recent (Kisiel, 2014). People move between different communities all the time, often without making any effort. In our study, we wanted to investigate whether and to what extent the teachers made an effort in dealing with differences or in what way they experienced discontinuities, in order to gain more insight into the temporality or partiality of boundaries (Akkerman, 2011).

Once possible boundaries experienced by teacher researchers have been identified, it makes sense to focus on the crossing of these boundaries. Suchman (1994) used the term *boundary crossing* to refer to the challenges when professionals enter unfamiliar territory, being to some extent 'unqualified'. The teachers might "face the challenge of negotiating and combining ingredients from different contexts to achieve hybrid situations" (Engeström et al., 1995, p. 319). From this perspective, boundary crossing can be seen as the efforts made in order to establish action or interaction across different practices. Akkerman and Bakker (2011) described four different mechanisms for doing so: identification, coordination, reflection, and transformation. Identification refers to demarcation of practices (e.g., learning how both practices work