

Chapter 10

Pedagogical Reasoning in Teacher Education

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... studies illustrate, [that] concerns about learning to teach highlight the importance of pedagogical reasoning and how that influences approaches to teaching ... the processes underpinning pedagogical reasoning ... [require] particular actions ... if teachers [are] to transform their personal comprehension of subject matter into forms that might be comprehensible to pupils. Pedagogical reasoning though is not as simple as just thinking about teaching. (Nilsson, 2009, p. 242)

The foundations on which teaching is constructed hint at ways of thinking and knowing that shape pedagogy and illustrate why simplistic notions of teaching as telling and learning as listening do not suffice (Loughran, 2013). As a consequence, teaching is perhaps best understood as being problematic because it exists in what Schön (1983) described as the swampy lowlands where important but messy problems exist that cannot be simply resolved or technically managed. Teachers work with uncertainty in an ‘indeterminate zone of practice’ (Schön, 1987) in which professional knowledge develops in response to, and is informed by, the context. In exploring the uncertainty inherent in navigating the swampy lowlands of practice, pedagogical reasoning – the scaffolding that supports the sophisticated business of professional practice – comes into sharp focus. Understanding pedagogical reasoning, how it develops and the manner in which it influences practice is important. Making that clear for others, especially students of teaching, is a challenge that should not be eschewed in teacher education programmes.

The mark of an expert is that they are sensitised to notice things which novices overlook. They have finer discernment. They make things look easy, because they have a refined sensitivity to professional situations and a rich collection of responses on which to draw. Among other things, experts are aware of their actions ... (Mason, 2002, p. 1)

The research literature highlights time and again that, to the untrained observer, teaching looks easy (see for example, Labaree, 2000; Russell, 2007). However, the

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reality is that teaching is complex and dilemma laden, so much so that the underpinnings that support quality practice are not immediately obvious or observable. Because teaching is often narrowly defined in terms of that which is seen to be happening during practice, other important features that have led to, and follow-on from that practice tend to be overlooked; as does the thinking, judgments and decision-making associated with managing teaching 'in action'. These unseen elements of practice offer access to pedagogical reasoning and create possibilities for uncovering the complex reality of teaching for students of teaching through their experiences of learning to teach.

Pedagogical Reasoning

In a previous era of 'educational reform'¹, Shulman (1987) made a compelling case for the need to articulate the knowledge base of teaching. In so doing, he highlighted the importance of better understanding and valuing the *wisdom of practice*. He noted how his efforts followed in the 'footsteps of many eminent scholars, including Dewey (1904), Scheffler (1965), Green (1971), and Fenstermacher (1986) ... [as their] discussions of what qualities and understandings, skills and abilities, and what traits and sensibilities render someone a competent teacher have continued to echo in the conference rooms of educators for generations' (p. 4).

The notion of *wisdom of practice* offers a way of conceptualizing more fully that which Polanyi (1966) described as teachers' tacit knowledge which, in part, perhaps helps to explain why teaching and teacher education is so often called into question and therefore so continually 'in need of reform'. Although teachers 'know a great deal that they have never tried to articulate ... [it is also the case that] a knowledge base for teaching is not fixed and final' (Shulman, 1987, p. 12). Therefore, Shulman's proposed Model of Pedagogical Reasoning can be seen as a starting point for unpacking the unseen aspects of practice and as a way of beginning to make clear that an expert pedagogue (Berliner, 1986) is a skillful and thoughtful practitioner who is informed by a knowledge base and responsive to the diversity of learning needs, demands and expectations inherent in a given teaching-learning experience. Shulman's model of pedagogical reasoning comprised a cycle of activities that included:

¹Throughout the literature, educational reform is a term often associated with times in which political imperatives lead to questioning about the 'quality' and/or 'standards' of teaching and teacher education. In such times, it is typical for teaching/teacher education to be viewed as a technical skill to be mastered so that the correct content can be delivered in the best way to maximize outcomes. In recent times, international testing has led to an increased focus on teacher education as the 'cause' of many issues with schooling and student success (or otherwise). Calls for 'reform' thus abound and are conveniently distanced from, or ignorant of, arguments about the shortcomings of education as a system by scholars such as Sarason (1990, 1996).

- Comprehension – of purposes, subject matter structure, ideas within and outside the discipline.
- Transformation – (which involves) preparation, representation, selection, and adaptation to students' characteristics.
- Instruction – the activities associated with doing teaching.
- Evaluation – checking student understanding, assessing learning and evaluating and adjusting one's own performance.
- Reflection – reviewing, reconstructing and analyzing in light of evidence of one's own and students' performance.
- New comprehensions – of purposes, subject matter, students, teaching and self; consolidation of new understandings and learnings from experience. (p. 15)

As Shulman described each of the activities that he considered comprised pedagogical reasoning, he did so in ways that illustrated how teaching was so much more than the transmission of information. Comprehension, as his beginning point, illustrated well his conception of teaching.

We engage in teaching to achieve educational purposes, to accomplish ends having to do with student literacy, student freedom to use and enjoy, student responsibility to care and care for, to believe and respect, to inquire and discover, to develop understandings, skills, and values needed to function in a free and just society ... Although most teaching begins with some sort of text, and the learning of that text can be a worthy end in itself, we should not lose sight of the fact that the text is often a vehicle for achieving other educational purposes. The goals of education transcend the comprehension of particular texts ... (pp. 14–15)

Following from comprehension, transformation is about the necessary shift from understanding subject matter from a teacher's perspective to ways in which it might best be understood by, and motivate the learning of, students. He considered transformation as another process (elements of which comprised a repertoire), 'wherein one moves from personal comprehension to preparing for the comprehension of others ... [and is] the essence of the act of pedagogical reasoning, of teaching as thinking, and of planning – whether explicitly or implicitly – the performance of teaching' (p. 16). These two aspects of pedagogical reasoning then could be seen as preparing for the act of teaching – a deep consideration of how instruction might be conducted. Teaching, with all the interactions associated with probing, questioning, managing and responding to students' learning needs encapsulates all of the 'processes of pedagogical reasoning and performance that are prospective and enactive' (p. 18). The retrospective elements begin with post-instruction evaluation.

Evaluation includes how instruction might be reconsidered in light of the student learning experience, and crucially, how the construction and performance of the pedagogical experience was carried out, including the value and nature of materials and activities employed in teaching. As Shulman described it, evaluation naturally flows into the next element, that of reflection. Reflection, as an element of pedagogical reasoning, was seen as looking back at 'the teaching and learning that has occurred, [it about how one] reconstructs, reenacts, and/or recaptures the events, the emotions, and the accomplishments [of the pedagogical experience] ... central to this process is the review of the teaching in comparison to the ends sought' (p. 19).

Through Shulman's model, evaluation and reflection flow neatly to an important learning about teaching outcome, that of *new comprehension*.

New comprehension is what Shulman viewed as a new beginning because of the expectation that 'through acts of teaching that are "reasoned" and "reasonable" the teacher achieves new comprehension, both of purposes and of the subjects to be taught, and also of the students and the processes of pedagogy themselves [but] ... New comprehension does not automatically occur, even after evaluation and reflection. Specific strategies for documentation, analysis, and discussion are needed' (p. 19); and it is through this intention that learning about pedagogy might be purposefully pursued.

An important, and perhaps sometimes overlooked, aspect of Shulman's model is that although it is offered as a cycle of interactive elements, he did make clear that in explicating a model, it was not meant to imply that the processes were always connected in a particular order. He stated that not all elements needed to necessarily occur, they may be 'truncated or elaborated' or given 'short shift'. What was central to his view was that a teacher should be able to, 'demonstrate the capacity to engage in these processes [and that] teacher education should provide students with the understandings and performance abilities they will need to reason their ways through and to enact a complete act of pedagogy' (p. 19). In so doing, pedagogical reasoning offers an overt illustration of the complex and sophisticated nature of practice – something important for students of teaching to see, experience and understand through their experiences of learning about teaching in teacher education.

Shulman's work on pedagogical reasoning arose in an era in which teaching was under increasing political scrutiny. His efforts to highlight the deep thinking associated with teaching was closely tied to attempts to better capture and portray teachers' professional knowledge and to address superficial views of teaching as the delivery of information (transmissive views of teaching as described, for example, by Barnes, 1976). In many ways, it sparked research programmes into teacher thinking that further illustrated how complicated teaching is when moving beyond a technical-rational view of practice.

Teacher Thinking

When teacher thinking (see Craig, Meijer, & Broeckmans, 2013 for a comprehensive overview of the field) began to be taken up in the research literature it was largely because, as an:

... approach to the study of teaching [there is the assumption that] what teachers do is affected by what they think. This cognitive information processing approach is concerned with teacher judgment, decision-making, and planning. The study of the thinking processes of teachers – how teachers gather, organize, interpret, and evaluate information – is expected to lead to understandings of the uniquely human processes that guide and determine teacher behavior. (Clark & Yinger, 1977, p. 279)

This relationship between teacher thinking and teacher behaviour offers another link to pedagogical reasoning. Through the research on teacher thinking (which was particularly strong around the 1980s–1990s), the desire to know more about ‘what teachers do and why they do it’ created new opportunities to better understand not only how teachers’ expertise developed, but also the type of learning that underpinned that development. Clark and Peterson (1986) were particularly interested in the range of knowledge teachers drew on to do their work. Elbaz (1983), through an extensive case-study of an English teacher, created five categories to describe what she considered to be a teacher’s practical knowledge (i.e., knowledge of: self; milieu of teaching; subject matter; instruction; and, curriculum). Through the teacher thinking research, the nature of teachers’ decision-making and the desire to understand more about the ways in which teachers’ cognition and information processing interacted to shape the ways in which practice was informed and conducted, was increasingly highlighted.

Mitchell and Marland (1989) demonstrated how teaching experience influenced the nature of teacher thinking. They showed that there was a discernible difference between novice and experienced teachers in how they framed approaches to student learning stating that a, ‘... feature that appears to distinguish the thinking of the experienced teacher from that of the neophyte lies in the ways in which the perceived stimuli are made sense of, and consequently reacted to by the teachers ... [experienced teachers have] a number of identifiable “frames” or “schemata” with which ... to interpret [the] classroom environment’ (p. 125). Further to this, Carlgren and Lindblad (1991) were interested in how teachers’ social contexts influenced their thinking and subsequent production of knowledge. Through this lens into teacher thinking, they were concerned to understand how teachers’ practical reasoning could enhance knowledge of practice as a way of helping to ‘establish a systematic relation between theory and practice so that practice can be controlled by, rather than control, teachers’ (p. 515).

Zeichner (1994) related the work of teacher thinking to that of reflective practice in teacher education, and suggested that both were borne of a concern of teacher educators to pursue the development of teachers who were more thoughtful and analytic about their practice. However, he also noted that having such a concern did not mean that the ideas were translated into teacher education practices and that:

... no matter what we do in our teacher education programmes, and no matter how well we do them, at best, we can only prepare teachers to begin teaching ... With [teacher thinking and] the concept of reflective teaching, there is a commitment by teacher educators to helping prospective teachers internalize during their initial training, the disposition and skill to study their teaching and to become better at teaching over time, a commitment to take responsibility for their own professional development. (p. 11)

This recognition of the difference between a conception of teacher thinking/reflective practice (and by extension, pedagogical reasoning) and the reality of implementing deeper understandings of it in teacher education programmes, is something that has been played out in many ways across the generations. In trying to help pre-service teachers begin to learn about the complex nature of teaching, and to grasp what that might mean for their own personal and professional learning,

teacher educators have found it difficult to find productive ways of progressing such work or of incorporating the ideas into the curriculum of teacher education in ways that could be shown to make a difference.

What it means to teach about teaching and the commensurate impact of that on the nature of learning about teaching has meant that creating ways of making pedagogical reasoning clear to prospective teachers has proved demanding. Even if Shulman's model of pedagogical reasoning has traction with teacher educators, conceptualizing positive and productive ways of teaching about preparing for teaching can be fraught. There is little doubt that there are:

... numerous difficulties in teacher education ... [for example] teacher planning is not a rational, linear process ... [it is] much more creative, interactive, problem-finding and problem-solving process, where teachers may start with an idea, a child's difficulty ... to construct eventually a conception of a classroom activity or series of activities ... in teacher education we have a body of painful experience that tells us that planning is something that is difficult to teach to students. (Calderhead, 1993, p. 15)

It seems clear then that in order to develop ways of illustrating the nature of pedagogical reasoning in teacher education, that the concept alone is not sufficient. Making pedagogical reasoning tangible for pre-service teachers is a challenge that has proved difficult to address. Considering pedagogical reasoning as a framework for practice has offered possibilities for finding a way to move forward.

Pedagogical Reasoning as a Framework for Practice

It could well be argued that pedagogical reasoning is evident in the way a teacher works with students to uncover their prior knowledge in relation to the particular topic under consideration. Pedagogical reasoning then shapes understandings of how to work with differences in learners, or as Grimmett and MacKinnon (1992) described it, the learning about teaching through the development of 'craft knowledge' – a term that attracted attention at the time as it was seen by some as a contradiction in terms (see for example, Tom & Valli, 1990), whilst for others craft knowledge was most apt. For example Van Driel, Verloop, and De Vos (1998) noted that:

we define craft knowledge as integrated knowledge which represents teachers' accumulated wisdom with respect to their teaching practice. As this knowledge guides teachers' actions in practice, it encompasses teachers' knowledge and beliefs with respect to various aspects such as pedagogy, students, subject matter, and the curriculum. Although deeply rooted in teachers' practical work, craft knowledge is, in our view, not opposite theoretical or scientific knowledge. Instead, craft knowledge encompasses knowledge derived from prior education as well as from ongoing schooling activities ... craft knowledge is supposedly influenced by factors related to teachers' personal backgrounds and by the context in which they work ... research on craft knowledge cannot lead to the establishment of a knowledge base with a prescriptive nature. However, research on craft knowledge should attempt to surpass the idiosyncratic level of individual narratives. As for us, we are looking for common patterns in craft knowledge and in the development of this knowledge to develop "frameworks" ... (p. 674)

The notion of a framework as a way of thinking about and shaping practice could well be central to conceptualizing pedagogical reasoning. As Shulman's model suggests, teachers need to think deeply about what it means to learn different things about subject matter and teaching in different contexts. Teachers need to understand how to structure interactions with, and between, students so that meaningful learning is fostered. It has well been illustrated that 'experienced teachers develop repertoires of strategies for dealing with the multifarious signs and signals that demand immediate attention in the course of a normal lesson; teaching is in its very essence interactive' (Barnes, 1992, p. 15).

Teachers' frames are important to understand because their pedagogical experience shapes what and how they see in a given situation. As Barnes (1992) illustrated, teachers picture situations differently from other observers such as curriculum developers, academics and advisors. Thus framing is an important aspect of practice as a 'frame (Minsky, 1975; Schön, 1983; Wyer & Srull, 1984) can be used to consider the ways in which teachers perceive and execute their professional tasks. The term 'frame' is used to refer to the clustered set of standard expectations through which all adults organize, not only their knowledge of the world but their behavior within it' (Barnes, 1992, p. 15).

As has long been abundantly clear in the literature that framing influences how teachers develop their knowledge of practice through such things as reflection, collaboration, reviewing their practice in relation to their students' learning, and testing their new and developing understandings in their own classrooms with their own students (see for example, Borko, 2004; Bullock, 2009; Clandinin, 1995; Hoban, 2000; Mitchell, 2002; Smith, 2011).

What did teachers themselves consider to be the engines of their growth in knowledge, skill, and pedagogical reasoning ... [they] believed that reflecting about their experience in trying ideas in the classroom and observing pupils' learning was the primary source of their development. This involved trial and error and reformulation of activities and instructions from year to year ... a keen eye to "unpick the processes of learning and the things that work and don't work" through comments and written assignments. All of the teachers were engaged in this process of observing, diagnosing, reflecting, refining, practicing, and experimenting anew—reasoning pedagogically, in other words; whatever its starting point, it seemed to be a natural and spontaneous cycle. (Cunningham, 2007, p. 612)

Studies designed to explore pedagogical reasoning exist across a range of teaching and learning contexts (see for example, Cunningham, 2007; Elliott, 1996; Risko, Vukelich, & Roskos, 2009; Zangori, Forbes, & Biggers, 2013). Many demonstrate well the link to Shulman's model as a starting point for considering the notion of pedagogical reasoning, and in some cases, authors propose modifications designed to address changes in understandings of teaching and learning that have come about over time. Common to all is the idea that any form of model serves as a framework for thinking about practice as comprising much more than just the act of "doing teaching". Webb (2002) offered a comprehensive explanation of pedagogical reasoning in teaching ICT in secondary schools whilst Starkey (2010, p. 243) advanced Shulman's framework, adapting it to the following form:

Comprehension of subject (content knowledge) including:

- substantive knowledge (concepts and principles) and
- syntactic knowledge (subject methodologies).

Enabling connections – preparation for teaching (pedagogical content knowledge) including:

- selecting appropriate resources and methods to enable students to make connections between prior knowledge and developing subject knowledge;
- transforming existing knowledge into teachable content;
- enabling opportunities for students to create, critique and share knowledge;
- enabling connections between groups and individuals to develop knowledge of the subject;
- adaptation and tailoring (personalising) learning for the students being taught.

Teaching and learning – knowledge of context (including):

- formative and summative evaluations of student learning with feedback to the students (from a variety of sources), and modifications of the teaching process where appropriate.

Reflection – reviewing and critically analysing teaching decisions based on evidence.

New comprehensions – about the subject, students and teaching.

Starkey (2010) explained her adaptation of Shulman's model based on the need to update it to account for learning in the digital age. She was of the view that beginning teachers were moving into the profession with a rich understanding of digital technologies from their personal and academic lives which stood them apart from many experienced teachers on which many studies of pedagogical reasoning had been based in the past. She explained the need to adapt the model (as described in the quote below) implicitly placing an expectation on teacher education to similarly respond through the manner of the teaching and learning experiences to be created for pre-service teachers:

The two major differences between the original developed by Shulman in 1987 and [the modified model] are the change from transformation to enabling connections and the integration of evaluation and instruction into one teaching and learning aspect. A fundamental change since 1987 is the underpinning idea of students creating knowledge in the digital era through connections in an open and flexible curriculum, rather than the teacher transmitting 'truths' and methodologies of a subject according to a prescribed curriculum. Both models assume that the students will construct an understanding of the content through a variety of pedagogical approaches to build on their existing knowledge, though in the last 20 years assessment or evaluation has been recognized as being integral to the teaching process, hence the combining of these aspects. (Starkey, 2010, p. 242)

Peterson and Treagust (1992, 1995, 1998) explored how pre-service teachers' pedagogical reasoning ability was developed and refined through a problem-based learning approach. Once again, Shulman's model was used as framework for pedagogical reasoning, and in so doing, offered a way of structuring both the way in which a science education unit was organized as well as structuring data collection

and analysis. Peterson and Treagust (1995) organized the teaching of the science education unit in a pre-service teacher education programme based around a guiding framework that prompted their pre-service teacher participants to structure their practice based on questions designed to bring Shulman's elements of pedagogical reasoning to life. The framework used by Peterson and Treagust (1995, p. 294) to frame pedagogical reasoning was organized as follows:

Comprehension

What do you know or understand in the topic you will be investigating?

Draw a concept map for your topic.

Which ideas do you fully understand?

Which ideas don't you understand?

What did you learn through these [practical] activities?

Transformation

How will these ideas be presented and explained to another person?

In what order would you present the ideas to this person? How will the science ideas be explained?

Instruction

How will you teach your topic to another person?

Evaluation

What aspects of the lesson went well?

What aspects did not go as well as expected?

How well were these ideas understood [by this person]?

Reflection

What changes would you make?

New Comprehension

List all of the ideas you now have and understand on the topic, and re-draw your concept map.

Peterson and Treagust interviewed participants about their experience of being in the unit with a major emphasis around planning for and teaching primary science. They were of the view that their pre-service teachers developed their science content knowledge and their knowledge of curriculum as a consequence of the experience and concluded that, 'the use of a problem-based approach in which the problem was placed in a context enabled the preservice teachers to begin exploring their pedagogical reasoning ability, and to apply their knowledge of science, curriculum and learners to the situation ... Through the process, individual preservice teachers focused on issues which were relevant to their own learning needs, and their developing understanding of the teaching process' (Peterson & Treagust, 1995, p. 304). Likewise, Stoiber (1991), who studied the links between reflection,

pedagogical reasoning and problem solving, also noted how pre-service teachers' analysis of pedagogy was enhanced as a consequence of the conceptual relationships between problem solving and the active aspects of reflection.

Buxton, Salinas, Mahotiere, Lee, and Secada (2013) also pursued understandings of pedagogical reasoning through students' problem solving activities. They used the term 'pedagogical reasoning complexity' as a way of examining 'the quality of an individual's reasoning about another person's learning in an engagement task' (p. 32). Their interest in pedagogical reasoning was partly driven by the view that the field was underdeveloped in relation to the research on reasoning skills. Working with a framework derived of studies into science reasoning complexity (drawn from studies by, Hogan, Nastasi, & Pressley, 2000; Resnick, Salmon, & Zeitz, 1993), they 'adapted these reasoning typologies to create a new framework designed to assess teachers' pedagogical reasoning about their students' problem solving in science' (p. 33). The framework they developed was designed to examine individual teachers' reasoning about students' engagement in problem solving tasks and consisted of 'four key dimensions of reasoning: (a) the generativity of assertions, (b) the elaboration of assertions with supporting examples, (c) the justification of assertions with evidence, and (d) the explanation of assertions through links to underlying structures, mechanisms or theories' (p. 33). Their view was that these four key dimensions offered insights into the strength of reasoning and although they could be evaluated individually, viewing them together as a 'connected set of skills' made explicit the complexity of pedagogical reasoning. They anticipated that in seeking to improve teachers' pedagogical reasoning it might provide a useful way of connecting 'content area learning goals with students' cultural and linguistic backgrounds' (p. 40). Not surprisingly, implementing such an approach in teacher education programmes was seen as a very important beginning point in that process.

In a similar vein, and also in science, James and Scharmann (2007) investigated the development of pre-service teachers' pedagogical reasoning through the use of analogies in teaching. Their research illustrated substantial gains in participants' pedagogy and associated confidence in teaching science and intimated that the use of analogies was a catalyst for pedagogical reasoning (drawing again on Shulman's model). As a consequence, pre-service teachers' practice explicitly changed from the transmission of science facts to teaching for conceptual understanding. James and Scharmann were of the view that the use of analogies, 'was strongly correlated with other positive indicants of pedagogical ability (meaningful interactions, number of explanations, number of application level questions, and less use of jargon)' (p. 581). They found that the elements of pedagogical reasoning combined in a process that clearly informed practice – and therefore impacted student learning – and helped pre-service teachers engage with subject matter knowledge in new and different ways. This enhancement of practice through pedagogical reasoning was also highlighted in the research of Youngs and Bird (2010) who used embedded assessments to promote pedagogical reasoning in secondary teaching candidates. Their study illustrated the importance of beginning to make pedagogical reasoning clear and explicit in teacher education, not least because it created opportunities to

genuinely accelerate learning about teaching and facilitate pre-service teachers' pedagogical development; something that is always difficult because:

Teacher educators face the challenge of mounting powerful pedagogies that reasonably could be expected to help teacher candidates learn much from their time in teacher preparation programmes. Further, they must address this challenge in the face of powerful forces including the strong continuity of the ideas that teaching candidates bring to teacher preparation from their experience as elementary and secondary students. (p. 192)

Drawing on data from more than 180 pre-service teacher candidates Youngs and Bird (2010) concluded that their research illustrated that their participants:

... were able to begin moving from the survival stage of teaching toward the mastery stage ... assessments revealed that many were able to hypothesise about factors that seemed to influence student engagement and performance, to modify their instruction accordingly, and to analyse the implications of their decisions and actions ... [they were] moving from being focussed on themselves and student behavior to engaging in pedagogical reasoning and analysing the effects of their instructional decisions on student engagement and learning ... a key part of the process of moving to the master stage of teaching is the ability to consider multiple explanations for student motivation or behavior, reason through the possible consequences of different teacher responses, and reflect on and modify instructional practice based on the outcomes of one's decisions ... [participants'] performance on the embedded assessments described [showed that] many of the teaching candidates in this study were moving toward the mastery stage of teaching. (p. 192)

Another example of the use of Shulman's pedagogical reasoning model as a 'way in' to explore the development of pre-service teachers' practice is through the work of Nilsson (2009). She used critical incidents (Tripp, 1993) in order to access the questions, issues and concerns that pre-service teachers reflected upon in their practice as they came to understand, and grapple with, the problematic nature of teaching. As noted by Youngs and Bird (above), Lortie's (1975) *Apprenticeship of Observation* has ramifications in terms of that which pre-service teachers anticipate might comprise learning about teaching; and that is often focused on doing, more so than thinking and reasoning, as Nilsson noted:

Student teachers are often interested in knowledge that is practical and can be applied in the classroom ... they do not always manage to make explicit connections between teachers' actions and the pedagogical theories that inform practice. For student teachers, the theoretical knowledge (subject matter as well as pedagogy) might not always be experienced as immediately useful in addressing their problems in practice. However, through teaching experiences that are reasoned and reflected ... [they] might recognize their knowledge needs and, thus, bridge theory and practice in a meaningful way. (Nilsson, 2009, pp. 239–240)

In Nilsson's study, pedagogical reasoning was used as a methodological framework, designed to capture and analyse her pre-service primary science teachers' reflections around critical incidents. As illustrated in the framework (Fig. 10.1), she had three major data collection points (A, B & C) that created ways of using the framework to help structure an approach to thematic analysis; from which three major themes emerged.

Nilsson's first theme was associated with critical incidents that influenced pedagogical reasoning in learning to teach and included two major sub-groups: critical

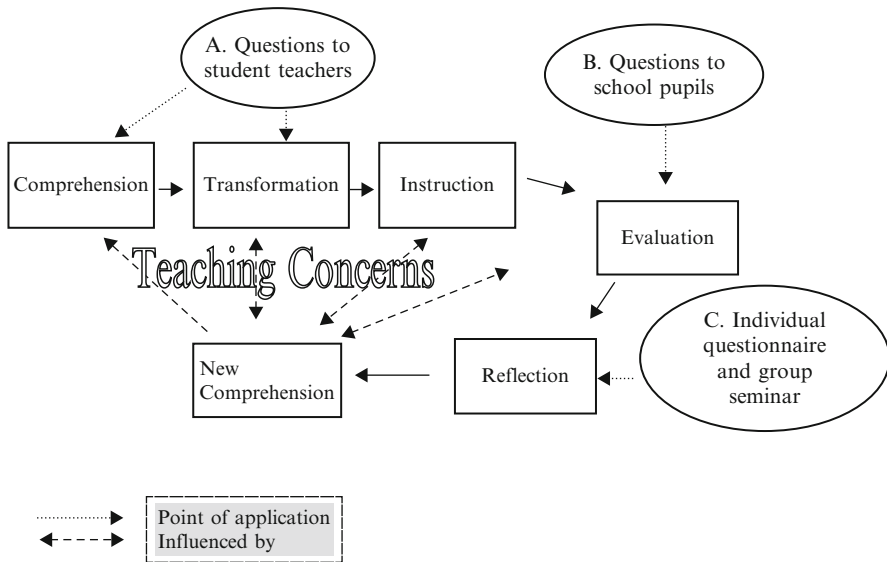


Fig. 10.1 The process of pedagogical reasoning and action (Nilsson, 2009, p. 244)

incidents connected to classroom management; and, critical incidents connected to pupils' attitudes and learning. Her second major theme was related to teaching concerns of which there were three sub-groups: adjusting instruction to pupils' learning needs and prior conceptions; stimulating pupils' interest in learning science; and, developing learning about teaching primary science. Her third major theme was associated with teaching needs that helped to address participants' teaching concerns of which there were four sub-groups, the need for: good subject matter knowledge; a repertoire of experiments and activities; knowledge of students' prior knowledge and learning; and, knowing how to be self-reflective.

Importantly, and echoing the work of many others in teacher education (Berry, 2007; Brandenburg, 2008; Bullock, 2009; Darling-Hammond, 2013; Korthagen, Kessels, Koster, Langerwarf, & Wubbels, 2001; Loughran, 2006; Ritter, 2007; Russell & Loughran, 2007; Zeichner, 2005), Nilsson came to see that, in exploring pre-service teachers' experiences of learning to teach, that a crucial implication of so doing was the need for a sharper focus on a pedagogy of teacher education. She suggested the need for teacher educators to be much more conscious of not only what was happening in teacher education programmatically, but also to link the learning about teaching experiences of pre-service teachers explicitly to the way in which teacher education itself is structured and conducted. She stated that:

... by helping student teachers focus on their critical incidents, by empowering student teachers to trust in the authority of their own experience (Munby & Russell, 1994) and by linking those experiences with concrete aspects of their own pedagogical reasoning, student teachers can direct their own professional development. In that sense, it is crucial that teacher educators, in developing their pedagogy of teacher education, seek to find ways of

incorporating such practice into their teaching about teaching in ways that are based on student teachers' own recent and real experiences of teaching. (p. 255)

As the literature demonstrates, Shulman's model of pedagogical reasoning has been used in different ways in teacher education over the years. However, the focus has been more on researching pedagogical reasoning than necessarily explicating ways of teaching about it; or making its development an explicit aspect of learning about teaching. Therefore to understand how pedagogical reasoning has been included in teaching in teacher education programmes often requires looking beyond the label of pedagogical reasoning to other aspects of teaching and learning in order to gain insights into how the thinking that underpins expert practice is included in teaching and learning about teaching. Not surprisingly, it is in the efforts of those concerned with embedding reflective practice in teacher preparation and/or who have attempted to document and portray their pedagogy of teacher education that insights into the teaching of pedagogical reasoning most commonly tend to be found.

Teaching About Pedagogical Reasoning in Teacher Education

To me as a teacher educator the appeal of Shulman's model resides in its dynamic nature and in its focus on transformation of subject matter as an aspect of pedagogical reasoning. (Wilkes, 1994, p. 4)

Reflection

It is not difficult to see how research into reflection intersects with the thinking around the elements of pedagogical reasoning proposed in Shulman's model (above). As even a cursory glimpse of the literature shows, Dewey's (1933) notion of reflection has resonated down through the ages, perhaps because it sits so comfortably with the idea that learning through experience matters in shaping knowledge of practice. Skillful teachers that are able to unpack and articulate the thinking underpinning their actions could well be described as reflective practitioners. However, reflection, in a manner similar to that of pedagogical reasoning, is more than simply thinking about teaching. It is about deeper understandings of the 'why' of practice; being able to recognize and respond to the problematic nature of teaching and being able to do so in the very crucible of teaching and learning that is the action present of the classroom.

As alluded to earlier in this chapter, understanding teachers as professionals goes to the heart of Schön's (1983, 1987, 1991) differentiation between the high ground of academia and the swampy lowlands of practice. In so doing, Schön created a new wave of interest in reflection and reflective practice, that led to a revisiting of

Dewey's (1904, 1933) seminal work in the field and, for a time, dramatically shaped the expectations for, and practices of, teacher education.

Fifty years after Dewey made his historic distinction between "routine action" (action that takes the definition of social reality for granted and the goals towards which action is directed as given, while allowing for variation in the means by which goals might be achieved) and "reflective action" ("active, persistent and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further consequences to which it leads" [Dewey, 1933, p. 9]), teacher education seems to have become caught up in a seemingly inexplicable wave of enthusiasm for reflective approaches. (Smyth, 1992, p. 268)

Smyth was skeptical of the allure of reflection because of the ways in which he perceived it was being adopted in teaching and teacher education. He was of the view that reflection was being taken up in technical ways in response to the educational conservatism of the day: 'My view is that reflective teaching is entering a phase, like many other educational ideas and reforms, where it has become co-opted and institutionalized. Like most educational reforms before it, it is being "cast in the mold of the technological mindset and thus support[s] standard practice rather than challenge[s] it" [(Gibboney, 1990, p. 40)]' (Smyth, 1992, p. 275). However, there were numerous others who documented their approaches to incorporating reflection into teaching, and more importantly, in their teaching of teaching, that transcended the notion of a 'bandwagon of reform' or a technical adaptation to satisfy calls for change (see for example, Baird, 1990; Clarke, 1995; Clift, Houston, & Pugach, 1990; Korthagen & Russell, 1995; LaBoskey, 1991; Loughran, 1996; MacKinnon, 1989; Richert, 1992; Russell & Munby, 1991; Zeichner, 1995).

Many teacher educators saw reflection as a valuable way of making pedagogical decision-making and 'teacher thinking' more explicit for pre-service teachers i.e., as a way of uncovering the tacit knowledge of practice and to make the problematic nature of teaching accessible.

... reflection continually emerges as a suggested way of helping practitioners better understand what they know and do as they develop their knowledge of practice through reconsidering what they learn in practice ... [it] places an emphasis on learning through questioning and investigation to lead to a development of understanding ... [Reflection] is important in sustaining one's professional health and competence and ... the ability to exercise professional judgment is in fact informed through reflection on practice ... (Loughran, 2002, p. 34)

The relationship between reflection and pedagogical reasoning is not difficult to see. From Dewey's (1933) three attitudes that 'predispose an individual to reflect' through to his five phases of reflection, the synergies with pedagogical reasoning are strong and clear. Through a focus on teaching, Dewey's explication of reflection illustrated well how an artful teacher might create and respond to conditions that arouse intellectual responses and also actively cultivate 'the attitudes that are favourable to the use of the best methods of inquiry and testing' (p. 29); in short, to explore not just the what, but also the how and why of professional practice.

Dewey's attitudes of open-mindedness (the ability to consider problems in different ways), whole-heartedness (experiencing the flood of ideas and thoughts about

an issue or topic) and responsibility (considering the consequences of actions and knowing why something is worth doing), offer a window into the deep thinking associated with deciding what to do, how and why as a teacher. More so though, in conducting pedagogical action, Dewey's reflective phases: (1) suggestions – ideas that come to the fore when confronted by a problem; (2) problem/intellectualization – seeing the puzzle as a whole not as discrete entities; (3) hypothesis – considering a suggestion in terms of what might be done and/or how it could be used; (4) reasoning – linking ideas, experiences and information to extend thinking about a situation; and, (5) testing – putting an hypothesis to the test (in reality or through a 'thought-experiment'), shows how closely aligned the notion of pedagogical reasoning is to the foundations of that which is reflective practice.

In making reflection explicit and integral to teaching *and* learning about teaching, even without the label of pedagogical reasoning, it is obvious that Dewey's views of that which comprise reflection could help a novice teacher see beyond the technical and into the problematic. Through reflection, it becomes possible to see that the uncertainty of the swampy lowlands of practice require much more than the application of a teaching script or routine to appropriately navigate.

Schön helped to rekindle interest in reflection when he introduced the ideas of reflection-on, and reflection-in, practice. Importantly, at the centre of his work was a concentration on the 'problem'. Dewey (1933) had previously described his five phases as 'not simply a sequence of ideas, but a *consequence* – a consecutive ordering in such a way that each determines the next as its proper outcome ... successive portions of reflective thought flow out of one another and support one another' (p. 4). When Schön encapsulated the essence of these ideas through the practices inherent in 'reflection-on-action' and then pushed thinking further through his ideas of 'reflection-in-action', a centre-piece of his argument was about coming to see and understand 'the problem' in new and different ways. Schön introduced framing and reframing as integral to viewing a problem and in so doing, placed added emphasis on what was happening through reflection and again, can be seen as strengthening the synergies between reflection and pedagogical reasoning.

As [teachers/teacher educators] frame the problem of the situation, they determine the features to which they will attend, the order they will attempt to impose on the situation, the directions in which they will try to change it. In this process, they identify both the ends to be sought and the means to be employed. (Schön, 1983, p. 165)

Schön illustrated how, through framing, practitioners create alternative ways of looking into a situation in order to develop new ways of perceiving 'the problem', and therefore encouraging new ways of responding to that situation. Seeing the problem is something that has been examined in many ways. Dewey (1933) outlined the notion of problem in terms of that which captures a teacher's attention in a situation; the puzzling, curious or engaging instance that encourages one to 'look again' at the situation. It may well be that allowing problems to surface in practice (Chak, 2006) is an overt display of those attitudes that predispose reflective thought (as per Dewey, 1933) and which leads a teacher to apprehend issues in practice and

frame them in a positive manner when reconsidering pedagogical experiences and situations.

Mason (2002) similarly drew attention to the centrality of problem recognition through his concept of ‘noticing’:

Every act of teaching depends on noticing: noticing what children are doing, how they respond, evaluating what is being said or done against expectations and criteria, and considering what might be said or done next. It is almost too obvious to say that what you do not notice, you cannot act upon; you cannot choose to act if you do not notice an opportunity. ... Noticing requires sensitivity. I cannot notice that some students are bored if my attention is focused on my own nervousness or insecurity. I need to become aware of the ebb and flow of energy in the classroom (and each class is different in this respect.) (pp. 7–8)

Mason highlighted the fact that ‘noticing’ is important if practice is to be reconsidered and alternative actions taken. Noticing is problem recognition framed in such a way as triggering the need to respond; lack of noticing suggests that changes in practice are less likely – and may well be a limiting factor in conceptualizing teaching as being problematic. Therefore, noticing not only begins to place the problem front and centre in a pedagogical situation, it also invites reconsideration in terms of alternative perspectives and developing informed judgments about what has been happening, what might happen from a different perspective and how learning might change as a consequence of adjustments to a teaching approach. Through problem recognition, reflection may be initiated, but equally, problem recognition has obvious links to other aspects of practice. Therefore, yet again, the relationship with pedagogical reasoning stands out; and markedly so when considered in relation to the ‘time of reflection’.

Schön’s differentiation between reflection-on-practice and reflection-in-practice highlighted how practitioners’ knowledge and skills develop through the ways in which they reflect at different times. His description of reflection-on-practice resonated with Dewey’s explication as a deliberate, thoughtful and purposeful approach to reasoning. However, reflection-in-action (as the term suggests, the reflection that occurs during teaching) was about the sub-conscious, highly refined and somewhat tacit knowledge that is apparent when confronted by a problem in the action present. Reflection-in-action could then also be seen as a way of understanding the manner in which knowledge of practice is refined and, as a consequence, how pedagogical reasoning is initiated and enacted. Reflection-in-action, as a fast moving, sub-conscious, *consequence* of events also illustrates why the highly refined knowledge of practice of the expert pedagogue is so often tacit in nature and difficult to articulate, capture and portray. It also illustrates why preservice teachers may not be aware of experienced teachers’ reflection-in-action as it is not obvious when observing a teacher teaching, nor a common aspect of teacher talk when discussing their practice. The tacit nature of reflection then can make it difficult to access and understand; an issue pertinent to teacher education.

It could be argued that Brookfield (1995) attempted to make the tacit more explicit through his notion of the critically reflective practitioner. For Brookfield, being critically reflective meant becoming much more aware of the different vantage points for looking into practice (an idea that resonates with Schön’s framing and

reframing). His ideas for critical reflection centred on four aspects/lenses of seeing into practice:

1. autobiographical: a self-lens through which teachers are able to focus on their practice in order to begin to see possibilities for adjustment and/or strengthening;
2. students' eyes: a lens through which students' views of teaching and learning are able to be captured and responded to;
3. colleagues' experiences: a peer lens through which unnoticed aspects of practice might be highlighted as well as opportunities for innovative solutions to teaching situations to be trialed and tested with support; and,
4. theoretical literature: a theory lens that can provide a language for teaching and learning and offer new 'ways in' to understanding teaching.

In defining these four major perspectives, Brookfield suggested that, by working through these processes and by examining the assumptions underpinning one's individual approaches to practice, that the conditions necessary to becoming an expert teacher were more likely to be created. Thus, if a practitioner recognized and responded to such conditions then it was more probable that it would lead to powerful learning outcomes because one would also learn to 'teach more responsively' (Brookfield, 1995, p. 35). Again, Brookfield's explanations of critical reflective practice illustrate strong links with pedagogical reasoning and how synergistic the two concepts are – conceptually and practically.

Through critical reflective practice, Brookfield was drawing attention to the need for teachers to recognize the assumptions that underpin their practice. Clearly, in so doing, a great deal of understanding about what is being done, how and why is able to be brought to the surface, mulled over, worked through and developed. It therefore seems fair to assert that such a process must surely lead a practitioner to becoming more informed about, and responsive to the nature of pedagogy.

In teacher education, this focus on reflective practice has led to many qualifiers being placed in front of the term in order to more precisely define what reflection might mean, how it might be enacted and what it might look like. The notion of effective reflective practice (Loughran, 2002) emerged as an attempt to bring to the surface the learning through reflection that might occur in the process of learning to teach and to make that learning explicit and articulable. As noted earlier by Smyth (1992), the 'take-up' of reflection in teacher education could be seen as part of a 'wave of enthusiasm for reflective approaches', or worse, it could simply be seen as more theory from the 'high ground of academia'.

The need to help pre-service teachers understand reflection as something more than rhetoric matters in order to focus serious attention on the thinking that underpins pedagogical decision-making. If that is the case then pre-service teachers might begin to better identify the foundations crucial to underpinning their developing knowledge of practice. Thus effective reflective practice was as much about ensuring that pre-service teachers did not allow 'rationalization to masquerade as reflection' (Loughran, 2002, p. 35) and that, through 'problem recognition', the thoughts, actions and processes that could effectively shape subsequent practice in meaning-

ful ways might be triggered, recognized and grasped. As the quote below (from a pre-service teacher) demonstrates, there is great value in questioning taken-for-granted assumptions about teaching and the process can be a trigger for reflection that leads to new learning. In the quotation (below), by reframing the situation the pre-service teacher came to realize enhanced pedagogical outcomes for her students and a deeper knowledge of her own practice. She clearly experienced that which could be regarded as effective reflective practice; again, the link to pedagogical reasoning is inescapable.

I assumed as a consequence of my own lack of enthusiasm that the students had a negative relationship with the subject. I sought to identify the factors contributing to their experience and experiment with alternative ways of teaching based on the feedback I received. ... It was in their [students'] responses that I realized that my perceptions were not entirely accurate ... I was surprised to find that the students generally felt positive towards the subject, but identified key elements that took away from their learning experience ... This made me feel confident that choosing to pursue ways of responding to some of these "highlighted issues" in my teaching practice could make the environment more stimulating for my students. (Loughran, 2002, pp. 35–36)

In seeking to develop reflective practitioners through the experiences of teacher education, approaches to, and practices of, teacher preparation have been brought into sharper focus. That has inevitably meant that the ways in which teacher educators teach about teaching have been called into question. Like many before, and those that have followed, Segall (2002) saw a need to focus serious attention on the practices of teacher education. He called for teacher educators to purposefully model the teaching that they expected their pre-service teachers to enact in their own practice.

Modelling Teaching

... in order to improve the impact of teacher education, and especially the potential of teacher education to develop new visions of learning and the related practices in their graduates, one aspect that we have to look at carefully is the role of the teacher educator and educational practices within teacher education itself. (Lunenberg, Korthagen, & Swennen, 2007, p. 588)

As the literature clearly demonstrates calls for teacher educators to look at their own practice have been enduring. For example, Northfield and Gunstone (1997) outlined a number of assumptions that underpinned what they described as their principles for teacher education and explained that, 'Teacher education programs should model the teaching and learning approaches being advocated and promote the vision of the profession for which they are preparing teachers' (p. 49). Russell (1999) went further stating more boldly that, 'university-based teacher educators particularly, have no right to recommend to teachers any teaching practices that they have not themselves used successfully at the university' (p. 220).

This focus on the teaching of teacher educators has had ramifications. It has led to calls for more modelling of practice in teacher education programmes, for teacher educators to have recent and relevant classroom experience, and in more recent times, for teacher education itself to be located in schools rather than universities. On the one hand, such calls have been driven by concerns for pre-service teachers to ‘see into teaching’ in new ways. On the other hand, such calls can also be seen as a reaction to the perceived need to ‘train teachers to be classroom ready’. The point of difference may well be linked to whether or not teaching is viewed as being problematic and whether or not ‘being problematic’ is a conceptualization that drives teaching about teaching. If modelling teaching is perceived to be about a technical-rational approach to teaching and is regarded simply as working to a training regime, then modelling will serve a very different purpose from that of modelling the complexity of practice.

Modelling

Research in teacher education has found teachers’ beliefs drive classroom actions (Richardson, 1996). These conceptions often resist change; over time, for example, teachers continue to emphasize the personal facets of teaching and downplay the academic side of teaching (Wideen, Mayer-Smith, & Moon, 1998). Findings such as these have made it clear that it is not enough for teacher education simply to inform students of theoretical and pedagogical information ... Prospective teachers must be convinced that theoretically and pedagogically sound information is more accurate and useful than their own preinstructional conceptions. Without such intervention, prospective teachers may retain their initial beliefs rather than transforming them into sound professional teaching knowledge ... (Goeke, 2008, p. 21)

Teacher educators have long been challenged to ‘walk the talk’ in teaching about teaching (see for example, Aubusson & Schuck, 2006; Crowe & Berry, 2007; Guilfoyle, Hamilton, Pinnegar, & Placier, 1995; Kosnick, 2007; Myers, 2002). The need to model the teaching that they hope their pre-service teachers might experiment with and employ in their own practice seems to be a statement of the obvious. When done well, modelling teaching with pre-service teachers appears to assist them to see the pedagogical intentions underpinning teaching and to see the value in developing deeper understandings of practice. However, how that might happen in a teacher education programme is not as straight forward as one might imagine.

Myers (2002) made clear that a ‘teaching as telling, showing, guided practice approach’ (p. 131) does not suffice as an approach to modelling teaching. When modelling is interpreted as a way for pre-service teachers to copy or mimic the practice of their teacher educators, the development of understanding of practice tends to be quite limited. Modelling with the aim of helping pre-service teachers recognize, access and develop pedagogical reasoning requires much more than guided practice. Opportunities to see and experience the nature of pedagogical reasoning through the shared experiences of teaching and learning are essential.

Berry (2001, 2004) shared her thinking about her teaching through an online diary which she made public to her pre-service teachers. In so doing, she laid bare her reactions to her teaching and her students' learning and created genuine opportunities for her pre-service teachers to understand the pedagogical reasoning that underpinned her practice; practice that they experienced themselves as learners in her class. Berry worked in such a way as to illustrate to her pre-service teachers that 'there is more to teaching than meets the eye ... [because of her desire to help] pre-service teachers recognize the complex and uncertain nature of teaching' (Berry, 2001, p. 1).

Berry's use of an online journal worked at a number of levels. It was able to demonstrate the pedagogical reasoning underpinning how she thought about and prepared for teaching, as well as offering a strong mechanism for reflection following a class. However, at another level, it made it possible for her to reconsider (and articulate) some of the crucial 'in-action' reasoning that influenced what she did (or did not do) and how she interpreted, responded to and made decisions about her teaching during teaching. She explained it as:

My previous experiences of working with student teachers ... led me to understand that learning about teaching is enhanced through embedding learning in experience and that modelling particular aspects of teaching has a much greater impact on student teachers' thinking about practice than what I tell them. Therefore, in my own teaching I have tried to model an attitude and approach to exploring the effect of my teaching on my students' learning, so my student teachers may consider a similar approach for their learning. However, I have found that this is not an easy goal to 'live' as a teacher educator. I am not always conscious of my actions, in action, nor am I always readily able to articulate my pedagogical reasoning 'on the spot'. Hence my decision to keep a public journal which gave me extra thinking time to question and examine my thoughts and feelings and decide what might be most useful to bring to my students' attention. I hoped that by publishing my thinking I might also encourage students to re-think their experiences of a session, and hopefully engage in a conversation (electronic or otherwise) about practice with me and/or their peers. (Berry, 2004, p. 18)

Berry's modelling of her teaching, and as a consequence making her pedagogical reasoning accessible to her pre-service teachers through her online journal, led to learning outcomes that might not have been so likely had she not made the journal public. She recognized that she learnt to better articulate her own pedagogical reasoning and that, in itself, enhanced her teaching. However, beyond her own practice, the dialogue, feedback and sharing that occurred with her pre-service teachers through (and as a result of) the journal, also opened her eyes to new ways of understanding their learning experiences in her classes, and as a consequence, encouraged her to see new ways of framing different aspects of teaching *and* learning about teaching. But just making pedagogical reasoning explicit for her pre-service teachers was not a goal unto itself because, 'Making a choice about what to make explicit both in my talking about practice during classes and in my journal entries was a constant dilemma for me. I had to choose carefully what I held up for public examination that would be useful and accessible for these student teachers' (Berry, 2001, p. 5).

Berry (above) hints at an issue inherent in ‘think aloud’ approaches to explicating pedagogical reasoning in the teaching of teaching. Just as modelling can be misinterpreted as a script to be copied (Loughran & Berry, 2005), so too teacher educators making their pedagogical reasoning explicit can inadvertently create an impression amongst their pre-service teachers that they are justifying or rationalizing their actions in action. It is important that in trying to open up for scrutiny the pedagogical reasoning underpinning a teacher educator’s practice that it is done in ways that assist pre-service teachers learn about pedagogy (through the dilemmas, issues and concerns that make teaching problematic, see for example, Loughran, 1995), not be confused by, or lose confidence in their teacher educator.

Choosing an appropriate time to explain that I would be “thinking out loud” and the purpose for doing so was important. I had to have a sense of trust in the class and they with me otherwise my behaviour could appear to be peculiar rather than purposeful. There was a danger that talking aloud about what I was or was not doing, and why, could be interpreted as lacking appropriate direction. (Loughran, 1996, p. 39)

Moreso, the purpose of a ‘talk aloud’ approach to the teaching and learning about teaching needs to be clear not only from a teacher educator’s perspective (in terms of doing it), but the purpose needs to be well understood (and seen as useful) from a pre-service teacher’s perspective. In her teaching about teaching, Berry described the search for the alignment of these perspectives as tensions (Berry, 2007), which powerfully portrayed the challenges confronted by teacher educators when conceptualizing their teaching of teaching in relation to their students’ learning about teaching. Equally, her collaborative efforts with Crowe to help their pre-service teachers begin to ‘think like a teacher’ (Crowe & Berry, 2007), highlighted the difficulties of making pedagogical reasoning clear, meaningful and useful, but also how professionally rewarding it could be when purpose and practice align and some form of harmony in teaching and learning about teaching is achieved. Bullock’s (2009, 2011) work in this field is equally impressive. He illustrated what it means to learn about being a teacher educator and how, through researching his own practice, he was able to move beyond superficial views of modelling teaching in order to make unpacking pedagogical reasoning central to a demonstration of expertise in teaching – and as a consequence, the teaching of teaching.

In many ways, all of these efforts to make pedagogical reasoning clear and explicit for pre-service teachers can be seen as a belated response to Clark’s (1988) earlier challenge to teacher educators when he asked whether or not:

... teachers of teachers have the courage to think aloud as they themselves wrestle with troubling dilemmas such as striking a balance between depth and breadth of content studied, distribution of time and attention among individual students, making inferences about what students know and what grades they should be assigned, or with how to repair errors, teaching disasters, and the human mistakes that even experienced teacher educators make from time to time? (p. 10)

The increasing focus in the literature on a pedagogy of teacher education might now be considered as a real outcome of much of this earlier work through which the desire to make pedagogical reasoning overt to pre-service teachers has now become

a meaningful part of some teacher educators' practice. The following section takes up the explication of pedagogical reasoning through an extended case of the efforts of two teacher educators.

Making Pedagogical Reasoning Explicit in Teacher Education

Making pedagogical reasoning in the teaching of teaching explicit is a powerful way of helping students of teaching to see into the problematic nature of practice. Just as reflection in teacher education led to a variety of ways in which teacher educators began to share their learning with their students of teaching through journaling (e.g., Nicol, 1997), so too, in some fields, the use of a 'think aloud' or 'talk aloud' approach has been used to access students' thinking processes as seen in: the learning of chemistry (Bowen, 1994); prior experiences of pedagogy (Powell, 1992); the teaching and learning of reading (Bereiter & Bird, 1985; Collins, Seely Brown, & Newman, 1989); and, teaching and learning of languages (Chamot & Kupper, 1989).

In a similar vein, think aloud has also been used by some teacher educators to share their thoughts and actions during their teaching of teaching as a way of articulating for their students of teaching their pedagogical reasoning in-action (see for example, Berry, 2007; Loughran, 1996). As the outcomes of such work demonstrate, when students of teaching are able to see and hear their teacher educator's pedagogical reasoning during their shared teaching and learning experiences, the complex nature of teaching comes to the fore and the notion of a script or recipe as a way of learning about teaching is challenged. Working to make pedagogical reasoning in the teaching of teaching clear and explicit is neither simple, nor straightforward. It involves a commitment to opening up for scrutiny one's own practice and comes with a heightened sense of vulnerability and a questioning of that which might be perceived as comprising expertise. The following case study is designed to illustrate how two teacher educators, working as a team, sought to pursue the explication of their pedagogical reasoning for their students of teaching.

Case-Study

The following case study is drawn from the work of Stephen Keast and Rebecca Cooper, two teacher educators who worked together over 8 years in what started out as a study into the articulation of the professional wisdom of practice and transformed into a project about sharing their pedagogical reasoning with their pre-service teachers. It began when Cooper started teaching for the first time in a university teacher education programme with Keast. At that time she was a part-time sessional science method tutor while still teaching in a secondary school. Of

interest to Keast at that time was exploring the learning derived of sharing his pedagogical knowledge with his pre-service teachers.

Teaching together had led Keast and Cooper to have a strong relationship of trust and respect from which the opportunity to research and improve their practice through critical reflection of their teaching of teaching together could be examined. In so doing, Keast soon began to ‘unpack’ his professional wisdom which was bound up in tacit knowledge he carried as a teacher educator. He began to make that knowledge explicit for himself and to also share it with Cooper as they developed their pedagogy of teacher education. Through team teaching they learnt to question and critique the reasoning underpinning their teaching together and were encouraged to do so as a consequence of what they learnt together as teachers and from their students as learners of teaching:

The students are stuck viewing things as students and can't seem to view things from a teacher's point of view. They are trying to make the transition from student to teacher but seem to be finding it difficult. They all have different ideas about what is important for them to know and for the students to know. I know we all have different approaches to teaching but I think it would be good to be at least on the same page about this.

I couldn't believe that it took an hour to get through the pancakes homework! I'm out of practice breaking things down in such detail. Stephen was trying to help the students to talk their way to understanding but unfortunately they were not really joining him on the journey. The students did not want to volunteer their ideas and were finding it difficult to support each other.[Cooper] (Keast & Cooper, 2010, p. 3)

It is often the case that good teachers are offered opportunities to be teacher educators with little or no induction, almost as if there is a misguided expectation that teacher education is no different to teaching. That view is of course in stark contrast to the argument put by Korthagen, Loughran, and Lunenberg (2005) who argued that teaching in teacher education is not the same as teaching in school. Rosean and Wilson (1995) drew attention to the fact that teachers who became teacher educators often struggled to maintain a teacher education focus; they did not problematise their teaching about teaching in the same way as they problematized their classroom practice (Rosaen & Wilson, 1995). Cooper, on the other hand, was introduced to teaching in teacher education in a supportive and reflective manner and was not confronted by the ‘sink or swim’ approach that often happens to beginning teacher educators who are left to work alone (Korthagen et al., 2005).

Rebecca and Stephen constantly discussed their practice both during and after class and never did they view their roles as novice and expert in an effort to model collaborative roles for the pre-service teachers. They received and acted on feedback from each other and collaborated on their beliefs about teacher education. Rebecca viewed her transition as a process; a continuation of her teaching journey, while Stephen viewed it as an opportunity to articulate his knowledge, improve his practice and continue his teaching journey. (Cooper & Keast, 2009, p. 46)

As Keast and Cooper planned their teaching together and shared their pedagogical reasoning it supported Cooper in her learning through reflection about teaching. Having Keast share his practice and his reasons for choosing what he did helped to smooth the path for Cooper's transition from school teacher to teacher educator. By

researching and reporting on their practice, they made explicit that which was tacit in their practice and by deliberately researching their experiences, purposefully began to develop the knowledge underpinning their pedagogy of teacher education.

In the first years of working together, they shared their planning and opened up their pedagogical reasoning to the scrutiny of the other (Rebecca Cooper & Keast, 2009). They developed a routine through which Keast would teach the morning class while Cooper observed. Then, following the class, they would debrief and record the conversation for later analysis. Cooper then taught the afternoon class and Keast observed. In addition to recording their debrief of the second class they would also build on both events to develop the teaching for the following week.

Initially the focus of their research and discussion was twofold, the sharing of their developing pedagogy of teacher education and sharing their pedagogical thinking of practice with their pre-service teachers. Throughout their work together they wanted to share with their pre-service teachers the thinking and to make explicit the pedagogical reasoning; something that is often not shared with pre-service teachers. In so doing, they were opening up for scrutiny that which may be described as *secret teacher business*.

Of course, the transition from teacher to teacher educator was not easy, Cooper grappled with the change in role and the challenges of working with Keast in a way that was not part of the normal ‘script’ of teaching and learning about teaching:

The focus when teaching secondary students is on helping students to understand the subject matter in such a way that students can apply this knowledge effectively, to complete set tasks. In teaching pre-service teachers, the focus is more on helping pre-service teachers understand the context and different ways that the teacher manages this context so that school students can maximise their learning. However, for many pre-service teachers, I noted that their thinking was directed towards the subject matter and it was difficult to move them to thinking less about the content and thinking more about why the content is being presented in the first place and the impact of how that content is presented and assessed. (Cooper & Keast, 2008, pp. 78–79)

Importantly, Cooper had a clear vision of her role as a teacher educator, but that did not mean it could always be achieved as planned.

I found it difficult to engage the students who were not expecting to have to discuss their own teaching but were expecting just to sit back and be told how to teach. I used a variety of approaches to help these students engage with the class and explore their thoughts but found it challenging and at times frustrating. (Cooper & Keast, 2008, p. 78)

Not only did they interrogate their practice with each other, but they quickly established a routine to do the same in class in front of their students. In so doing, they were able to share their pedagogical reasoning in the moment. They answered questions such as: “Why are you teaching this way?” “Why is that example/resource important?” Being questioned in that way not only helped each of them articulate their pedagogical reasoning for themselves but unlooked the world of their secret teacher business for their pre-service teachers.

It was beneficial therefore, to have Stephen in the classroom to question me during my teaching to help tease out my intentions within the class situation. A shared teaching

arrangement enabled this to happen, as being in each other's classes allowed each to support the other to take our students further than we would have been able to on our own. (Cooper & Keast, 2008, p. 79)

As they developed their knowledge and skills at making their pedagogical reasoning accessible for their students they introduced the use of cases (Loughran & Berry, 2006). However, in the first instance, neither was pleased with the teaching experience and how it was unpacked their classes.

During our debrief Stephen commented that he was trying to create an "ah-ha moment" for his pre-service teachers with respect to the link between the work we do with them at university and the experiences on their teaching round. I wondered if there was a midpoint somewhere between; without spelling it out for them and the "ah-ha moment" but have since decided that this would be an almost impossible judgement to make as it could be different for every student in the room. When Stephen told me what he had planned I thought it was perfectly clear to me and that he did not need to do any more than just introduce the cases and let it all unfold. We talked about many possibilities for why the pre-service teachers had not jumped on this opportunity to explore their teaching which included; not understanding the task, us not making the task explicit and the pre-service teachers not being able to view themselves as teachers whilst being in a class as students. (Cooper, journal – week 5: Lunch debrief) (Cooper & Keast, 2009, p. 45)

As an experienced teacher educator Keast recognized the messy, complex and dilemma driven nature of teaching. He was well aware that careful planning does not always lead to the learning that is planned or expected. Through the cases experience (above), the pre-service teachers were not making the links as expected but it created new questions and issues for Keast and Cooper about their teaching that impacted their planning for the next class. It also made clear that teacher education was not the same as teaching – even though many of the problems may appear are the same. Teachers cannot always plan for the type of learning they want their students to engage in, accepting that learning is idiosyncratic and personal is important, responding to it is crucial.

In time there was a shift in Keast and Cooper's teaching approach whereby rather than one teaching while the other observed, their practice had morphed into something congruent with team teaching. They had become very familiar with each other's style of teaching and their values closely aligned which gave greater strength to their teaching. As they became more expert at sharing their pedagogical reasoning with their pre-service teachers they recognized the importance of acknowledging and responding to the different teaching and learning expectations:

I could have offered the pre-service teachers a list of useful teaching strategies that have been successful during my teaching career. Instead, I attempted to help my pre-service teachers unravel the complexities of teaching that they may face and encouraged them to articulate what they struggled with in their own classrooms during teaching rounds ... At the same time, I have learnt about myself as a teacher and a teacher educator; I am developing my pedagogy of teacher education. I understand my experiences as the first step on a journey that involves my shifting thinking about teaching towards a view that allows for creating and engaging in possibilities rather than denying them. Finally, I have learnt that learning about teacher education means sharing the frustrations of my teaching with Stephen in order to encourage others to begin to consider doing the same. (Cooper & Keast, 2008, p. 80)

While sharing their pedagogical reasoning with their pre-service teachers was valuable to Keast and Cooper in terms of their own practice, trying to get their pre-service teachers to share their pedagogical reasoning was much more difficult. However, one useful tool they found was slowmation (Hoban, 2007; Hoban, Loughran, & Nielsen, 2011, also see www.slowmation.com). They encouraged their pre-service teachers to use the procedure with their students whilst on their practicum and to then share the experience with their teacher education peers when they returned to university (Keast, Cooper, Berry, Loughran, & Hoban, 2008). What emerged was a teaching procedure that allowed the teacher educators to explore the pedagogical reasoning of their pre-service teachers. As pre-service teachers showed the movies of their students in class they recounted what the students had learnt and in so doing what they learnt about their teaching which also helped to make clear their developing understanding of their pedagogical reasoning:

In this movie, they have taken survival of the fittest to mean the survival of the biggest and the strongest at the top of the food chain. Rather than the process of survival as in evolution (PST9). Yeah so they have mixed up survival of the fittest with the food chain. A bigger animal or scarier animal kills a smaller animal and survives. (PST10, classroom presentation, 2008)(Keast, Cooper, Berry, Loughran, & Hoban, 2010, p. 8)

The pre-service teacher (in the extract above) had become aware of students' alternative conceptions in terms of food chains. By using slowmation, the pre-service teacher recognised a learning issue that otherwise may have gone unnoticed. More importantly the pre-service teacher had obtained vital information about a feature of learning that could influence future teaching of the food chain. Of significance to Keast and Cooper through the slowmation procedure and debriefing was the fact that their pre-service teachers began to interrogate each other's practice collaboratively and supportively.

When I taught Mitosis on my previous round I noticed they [students] thought it was a process that went phase 1, phase 2, phase 3, etc. not that it gradually changed. They just think they [cells] divide and that's it, not that it's a cyclic process.

[PST6 2008 responds] That's what we got at the end of our video, in fact we didn't even get two cells. We actually got, they've pulled apart, that's it. That's the end of the process. I think that's one of the things I would address, like with animation, and could show, the connection of the processes rather than just stage 1, stage 2, stage 3. (Keast et al., 2010, p. 9)

Watching their 'school student created' slowmations gave the pre-service teachers a way of observing how their students understood some of the abstract scientific concepts they were teaching. Not only did it give insights that assisted them (pre-service teachers) to rethink the subject matter content, but it also gave them ways of thinking out loud about what they saw in terms of student learning and how that influenced their thinking about their practice.

In terms of group work, I found that everyone could be working hard, but not doing very much about science. So in groups of 3, I found one person tended to be the director, someone would be the media player whiz, who was getting it all going on the computer and someone would be really involved in making the models. But they wouldn't really engage with the science at all. So you couldn't say that they weren't working because they were, but they weren't doing the sort of work that I wanted. So I don't know what the answer to that

would be, because to get everyone to do an individual one [Slowmation] is too time consuming and resource consuming. (PST2, Classroom presentation 2007) (Keast et al., 2010, p. 10)

The discussion (above) led to a deep and engaging interchange between the pre-service teachers about whether or not the issue could be solved. At the end of the discussion they came to the realisation that not everything could be ‘solved’ and that teaching was complex, deeply embedded in the situation, messy and full of dilemmas. There were no simple answers. By explicating their pedagogical reasoning they jointly developed a greater understanding of what it meant to be a teacher of science.

Keast and Cooper’s collaborative inquiry gave them a base that allowed them to gain funding for a research assistant who was able to join their class and act as a critical friend (CF) to support their research. The classes were video-taped, CF took notes during class and analysed the video for themes. As an outside observer the CF was able to look into their practice with new eyes and offer a fresh perspective on their shared practice:

Stephen’s Journal for Week 1

This first week is very important for setting the scene for the rest of the semester, I want to push their understanding and question what they really know about content. They enter our class expecting to be shown how to teach, and more importantly how to teach certain topics. I don’t intend to do this, so this first week is about explaining why they won’t be getting what they desire and why, and keeping them onside. If it fell over badly this week, the whole semester of learning for them and teaching for me would be disastrous. It is about walking the fine line between pushing and listening, reading their reactions and moving them forward. [Keast week 1, 2010]

Here Stephen exposes his concerns for his pre-service teachers’ expectations. On the one hand he wants to meet the needs of his pre-service teachers and on the other he recognises that what they expect is not what they need to be learning about teaching. It is a dilemma as he is torn between meeting their needs and challenging their expectations. In his pre-service teachers’ eyes he could well be seen as a “living contradiction” (Whitehead, 1993). [CF week 1, 2010](Keast & Cooper, 2012, p. 71)

In further expanding on his practice Keast continued to ‘unpack’ his pedagogical reasoning for the first week of the semester and give the CF insight into the ideas that underpinned his approach to practice.

Many of the pre-service teachers at first thought this was fun but didn’t see the science. Important for us to note in our teaching that while it is fun, what is our purpose and what is the learning we want from our pre-service teachers, just as they need to think about the learning of their students. The unpacking was important to demonstrate where the science was, and how such an activity could be used to bring out science concepts often taught in an abstract way using unfamiliar chemicals. By the end of the discussion most of the pre-service teachers could see the benefit of this approach. (Keast)

The need to allow their pre-service teachers into the way they think about their teaching is important to both Stephen and Rebecca. While fun activities and engaged students are important, making sure they see the science and recognise the scientific concepts is the main point to teaching science. While promoting the Human Qualities of science we are also promoting the cognitive value of science. The need to identify with the science concepts within the human endeavour appears to be an underpinning aspect of their approach to teaching about science teaching. (CF)

There are many concerns I took into this week and just as many I take out of it. If I push them too hard about their lack of 'real' understanding of simple concepts like change of state and chemical reaction, it will take a few weeks to get them back to take risks and discuss openly what they know, what they don't know and how they know it. Did I push them too hard? We will only know next week! Humour and the practical nature of the activity helped this year to keep it less confronting than previous years. (Keast)

In his journal, Stephen is telling his story, what Hamilton (Pinnegar & Hamilton, 2009) described as "story of self." Often the first step in self-study is to make explicit your own thoughts and ideas about your teaching; Stephen does that here. (CF) (Keast & Cooper, 2012, pp. 71–72)

The critical friend offered insights into their practice that gave a new perspective on their teaching. Keast and Cooper had been teaching together for 5 years and so the fresh eyes, for them, created possibilities that they could not fully grasp alone. As a consequence, their pedagogical reasoning was more closely analysed and they came to see new aspects of their practice and the ways in which their students interpreted their practice, that they had previously not recognized.

A significant finding from working with the critical friend was the lack of connection that pre-service teachers made to Keast and Cooper's pedagogical reasoning. The pre-service teachers appeared to view the teaching from a technical skills perspective, thus not fully grasping that which was intended by the modelling and articulation of pedagogical reasoning at the heart of the experience.

Our critical friend's perspective on our practice has added another view to our understanding of our teaching of science teaching. While our critical friend could identify the values we were promoting, from the interactions with pre-service teachers, an issue persisted. It appeared to be difficult for the pre-service teachers to differentiate between the pedagogy and technical skills and the overarching values of science being promoted. Taking the pre-service teachers along on the learning journey with us, we could see a change in their attitudes to science and science teaching. However, we were aiming to make their values explicit; through our critical friend's reframing of our practice, we saw that we did not always meet that objective. Instead, the pre-service teachers viewed their practice in terms of technical skills rather than as higher levels of pedagogical reasoning. (Keast & Cooper, 2012, pp. 75–76)

When reflecting on their learning experiences about their teaching about teaching, Keast and Cooper saw benefits in making their pedagogical reasoning explicit in the manner they developed together:

After reframing our practice through the eyes of our critical friend we have realised that discussions about our pedagogy that we openly share in front of our pre-service teachers not only make explicit our pedagogical reasoning, but models the types of discussion that are so important for them to engage in later in the semester as we encourage them to publicly articulate their own developing pedagogical reasoning. In one sense, this has confirmed for us that the pedagogical practices we have been developing and adopted, scaffold the type of learning we aim for at the beginning of semester. Our critical friend has made explicit several tacit aspects of our pedagogical reasoning, such as interjecting in the moment. This has opened our eyes to the impact such practice has on us individually and as a team and the impact it has on our preservice teachers and the course. (Keast & Cooper, 2012, p. 80)

The manner in which Keast and Cooper developed pedagogically together centred around recording their thinking about their individual teaching as well as critiquing one another's practice in order to identify and challenge their ways of articulating their pedagogical reasoning. They responded to the challenge in multiple ways (keeping a journal, responding to questions about their decisions in class, being filmed and analysing the subsequent video-tape, and through the analysis and questions of a critical friend). It was a constructive and productive process for them, but much of their success was due to two important aspects that they came to better understand over time.

Firstly, it became apparent to them that by articulating their visions and goals for teacher education they developed a shared understanding which provided them with some common ground and shared knowledge so that even when they were not team teaching, those understandings informed their pedagogical reasoning and thus, their resultant practice. In having a shared understanding they developed a clarity that provided a stronger foundation from which to illicit their pedagogical reasoning. Secondly, and perhaps more importantly, together they established and maintained a professional relationship (between themselves and their pre-service teachers) that was built on trust that supported the open sharing of frustrations and failures as well the championing of success.

The process led to them both better understanding the assumptions that shape their ideas about teacher education and therefore their practice in relation to their pre-service teachers. For Cooper, in particular, the experience led to greater noticing about the difference between teaching and teaching about teaching; then having the support and the time to do something about that which stood out as a consequence. For both, the how and why of practice most definitely surfaced, was considered from multiple angles, grappled with, reshaped and taken up through new challenges and opportunities.

The work of Keast and Cooper is significant because it acknowledges the need to build a pedagogy of teacher education in ways that allow for quality outcomes for teacher educators and pre-service teachers together, thus shifting the notion of modelling quality practice to something that goes well beyond the status-quo and the expectation of simply sharing tips and tricks. Their articulation of pedagogical reasoning strengthened their ability to model practice in a way that exemplified teaching as being problematic, but it also offered windows into how 'problems' can be worked through. So rather than implying that teaching and learning are linked in a linear form dependent on a search for 'the solution', their approach exemplified the value of learning to become more informed about practice in order to make deliberate choices about what to do because the 'why' of practice directed that decision-making. In so doing, they were able to illustrate what it meant to seek to foster quality learning for themselves as teacher educators and, especially so for the learning about teaching of their pre-service teachers.

Conclusion

We rarely talk with each other about teaching at any depth – and why should we when we have nothing more than “tips, tricks, and techniques” to discuss? That kind of talk fails to touch the heart of a teacher’s experience. (Palmer, 1998, p. 11)

There are major challenges that confront teacher educators in their teaching about teaching. However, those challenges also offer opportunities to lay bare the underpinnings of practiced through explicating pedagogical reasoning. Making pedagogical reasoning explicit through the teaching and learning of teaching has implications for both the thinking about, and development of the teacher educators’ practice, and the same clearly applies for pre-service teachers.

There is a great need to educate pre-service teachers in ways that extend beyond handing down teaching strategies that work. There is a crucial need to develop more robust understandings of what it means for a beginning teacher to be classroom ready, and promoting deeper thinking about teaching clearly can foster such development. That development can be evidenced in teachers’ willingness to reframe, reconsider, contextualise and problematise their practice rather than seek to mimic or replicate the practices of those they observed through their experiences in teacher education.

The work of teacher education is not about training, it should be an educative process that develops thoughtful, informed and highly able professionals. By placing greater emphasis on pedagogical reasoning in the teaching and learning about teaching, pre-service teachers can be given genuine opportunities to better apprehend the complex nature of teaching and begin to develop a vision for their future professional learning.

I have worked with countless teachers, and many of them have confirmed my own experience: as important as methods (teaching tips and tricks) may be, the most practical thing we can achieve in any kind of work is insight into what is happening inside us as we do it. (Palmer, 1998, p. 5)

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