

Learning in a Community of Inquirers: Developing an Inquiry Stance

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In this paper I make a case that the process of becoming a teacher of mathematics can be enhanced when teacher educators adopt a theory/practice/reflection cycle of inquiry that occurs within a community of inquirers. An account of prospective teachers' narrative inquiries undertaken in the final year of their B Ed (Primary) course is presented to illustrate the nature of learning within a community of inquirers. Through the narrative analysis of data focused on the presentation of posters created at the end of a year-long subject, I explore the metaphors that portrayed prospective teachers' collective experience as practical inquirers. The choice of metaphors suggest that prospective teachers had begun to develop an *inquiry stance* as part of their forming identities as future classroom teachers.

One of the continuing concerns for teacher educators is the extent to which prospective teachers can make the transition between the theories and ideas they are exposed to in a university setting, and their enacted practice in a school-based setting. In this paper, I describe a set of pedagogical practices that constitute a cycle of learning through inquiry with the intention of blurring the boundaries between theory and practice. In particular, the nature of learning within a community of inquirers, and the extent to which it enhances the development of an inquiry stance are explored using prospective teachers' experiences as narrative inquirers that are represented in collaborative group posters. Learning in this sense is characterised as a process of becoming where prospective teachers learn to belong in a community of inquirers, learn from inquiry, learn through negotiation, and learn about their identities as inquiring teachers (Wenger, 1998).

Narrative Inquiry in Mathematics Teacher Education

From the perspective of learning to teach mathematics, Brown & Borko (1992) stated that very little data exists in relation to what elements facilitate the process of becoming a teacher of mathematics and how we can gain insights into the complexity of such a process. For over a decade, teacher research or practical inquiry (Cochran-Smith & Lytle, 1999) has provided one way of gaining such important insights into the knowledge and understanding of practitioners. However, few studies have explored those insights using data gained from prospective teachers' own research. Given such a perceived gap in the literature, prospective teachers' stories that frame their own systematic and intentional inquiry into aspects of becoming a teacher of mathematics have the potential to generate additional understandings and lead to deeper insights into the resulting changes in their knowledge, beliefs, dispositions and actions (Brown & Borko, 1992). The concept of narrative inquiry provides a particular way of structuring the lived experience of an inquiry through the writing of stories about those experiences (Carter & Anders, 1996; Clandinin & Connelly, 2000).

Writing Stories of Experience

One of the most compelling purposes for using stories as a way of structuring experience is to understand how individuals assign meaning to their lived experiences and what insights those meanings can portray (Clandinin & Connelly, 2000). Thinking and

writing about the lived experiences of being an inquirer calls on practitioners to thoughtfully reflect on their actions and reactions by configuring a narrative to structure and make sense of those experiences. In particular, the writing of case stories in teacher education recognises the situated nature of learning to teach and can assist prospective teachers to coordinate the different dimensions of an inquiry into meaningful ‘chunks’ or units that can become a focus for reflection (Laboskey, 1992; Shulman, 1996; Wenger, 1998). In this way, prospective teachers can begin to develop a more critical, inquiry stance towards their own learning by sharing their narratives in a community of supportive teacher educators and peers (Carter & Anders, 1996; Hill, 2000; Nelson, 1997).

Developing an “Inquiry Stance” in Mathematics Teacher Education

If we accept that one aspect of becoming a teacher of mathematics is to develop an inquiry stance, then we need to think of inquiry as a more ongoing and recursive process of learning, and sometimes unlearning to teach (Nelson, 1997). Developing an inquiry stance suggests an attitude of openness and acceptance that learning from inquiry is “a pathway with no end” but one that is also “a continual source of professional growth” (Nelson, 1997, p. 408). This way of thinking would require teachers and prospective teachers to develop the disposition to participate in ongoing reflection and learning as part of their everyday practice. From the perspective of preservice teacher education, Hill (2000) maintains that it is critical for teacher educators to trigger prospective teachers’ thoughtful reflection about their experiences so they can “confront the difficulties that inevitably accompany experimentation with innovative teaching approaches” (p. 38). She found that a cycle of theory, practice and reflection (T/P/R) provided opportunities for prospective teachers to strategically reflect on their field experiences by sharing and critiquing them in a supportive and collegial environment before they began teaching full time.

Creating a Community of Inquirers Through a Theory/Practice/Reflection (T/P/R) Cycle of Inquiry

Creating a community of inquirers can provide such a collegial environment and enhance the development of an inquiry stance (Nelson, 1997; Stein & Brown, 1997; Wenger, 1998). According to Wenger (1998), learning within a community of practice exists when the characteristics of mutual engagement, joint enterprise, and a shared repertoire combine to create a sense of coherence and belonging for its members. Participation in a community of inquirers where collegial and critical analysis of practice is the norm simultaneously provides a balance of support and challenge so that prospective teachers might be encouraged to construct and reconstruct personal beliefs that can have a significant affect on who they become as teachers (Thompson, 1992). A T/P/R cycle of inquiry would require prospective teachers to move in and out of university and school-based communities in a cyclic pattern that is mediated through a process of reflective activity, thus requiring the development and nurturing of school/university partnerships.

Inquiry Setting and Narrative Analysis

In the following pages, I explore the use of case investigations and the collaborative construction and presentation of posters as methods of narrative inquiry that create opportunities for learning from experience. This study is framed within a year-long subject Assessment and Diagnosis across the Curriculum – Mathematics Lobe that was undertaken by prospective teachers in their final year of a B Ed (Primary) course at a rural Australian

university. The underlying goal that guided this subject was to increase prospective teachers' understanding of, and ability to implement new methods of assessment in primary mathematics classrooms that would be considered educative or formative in nature (Bright & Joyner, 1998; Clarke, 1997). Using a process of narrative analysis, I describe the nature of learning through participation in a community of inquirers, and the extent to which such learning can nurture an inquiry stance.

Polkinghorne (1995) suggests that an inquirer using narrative analysis retrospectively configures a set of data elements taken from a study and develops them into a coherent story of experience. My analysis of learning in this study draws on a number of data elements including the visual images represented in the posters, an account of the process involved in constructing the posters written by prospective teachers as a group, and the transcripts from the presentation of posters to their peers. The posters were constructed collaboratively as a way of making sense of, and learning from case investigations that represented a T/P/R cycle of inquiry.

Case Investigations

During the first half of the 2001 academic year, prospective teachers had undertaken a case investigation (Laboskey, 1992) that required them to carry out a modified version of case study research during their ten-week internship in a school. Drawing on aspects of action research (Kemmis & McTaggart, 1988), this form of practical inquiry involved prospective teachers in: *planning* the investigation by identifying an assessment strategy they wanted to use on their internship, reviewing the relevant literature (theory), and outlining their methods for exploring the assessment strategy in a case proposal; *acting* out the plan by collecting data in school settings during their internship (practice); *observing* the impact of those actions; and *reflecting* on actions and observations by analysing the data and producing a case write-up in the form of a case story of their experience (reflection). In this way, the process that prospective teachers went through mirrors the narrative analysis process I have undertaken for the inquiry reported in this paper.

Collaborative Poster Presentations

In the second semester of the academic year, the designing of poster presentations created an occasion for prospective teachers to collaboratively share and critique the findings of individual case investigations and then develop a shared synthesis of experiences. Small groups of prospective teachers were clustered in one of two ways to construct their posters - according to the assessment strategy that they chose as the focus of their case investigation, or as a result of negotiating with their peers to find a common theme within their case stories. This process of negotiation was necessary because what many prospective teachers found was that their case proposals did not go to plan and in many cases, they needed to be modified in a variety of ways.

The use of group constructed posters to represent collective experience instead of an individual poster required mutual engagement in a sense-making process that called on a number of discursive practices. In Wenger's (1998) terms, posters represented the "reification" of understanding that emerged through the "negotiation of meaning" and the existence of a "joint enterprise". Working together in small groups to make sense of the case investigations, prospective teachers framed their learning experiences into a visual image over a period of two weeks during workshops. Initially, most groups struggled to come up with a way of representing their shared experiences, but I kept encouraging them

to talk about their experiences and listen carefully to their own explanations for guidance. In this sense, the metaphors that emerged were naturally grounded in personal and meaningful ideas and language. The groups then shared their posters during a presentation to the rest of their workshop peers towards the end of the academic year in late October and early November.

In every case, the posters became representations that synthesised the understanding that each prospective teacher had developed as a result of their attempts at putting theory into practice. The written case stories and the construction and presentation of posters provided opportunities for the reflective mediation of theory and practice. Prospective teachers were able to make sense of their inquiry by narratively structuring their experiences through a process of individual (case stories) and shared (poster presentations) reflection. Within the cohort of fifty-six prospective teachers (forty-seven females and nine males), the posters reflected a variety of experiences implementing a range of assessment strategies that included portfolios, observation grids, checklists, self-assessment and open-ended tasks. All the poster presentations were, to varying degrees, indicative of a growing awareness that learning to become a teacher was actually a complex and somewhat messy process that would “continue to change with more experience”. I have conceptualised this underlying theme as becoming a *life-long learner*.

Becoming a Life-long Learner

While space restrictions do not permit a close examination of each of the posters, the emerging theme that bound them together was a developing sensitivity towards the complexity and uncertainty of classroom life. The sharing of experiences in small groups and then with a larger group of peers in workshops provided valuable opportunities for me as a teacher educator and for prospective teachers to hear similar stories of struggle and begin to accept that life as a teacher would be a continual process of life-long learning. Prospective teachers were beginning to realise that the nature of learning from inquiry would necessitate an attitude of openness towards their practice as a teacher. Put another way, this attitude would require the development of an *inquiry stance*.

During the presentations, anecdotes that told of successes, constraints, contradictions, and conflicts were brought forth by prospective teachers as they shared their stories of inquiry. Emerging from the written explanations of posters and the transcripts of presentations was a heightened awareness of the complexity of trialling new approaches to teaching and assessing in classrooms. Very rarely did things go exactly to plan in their classrooms. These experiences seemed to create a growing understanding that risk-taking and learning from “bad” experiences would always be a necessary component of becoming a teacher of mathematics. The concept of becoming a life-long learner was perhaps most evident in the types of metaphors used to frame their collective experience.

Metaphors of Life-long Learning

In her narrative work with prospective teachers, Conle (1996) described the concept of resonance as “a way of seeing one experience in terms of another” (p. 299). In Conle’s (1996) study, when prospective teachers shared stories of learning, they experienced resonating moments that brought forth “metaphorical connections” and “emotional echoes” that “seemed to be able to bridge differences and create similarities” (p. 305). Almost without exception, each poster represented a metaphorical connection that was transformative in the sense that they were able to change or grow. For example, a disco

ball that turned into an exploding piñata of “commonality and difference” in their experiences implementing portfolios, scales that represented the need for a balanced variety of assessment strategies that were “in the best interests of the child”, and a connective chain that represented multiple strategies for using checklists to give them a “personal touch that works for you and your class”.

The resonating moments that Conle (1996) spoke of were clearly evident in this study as prospective teachers negotiated within a community of inquirers to make sense of their experiences (Wenger, 1998). As they jointly negotiated meaning, prospective teachers created metaphors that functioned as a connecting agent to structure and portray their collective experiences. Examples of other prospective teachers’ transformative metaphors of experience included:

- house plans with “extensions” that represented different degrees of freedom in school contexts to do their own thing (or not) with portfolio assessment;
- roundabouts that allowed for “getting on and off at different points” because you have to “look forward and you have to look back...it goes round and round”;
- traffic lights that represented the “challenges” (red light), the “issues that required thought for the future” (amber light) and “successes” (green light)... “we had to think about how our red lights could be turned into green lights”;
- games such as chess where “each black move represents challenges and opportunities” and “each white move represents student progress” and snakes and ladders that represented “the ups and downs of introducing self-assessment in our classrooms”; and
- jigsaw puzzles where “a few of the puzzle pieces remain unnamed because we are still learning what they are” ...or “the empty puzzle pieces might encourage the class to think of other strategies that may be used whilst engaged in observation”.

All of these metaphors of experience seem to allow for a generative kind of knowing about teaching that will always be changing and evolving. Further analysis of the poster presentation transcripts and the written reflections continued to provide evidence of the generative essence of these metaphorical connections. To illustrate the nature of learning from inquiry in more detail, I present an account of one group’s description of learning framed by “the tree of knowledge” in Figure One.

The Tree of Knowledge

Sally, Rochelle and Lew formed their group through a process of negotiation because each of them “did lots of bits and pieces” on their internship because their case proposals were not able to be carried out as they had planned. For example, Sally was going to implement self-assessment on her internship but she “walked into a class that had 11 indigenous students and there was no way in hell I was going to get them to write or talk about themselves or write anything about themselves positively”. On the other hand, Lew wanted to implement open-ended assessment tasks in his Year One class to “get a cycle between teaching and learning through assessment” but was met with sceptical teachers who believed that “you might be able to do it with a few students, but basically it won’t work”. Finally, Rochelle wanted to be organised and plan the focus of her observation grids “at the beginning of the week”, but what she found was that “half the kids would be like ‘we already know this’ and the other half would be in tears going ‘I don’t even know the numbers’...I was always dividing my class up, even though they were already divided into ability groups”. For each group member, their preconceived image of practice needed

to be transformed according to the contextual constraints and dynamics that existed in their school settings.

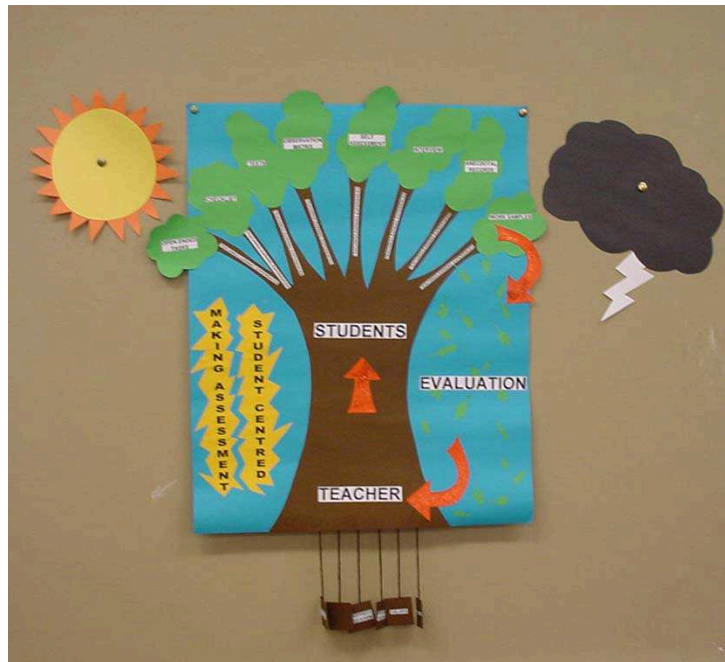


Figure 1. The tree of knowledge.

Through a process of negotiation, all three group members decided their common theme was that they all “put the kids first...our assessment was student centred...so each of our stories contributes to our tree”. The “tree of knowledge” represents “how we believe student centred assessment should occur”. The cycle of a living tree represented the idea that “a tree is continually growing, adding new roots, foliage and limbs...in that same way, teachers add new assessment and teaching strategies to their repertoire...to ensure that learning is life-long”. Some of the metaphorical connections in their tree of knowledge included: roots that represented “teachers’ prior experiences, beliefs and values”; the trunk that represented “the students as the main focus of the process”; the foliage that represented “the specific assessment strategies selected to match the needs of the students”; and the falling leaves of “evaluation” that represented “the thoughts which flow after the assessment...a time of review and decision making”.

A further metaphorical connection was evident when Sally reflected that “we learnt that all living things need sunlight which represents our successes and they need rain which represents our bad days and the things that we can learn from them when we look at them reflectively”. As a way of concluding their presentation and eliciting conversation, the group asked their peers “to think about a success you had with your assessment on your internship and a problem...and think about whether that success was because you put the kids first and whether the problem was because maybe you were pushing your own interests...which comes back to our sociology stuff, whose interests is it in”? I believe that this last excerpt is illustrative of a developing inquiry stance where the group members were asking their peers to question their own practices to determine “in whose interests” their assessment practices were focused. First hand experience with cultural diversity (Sally), sceptical teachers (Lew), and students’ diverse background knowledge (Rochelle) led this group of prospective teachers to realise that they needed to “put their students first” when considering appropriate strategies for assessing student learning.

Emotional Echoes

What cannot be reflected in words on a page is the sense of passion and emotion that could be heard in the shared conversations that complemented each poster presentation. At times, the group anecdotes created spontaneous responses from peers, often building on similar “emotional echoes” (Conle, 1996) they had experienced on their internships. For example, the question about “in whose interests” elicited comments like “yeah, it wasn’t until I took a step back and said that this isn’t about me, it’s about them (the students)”, “it’s so true”, and “it’s good to hear you had trouble too”. As a result of Sally, Lew and Rochelle’s compelling story of their tentative experience as change agents, the emotional echoes of their peers seemed to affirm their experiences and contribute to a shared feeling of coherence and belonging in that many prospective teachers realised they were not alone in their mixed experiences of success and challenge (Wenger, 1998).

Becoming an Inquiring Teacher: Embracing Complexity

What seems to be a vital disposition for becoming an inquiring teacher or life-long learner is the need to develop and maintain an inquiry stance towards teaching. It seems that for teachers and prospective teachers to adopt a stance of inquiry they need to accept that learning, for both themselves and their students is an ongoing and recursive process that is inherently complex and uncertain. They also need to belong to a community of inquirers where the norms of collegial and critical inquiry can become the means for transforming understanding about mathematics teaching, learning and assessment (Nelson, 1997; Wenger, 1998). In this sense, engaging in an inquiry as prospective teachers seemed to nurture such a disposition.

While the concept of life-long learning is not a new one, it was quite amazing to see it manifest itself in prospective teachers’ poster presentations as if it were a newly discovered secret. Case investigations and collaborative poster presentations provided occasions for prospective teachers to develop an inquiry stance by reflecting on particular beliefs, practices, contextual constraints and dilemmas they personally experienced as inquirers in school settings. When prospective teachers were given the opportunity to collaboratively share and critique the results of their inquiries, a consensual understanding and acceptance of the messiness of teaching emerged. What seemed to heighten their awareness that learning would need to be life-long was that prospective teachers had personally experienced “the ups and downs” of implementing an innovative assessment strategy and collectively constructed this understanding for themselves. In addition, due to the conversational nature of the presentations, other members of the community of inquirers were able to share their “emotional echoes” to further consolidate an understanding of what it might mean to become an inquiring teacher.

Concluding Comments...

Discovering and embracing the complexity of the process of becoming a teacher clearly necessitates the development of a personal disposition to continuously inquire into and learn from experience. Engaging prospective teachers in a T/P/R cycle of inquiry during a teacher education program can encourage them to think reflectively, share and learn from their collective experience and begin to develop a long-term inquiry stance toward their teaching. Such a cycle can begin to address the fact that new orientations towards teaching and assessing that have been introduced in a university course are likely to be challenged in some way at a personal and school-based level. Based on the findings

in this study, establishing a theory/practice/reflection cycle of learning and inquiry can provide an opportunity for teacher education programs to better prepare prospective teachers for such challenges in the future.

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