Navigating and noticing: Preservice teachers' journeys in planning mathematics programmes

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Abstract

National developments in curriculum and pedagogy have prompted interest in the ways that teachers plan for teaching. Preservice teachers are at a particular point in their teaching journey, yet little is known about how they go about planning for long-term student learning. This article discusses results from a study of preservice primary teachers who were preparing a long-term plan for mathematics. By using metaphors of navigating a curriculum landscape and of noticing features of a school mathematics landscape, we illustrate the complexities and dilemmas encountered by a small group of third- and final-year preservice teachers. This study found that the participants actively engaged in a curriculum-design process which was complex and iterative, and they collected and selected resources both for teaching and for learning more mathematics. The two metaphors were useful descriptive tools for interpreting the curriculum-design journeys of these novice teachers which they identified as a significant professional transition.

Introduction

The ways that primary school teachers use curriculum materials in their planning and preparation for teaching have long been of interest to researchers and policy makers (Stein, Remillard, & Smith, 2007). In English-speaking countries, there is specific interest in teachers' use of curriculum materials when new or reformed national curricula are introduced. For example, the introduction of a national curriculum in Australia has prompted the *Peopling Education Policy* project that examines the "processes and structures by which teachers and school systems make the national mathematics curriculum come alive in their

classrooms" (Clarke, Clarke, & Sullivan, 2012, pp. 9–10). While the Australian project surveyed a range of classroom teachers, other research has focused on novice teachers in particular (Grossman & Thompson, 2008; Kauffman, Johnson, Kardos, Liu, & Peske, 2002). These two studies investigated how first- and second-year teachers interpret and use curriculum materials, but they did not include novice teachers during their preservice teacher-education programme.

In this article we discuss how a group of preservice teachers (PSTs) engaged with New Zealand curriculum materials when planning for long-term mathematics learning, and we use findings from a larger study of PSTs as they prepared to teach mathematics in a primary school (Wilson, 2010). PSTs are a unique subset of teachers, because they are at the beginning of their teaching careers and are "learning to plan" using relatively unfamiliar curriculum materials (Wilson & McChesney, 2010). Over time, PSTs build up their experience by planning and teaching single and short sequences of lessons during practicum, when hosted in an experienced teacher's classroom. When required to engage in more complex planning such as curriculum programmes for a school term or a whole year, PSTs face different challenges to more experienced teachers.

We use two main concepts that serve as explanatory metaphors for findings related to the PSTs' interactions with curriculum materials. First, we draw on Connelly and Xu's notion of a landscape of curricula (Connelly & Xu, 200) to explore "navigating a curriculum landscape"; secondly, we incorporate the teacher "noticing" perspective of Mason (2002). These two metaphors enable us to examine relationships between materials and the PSTs activity with these artefacts. In addition, we support our discussion by using two perspectives from the field of teacher education, of teachers as "curriculum designers" (McGee, 1997; Stein et al., 2007), and of preservice experiences as an "approximation of practice" (Grossman, Compton, Igra, Ronfeldt, Shahan, & Williamson, 2009).

At the time of the study (in 2008), a new New Zealand curriculum was being implemented for use in all schools. Significant changes were made from previous curriculum documentation including a move from having separate documents such as *Mathematics in the New Zealand Curriculum* (Ministry of Education, 1992) to one document entitled *The New Zealand*

Curriculum (*NZC*) (Ministry of Education, 2007a). The PSTs in the study faced the challenge of navigating their way around a new document to locate mathematics curriculum information for planning (Barker, 2008). In this article we illustrate the complexities of processes that involved the PSTs in several cycles of noticing, selecting, using and adapting curriculum resources for planning.

A landscape of curriculum materials

The metaphor of a landscape for curriculum materials is not new and has been used by Connelly and Xu (2004) to describe how any particular curriculum landscape changes over time. In the New Zealand primary school context, the curriculum landscape is populated by documents such as *NZC* and *Te Marautanga o Aotearoa* (Ministry of Education, 2008), and supporting material for teachers published by the Ministry of Education. Regarded as the official curriculum document, *NZC* provides a "framework" for teachers to develop school and classroom programmes, "rather than a detailed plan" (p. 37). In addition, the mathematics curriculum landscape for primary school teachers comprises the Numeracy Development Projects (NDP) material supplied by the Ministry of Education. One of the NDP books for teachers describes a "Number Framework", comprising "stages" specified for domains of "knowledge" and "strategies" (Ministry of Education, 2007b) that some claim acts as a quasi-official curriculum for the number and algebra strand (Walls, 2004). Further mathematics materials written and published by the Ministry of Education are the "Figure It Out" series and the nzmaths website. As in many other countries, New Zealand teachers also have access to and use locally produced and overseas materials such as "web-based resources, (and) commercial publications" (Clarke et al., 2012, p. 10). The available range of curriculum materials is representative of resources for other learning areas of *NZC*.

A curriculum landscape is more than a collection of isolated materials; the materials are connected in different ways to each other and indicative of status and relevance. When discussing curriculum knowledge, Shulman acknowledged that the curriculum and "the variety of instructional materials available" are the "*material medica* of pedagogy,

the pharmacopeia from which the teacher draws those tools of teaching that present or exemplify particular content" (Shulman, 1986, p. 10). Some curriculum resources dominate due to embedded authority, such as Ministry documents, or to their pervasive use in teacher professional development, as with the material of the NDP. While *NZC* is considered to be the official curriculum, and in New Zealand "every school curriculum must be clearly aligned with the intent of [*NZC*]" (Ministry of Education, 2007a, p. 37), there is, however, an expectation that schools will design their own curricula. Furthermore, *NZC* states that "schools have considerable flexibility when determining the detail. In doing this they [teachers] can draw on a wide range of ideas, resources and models" (p. 37). Curriculum is therefore designed and interpreted at national, school, and classroom level, where schools have flexibility and authority to design and shape their localised curricula, enacted by teachers in classroom situations. And it is during the process of localised curriculum design that primary teachers navigate their way around these mathematics education materials.

A curriculum landscape

The process of navigating a curriculum landscape involves making sense of the landscape's multiple messages, meanings, and values. For teachers, we suggest that making sense requires "noticing", and we draw on Mason's description of noticing as "distinguishing some "thing' from its surroundings" (2002, p. 33). Noticing involves a process of "being present and sensitive in the moment, having a reason to act and having a different act come to mind" (p. 1). Teacher noticing has also been described by van Es and Sherin (2002) as teachers identifying what is noteworthy and important. Identifying what is important involves attending to messages about what has high status and authority, and therefore indicating valued content and pedagogy. When navigating within a curriculum landscape, noticing requires recognising, attending to, and making meaning of explicit messages and cues, and then selecting resources for particular teaching purposes, including planning.

The Australian project that sought insights from teachers about their planning processes reported diverse ways of planning. An online survey

of 256 primary teachers found that some teachers "base their planning on judgements and activities, others refer to official curriculum documents, yet others make judgements after discussion with colleagues" (Sullivan, Clarke, & Clarke, 2012, p. 21). It seems reasonable that when experienced teachers navigate a curriculum landscape, they find landmarks such as official documents and teaching resources to be familiar and interconnected. In fact, experienced teachers may not regularly consult curricular documents, and it is mainly during times of new curricula that teachers read documentation and attend to what is similar and what is different to their prior curriculum knowledge. In a study of a small group of New Zealand primary teachers, Byres (2008) noted that, when designing school curricula, national curriculum documents were used selectively and, if used at all, were referred to only at the end of planning processes. A recent Australian study found that teachers used their own curriculum materials in their planning processes, such as previously generated activities and assessment information (Sullivan et al., 2012). The curriculum landscapes of experienced teachers are therefore thickly populated with their own resources as well as those written by others. Novice teachers, however, have few planned resources themselves and typically access resources from either published materials or the generosity of their associate teachers while on practicum. This thinner base of curriculum materials must consequently influence and shape the planning processes of novice teachers.

Two United States studies have explored how novice teachers plan for teaching. Grossman and Thompson (2008) investigated how secondary teachers, during their first two years of teaching, interacted with curriculum materials. The teachers spent considerable time searching for materials to support their curriculum understanding and, once identified, used them to inform their decisions for teaching. In a study of first-year primary school teachers, Kauffman et al. (2002) found the novice teachers were concerned about knowing the curriculum. These teachers sensed the importance of the curriculum for planning, and wanted curriculum guidance about what it was they were supposed to teach. They claimed that some materials contained too little information while others contained too much. Novice teachers wanted access to high quality and comprehensive curriculum materials, and in turn, the curriculum materials were found to provide a

valuable scaffold for their planning processes (Grossman & Thompson, 2008). Both studies found that, in retrospect, the novice teachers wanted opportunities during their teacher education programmes to analyse and critique such materials with the help of an experienced educator.

In his chapter about the mathematics teacher as curriculum maker, Clarke (2008) discusses "the ways in which a teacher takes a syllabus or curriculum guidelines or standards and enacts then in the classroom" (p. 134). He identifies some basic requirements which teachers need as curriculum makers, which include having appropriate resources and "time to plan alone and with colleagues, to assimilate new content and pedagogy into their teaching repertoire" (p. 135). These requirements are particularly important for PSTs who are learning to become curriculum makers within their teacher-education programme, where planning opportunities are presented within course work and may be closely aligned with the work of teachers. These course experiences serve to *approximate* practices of real teachers:

> Although these activities are not entirely authentic in terms of their audience or execution, they can provide opportunities for students to experiment with new skills, roles, and ways of thinking with more support and feedback than actual practice in the field allows. (Grossman et al., 2009, p. 2077)

In our localised teacher-education context, lesson planning processes are a frequent and assumed aspect of our initial teacher education (ITE) programmes, in both course content and during the practicum. And by considering more closely the specific features of planning for future teaching, including selecting, preparing and adapting curriculum materials, novice teachers have further opportunities to consider content and pedagogy (McChesney, 2010).

Background to the study

The nine participants who volunteered for this study were preservice primary school teachers in their final year of a 3-year undergraduate degree, enrolled in an optional mathematics education course taught over a 5-week period. The first author was the course lecturer and researcher. For one assessment for the course, PSTs were required to

design a Mathematics Year Plan (MYPlan) for one "level" of *NZC*. This required PSTs to organise the mathematical content for all strands into units of about 3 weeks and then sequence these units over the 4 terms of the school year. They were also required to explain the key mathematics ideas for each unit, and justify the decisions they made concerning the organisation and placement of the units throughout the year. During some of the course workshops, time was spent by the PSTs collaboratively planning their MYPlans. These sessions simulated collaborative planning experiences that can be carried out by teachers in New Zealand schools. This meant that, within a relatively short period, PSTs experienced an iterative process of collaborative planning with peers, supported guidance from an experienced practitioner (the course lecturer), and independent planning and preparation, again approximating a typical planning process for New Zealand primary teachers.

The data for this article were drawn from two sets of focus-group interviews with PSTs, held midway and at the end of the course. Each set had two interviews, with different PSTs attending each interview according to their available time. The interviews were semistructured, audiotaped, and lasted about 40 minutes. The first set of interviews focused on the processes, issues, and questions that the PSTs engaged with during the time they completed their MYPlans. To assist this interview each PST was provided with their submitted, but not yet assessed, copy of their MYPlan assignment. This is similar to a stimulated recall design where plans were used to support interview conversations. The second set of interviews had two purposes; first to clarify and expand on data provided from the first interview, and secondly to focus on the PSTs' concerns and issues as they anticipated planning and teaching mathematics in their first year.

Once transcribed, the transcripts of each interview were returned to each participant for checking and feedback. The data were analysed using thematic analysis (Wilson, 2010), which primarily resulted in the identification of two themes—mathematics content knowledge, and curriculum knowledge (Shulman, 1986). In this article, we present a second layer of analysis relating to the theme of curriculum knowledge. This theme has been reanalysed in-depth, revealing three significant findings related to curriculum knowledge needed for planning in mathematics. We now report the three findings.

Navigating a curriculum landscape

Recognising curriculum signposts

The PSTs scrutinised *NZC* during the early stages of their planning, in particular the sections for Mathematics and Statistics for levels 1 to 4. They noticed the organisational structure of the mathematics and statistics content such as the strand headings of Geometry and Measurement, Number and Algebra, and Statistics, and the associated substrand headings. While both the strand and substrand headings provided initial information to help design their plans, the PSTs recognised there was more they needed to do to generate manageable teaching units. One PST described this process: "when you look at the curriculum it's just like, you see things written down there and they're all chunked into three strands, and then you actually take it from those three strands into twenty different units that you teach throughout the year." Other comments indicated a process of implicit decision making, for example, "you see all things written down and have to decide", and they needed "to sort everything and like, pick and change it". Their search for information led them to closely analyse the achievement objectives. They read these carefully, looking for clues about how to organise them into manageable chunks for teaching. The PSTs described these objectives as being "too broad", "too vague", and "lacking in detail", indicating they wanted more detailed information. Some achievement objectives appeared more complex than others. For example the "Measurement" objectives contain many significant measurement ideas of length, weight, capacity, time, and temperature. Initially the PSTs were unsure how to sort, choose, and transform these to design units of work for their MYPlans.

Within *NZC* objectives however, the PSTs did recognise mathematical terminology which flagged important messages about mathematical content. Unknown or unfamiliar terms were referred to as being "just a bunch of words" or "lingo", and examples included terms related to fractions, decimals, and algebra. One PST explained, "like algebra's just a word. I don't really know, I couldn't tell you what it is". They were candid about their uncertainties related to content knowledge, but recognised it as essential knowledge for planning for teaching mathematics. One PST who confessed to having difficulty understanding fractions explained that

"maths is sort of something that you can't bluff your way through, so you sort of have to need to know it". They looked to the curriculum for further information to develop their understanding of these terms but found nothing, prompting them to seek information from other sources. One PST revealed that when she did not know the content she was reluctant to find further information, saying, "when I don't understand the meaning of the actual words there is no point in looking at them". In this instance, the search for more information ceased and mathematical content remained at a superficial level.

The PSTs were also drawn to other *NZC* signposts that contained messages for them about teaching decisions. The inclusion of the verbs in the achievement objectives acted as signposts. One example related to teaching statistics where a PST focused on the "Conducting investigations" part of an objective, and then made sense of this by drawing out what this meant for teaching, "if they are designing and investigating ... then that's what they have to do". The verbs in the objectives acted as clues for revealing both the content for teaching, and how to organise more detailed learning purposes. Another signpost was the Venn diagrams (a graphic specific to the Mathematics and Statistics learning area), which they interpreted as containing messages about how to apportion the strands, and consequently the "units" of work within these strands, onto their MYPlans. Their response to these diagrams was to allocate a larger percentage of time to the Number and Algebra strands, with a lesser priority and emphasis given to the other strands. A process for doing this was explained by one PST: "you just go and find a big area where you can stick the number in quite comfortably ... and then you just shove all the rest in". While most were confident to do this, they wanted more explicit information from the curriculum about the intent of the diagrams; they looked to *NZC* for an explanation and found none.

The PSTs exploration of *NZC* was strongly linked to their experience. In the Number and Algebra strand, other terms noticed were "Knowledge and strategy". These terms were included in substrand headings and were deemed important, and recognised as originating from the two main sections of The Number Framework. Although these headings were recognised some were still uncertain about their meaning: "I still really

don't know the difference between the two". Uncertainty about these aspects led them to search for information to clarify these terms.

Responding to prompts for new searching

Having noticed and recognised several important signposts in the curriculum to inform their planning, the PSTs were keen to seek more information. For example one PST read the achievement objectives of *NZC* and said, "now it's quite brief ... and I had to refer to the old ones because I didn't quite understand it".

The sense of incomplete knowledge prompted extensive searches around a range of resources. They were drawn towards resources they deemed were important, and were familiar, such as the previous curriculum document *Mathematics in the New Zealand Curriculum* (Ministry of Education, 1992), the *Figure It Out* series, the NDP books, and the nzmaths website. All these resources, published by the New Zealand Ministry of Education, were considered to be of high status. These valued resources were selected in preference to other resources because they were trusted as authoritative and reliable sources of curriculum information.

The PSTs were seeking information about mathematical content meanings and for indicators of the expected scope of mathematical learning. They found what they needed in a variety of sources. Interestingly, the "old" mathematics curriculum document (Ministry of Education, 1992) was extensively used by all PSTs in the research group who described it as having more detail than *NZC* (Ministry of Education, 2007a), and having examples of content which helped to determine the meaning of *NZC* objectives. Specific sections in this document were the achievement objectives, the "suggested learning experiences" section which provided objective elaborations, and a glossary that provided useful definitions of mathematical terms. The Figure It Out series was also used extensively because it was readily available and appeared to align with the strand headings. They searched through both the student books and the teacher's guides for curriculum information, looking for mathematical terms that might help them to recognise the depth of expected content.

The NDP were also a valuable information source. To clarify the meaning of the terms "knowledge" and "strategy", PSTs read and analysed the Number Framework finding its detail particularly helpful and reassuring. One PST explained that when working with the Framework and related resources, "you get a sense of its importance ... you know, it's kind of vital for teaching". Numeracy project materials were variously described as, "all laid out", "telling us everything", "set in stone", "set in concrete" and, ultimately, being, "like a bible". They relied on these resources as a trusted source of curriculum information, with one stating, "If it's in the book, I have to teach it!" The Number Framework served as a supplementary document to the curriculum and was therefore a crucial planning resource.

In addition, the nzmaths website was used for their searches related to the strands of Geometry and Measurement, and Statistics. Finding their way around the website proved to be another complex journey. Considerable time was spent in workshops finding and exploring sections that could be useful for planning. Unit exemplars on the site were used to inform decisions about the organisation of objectives for inclusion in their units. However, they were frustrated to find that many of the units had not been updated to align with *NZC*. Finally, the PSTs consulted a variety of educational resources sourced from the university library, schools and the internet.

They did not trust these resources in the way they trusted resources authored by the New Zealand Ministry of Education, yet still included these in their final MYPlans. One PST described this lack of trust by stating that when planning with such resources he questioned whether he was, "doing it right". Interestingly, this was not an issue for him when using the NDP resources. In the first interview the PSTs unanimously requested a "geometry project" to provide them with detailed resources for the Geometry strand, in the way the NDP did for the Number and Algebra strand.

Looking back at their journey

The search for curriculum meanings unfolded for the PSTs in several stages. First they engaged in an active process of noticing and recognising curriculum features, which then prompted them to seek out further information. This information was typically found in resources external

to the curriculum. Once located, resources were critiqued for alignment with the content of *NZC* before being incorporated into the design of their plans. This was not a linear process. Instead, it involved a lot of "to-ing and fro-ing" within and between resources as they designed and redesigned their planning. PSTs preferred resources that were aligned to *NZC* because these had status and therefore engendered confidence and feelings of trust. Other resources were more precarious to work with because PSTs had to dig deeper to ascertain their suitability for use as a source of curriculum information. The searches provided the PSTs with opportunities to explore in-depth both *NZC* and mathematics resources, revealing the many layers of information that are implicit, yet hidden, in mathematics curriculum texts. This process was time consuming but necessary, because they wanted to make sense of the multiple varied resources available to teachers.

The planning task provided PSTs with an opportunity within their ITE programme to engage with a task that "real" teachers do. They were able to act autonomously to create their plans, while drawing on support and guidance from colleagues and lecturers. They authored their own plans, which helped them feel confident that they could replicate this in their first year of teaching. Their completed plan itself acted as a valuable scaffold and road map for mathematics teaching as explained by the following comments from PSTs: "I always feel more confident when I know where things are going—if it's just random I feel lost", and, "It is big process. And it's a plan ... this is where we're going ... otherwise you're just walking around blind". Having experienced a comprehensive planning process, they felt empowered to work alongside other teachers, rather than just merely being the recipients of other teachers' planning. One explained, "as a beginning teacher I can participate in the planning because I have done it myself. I can feel part of it going into a school, rather than sitting there and going, I have no idea how we are going to do this. Now I have some key knowledge."

When these PSTs looked towards their first year of teaching, they wanted to participate in planning experiences alongside more experienced colleagues, and importantly they now felt more confident about their possible contributions.

Conclusion

Our further analysis of the data has highlighted three main points. First, PSTs can, with support, be active participants in a process of curriculum-making. The social setting provided within the course mimicked many aspects of the social environment of school-based collaborative planning, such as opportunities for working with peers and more experienced teachers, in this case a teacher educator. The PSTs identified this as a valuable learning experience because they felt more prepared for their anticipated future involvement in shared planning. One PST encapsulates this sentiment: "I feel more confident taking a mathematics programme now that I have done a long-term plan. If we did it in all subjects, I'd feel a lot better about starting out as a teacher." We note the tension the PSTs face that is unique to this transition time; while seeking independence and looking forward to being more autonomous, they also want support from their future colleagues. Their transition to beginning teacher and their emerging independence is crucial (Winsløw et al., 2009), and this study shows that the road to independence is a collaborative one, and best paved with action shared with knowledgeable others. For PSTs, these kinds of experiences serve to approximate the independent and interdependent roles of teachers in the complex ecologies of primary schools.

Secondly, PSTs' sustained engagement with the official curriculum remains a complex task because there are several layers of information in the Mathematics and Statistics learning area of *NZC*. This requires the PSTs to engage in a process of "decoding" as a means of making sense of the "texts" of the curriculum materials. We contend that the PSTs are decoding when they first notice significant curriculum terms, such as the strand and substrand headings, the mathematics terminology within the achievement objectives, and the "text" of the Venn diagrams. All contain messages for teachers and can act as signposts, often prompting searches for further materials. Once found, PSTs selected possible resources, checked for alignment with *NZC*, and then incorporated into their planning, either unedited or with alterations. This complex curriculum-design task takes time for novice teachers. In the short term the PSTs needed time to plan, and in the future they will need time and opportunities to develop more comprehensive curriculum knowledge for longer term

learning. Unlike more experienced teachers who have the advantage of wisdom learnt from practice (Shulman, 1987), PSTs develop curriculum knowledge from a relatively weak base. Every prompt that led to a new search was the beginning of a new pathway. When these pathways became more familiar, searching became more efficient, and curriculum meanings more transparent.

Our third point is about the pivotal role of curriculum materials as resources for the PSTs. The process of curriculum making involved PSTs engaging in several search cycles that started with *NZC*, moved to other resources and returned to the curriculum. Resources provided PSTs with information that elaborated on Mathematics and Statistics achievement objectives, articulated key mathematics ideas related to these objectives, illustrated how this content might be taught, and suggested possible learning trajectories and sequences for teaching. There are a wide variety of mathematics curriculum materials. Consequently, finding and selecting resources will be time consuming. This is frustrating for PSTs who rely on limited curriculum experiences for matching resource content with curriculum content, sometimes being uncertain about the decisions they make. Although there is an expanding production of curriculum materials, with many available online, access to resources is only one aspect of localised curriculum design for PSTs. In this study, special status was assigned to resources from the Ministry of Education. *NZC* was accorded high status, possibly reflecting the part it plays in the "privileged repertoire" of ITE courses (Ensor, 2001). Similarly, the NDP resources were held in high regard, largely due to familiarity from their school practicum experiences. At times *The Number Framework* (Ministry of Education, 2007b) was used in preference to *NZC*, which supports a view that the NDP are used as a "de facto" curriculum" for teaching Number and Algebra (Walls, 2004). The group of PSTs felt secure using Ministry produced resources, providing them with a sense of certainty about their interpretations of the curriculum when planning. This illustrates a tension for PSTs between adopting "approved" curriculum resources and developing critical perspectives about the mathematical, cultural, and communicative qualities of mathematics materials.

Resources also played an important role in helping PSTs to develop their mathematics content knowledge (MCK). To use curriculum content effectively when planning, they wanted to understand and explain to themselves the mathematics in the achievement objectives. They used resources to clarify mathematical terms and important mathematical ideas embedded in these objectives. Again this was a cyclic process of starting with the curriculum, searching for terms and ideas in resources, and returning to *NZC* for consolidating their planning about what mathematics to teach and how to teach it. During this process mathematics was a focus at both a personal level and for planning and teaching. This is similar to some of the experiences of the novice secondary teachers of English in Grossman and Thompsons's study (2008). We also note that insecurities about mathematics content knowledge can be a roadblock for PSTs and as with any roadblock, there are choices about how to proceed. Some PSTs self-identified gaps in their maths knowledge and then chose to learn or relearn more mathematics either independently or with assistance from their peers and from other resources. For two PSTs at the early stages of planning, the roadblock of fragile mathematical content knowledge inhibited searches for more mathematics knowledge. One of these PSTs chose a further assessment topic to remedy one of the gaps in her knowledge, and the other relied on resource searches for further confidence in her mathematics. In summary, curriculum resources take on dual roles for PSTs; first as a scaffold for planning, and secondly as potential footholds for exploring mathematical content. In essence, deliberate engagement with resources can provide critical opportunities for preservice teacher professional learning about the many facets of the mathematics and statistics curriculum.

A return to navigating and noticing

Earlier in this article we referred to Mason's (2002) definitions of "noticing" as "being present and sensitive in the moment, having a reason to act and having a different act in mind" (p. 1), and "distinguishing some 'thing' from its surroundings" (p. 33). Our findings suggest that "noticing" is an essential feature of planning for mathematics teaching. By participating in the course experiences, PSTs showed they were "present and sensitive in the moment", and the prospect of their future

class of students became their "reason to act'. In addition, they were active agents, able to engage in a complex planning process, which involved them distinguishing and decoding several important resources within the curriculum and related materials, and then acting on or "re-sourcing" these artefacts. Importantly, noticing was a process of distinguishing "things" or features in the curriculum landscape. Mathematics concepts and terminology were landscape features that PSTs attended to in different ways, sometimes collecting, selecting and moving onto other features, or stopping to explore in more depth, often checking, decoding or revisiting mathematical content. We propose then, that the act of preparing for teaching mathematics in a primary school can be conceptualised as a distinctive process of "noticing" in which the novice teachers are authors of a prospective localised curriculum. Their experiences of traversing this landscape—to confront roadblocks, to seek out further resources, and to make links between the different domains of the landscape—indicated a significant professional transition. We also suggest this is the case for the landscapes of other curriculum subjects.

Novice teachers need access to a wide variety of credible resources, and require time for in-depth exploration, decoding, and adaptation. They benefit from guided participation in this process, first by teacher educators during ITE programmes and, then during their first years of teaching, by experienced teachers who expect the novice teachers to participate in and contribute to collaborative planning in localised school contexts. Here is the current paradox for ITE in New Zealand; expected by practitioners and external accrediting agencies to include more "practice" in ITE, course experiences of approximations of practice are increasingly difficult for teacher educators to sustain. When other perceived priorities command time in ITE programmes it tends to be curriculum experiences that are constrained, yet we contend that this diminishes opportunities for PSTs to gain expertise in mathematical content for teaching and in related curriculum design. At the time of writing this article, the course that provided the context for this study is not included in a new degree structure. Consequently, there will be no opportunity for PSTs to engage in substantial mathematics curriculum design. When contact with expert teacher educators is being cut back within ITE programmes, then this type of intensive, collaborative and guided planning activity is under threat.

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