

IDENTIFYING THE PROFESSIONAL KNOWLEDGE BASE FOR MULTI-GRADE TEACHING

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ABSTRACT

Most countries have made significant progress towards achieving the Millennium Development Goal of Universal Primary Education by setting up multi-grade schools in rural and remote areas. The new Sustainable Development Goal for education specifies Quality Education. This paper reports a small-scale qualitative study of teachers and teaching principals in multi-grade rural schools in Australia, focusing on identifying the professional knowledge base required for teachers in such contexts. Such a knowledge base is essential for improving the quality of multi-grade teaching. Interviews and observations revealed that multi-grade teachers need to develop the skills of learner grouping, organisation and routines, curriculum mapping, differentiating the curriculum, multi-level assessment, planning, and time management. Professional learning for multi-grade teachers will help them to implement increasingly effective methods for providing a quality education for the diverse range of learners in their classrooms.

Keywords: Multi-grade teaching, types of teacher knowledge, quality education, curriculum mapping, routines, groupings, differentiation, planning

INTRODUCTION

‘Multi-grade teaching’ describes the context where teachers have to teach, simultaneously in the same classroom, students in different grades. There are many different terms to describe classes that contain several grades (such as Grades 3, 4, 5 and 6), including multi-age, multi-grade, composite, combination, family, split-level, stage, multi-class and multi-year (Berry, 2010; Cornish, 2010; Juvane, 2005; Mulryan-Kyne, 2005; Little, 2001, cited in Ramrathan & Mzimela, 2016 p. 2). The type of class in this study is a multi-grade class.

Multi-grade classes exist in a number of countries for various reasons. Common reasons include a shortage of teachers and classrooms, low population density, or declining teacher–learner ratio (Little, 2005, pp. 4-5). Multi-grade classes are therefore formed by necessity (Cornish, 2010; Veenman, 1995). They are often found in rural areas or urban hinterlands where population is sparse and distances are too great for students to travel to an urban centre every day. Multi-grade teachers frequently teach the same class for several years.

Many countries have been working towards achieving the second Millennium Development Goal (MDG) of Education for All, or Universal Primary Education (<http://www.un.org/millenniumgoals>), by establishing multi-grade schools in rural and remote areas where communities are often small and poor. UNESCO (2015) regards multi-grade teaching as an important and appropriate way to help nations reach their internationally mandated Education For All targets. A school with multi-grade classes, in many instances, has only one or two classes in total — one for Grades 1 to 3 (foundation phase) and one for Grades 4 to 7 (intermediate and secondary/upper primary phases), and one of the teachers is also the principal. A teaching principal has a full teaching load as well as the principal role (du Plessis, 2014).

Many teachers and parents in these remote areas think multi-grade teaching is somehow “second class” — the last choice of poor systems and something to move away from as quickly as possible by building more classrooms and hiring more teachers, or closing small schools and forcing children to go long distances to larger ones (UNESCO, 2015, p. 2). Many of the multi-grade teachers in these countries are not confident about multi-grade teaching and do not feel well supported by training or resources (Hussain, 2006; Pridmore, 2006). We were interested to explore whether Australian multi-grade teachers feel more positive about multi-grade teaching and what they feel is necessary professional knowledge to be a successful multi-grade teacher. Our hope was that these teachers would be able to identify an essential professional knowledge base for multi-grade teaching. Such a knowledge base is important to identify because of the new global focus on Sustainable Development Goals (SDGs), with the fourth goal being Quality Education (<http://www.un.org/sustainabledevelopment/sustainable-development-goals>). Now multi-grade schools have been established worldwide, it is necessary to support multi-grade teachers so they can provide a quality education for their students.

This small-scale research project was carried out in rural multi-grade schools in the New England region of New South Wales, Australia. In this sparsely settled region, the majority of primary schools (62%) are multi-grade schools (School Education Director, pers. comm.). We ‘shadowed’ multi-grade teachers and interviewed them

about their experiences of multi-grade teaching. Loughran (2010, p. 38) holds the view that teaching is not just a matter of doing, it is about the doing informing the practice and how that doing is captured, reflected on, deconstructed and reconstructed in a genuine effort to learn from experience. In our research, we observed teachers' "doing" and used our observations as a basis to probe teacher reflections on their practice, in an attempt to identify what they have learned from their experience of teaching a multi-grade class. Our distillation of their responses forms our summary of the professional knowledge base they identified as essential to be an effective multi-grade teacher.

CONCEPTUAL FRAMEWORK

The framework that underpins this article is drawn from two main sources: Shulman's (1986, 1987) delineation of seven different types of knowledge demonstrated by effective teachers, and social-constructivist theory (Vygotsky, 1978). Vygotsky believed that social interactions stimulate learning and that we "construct" understanding and meaning through these social interactions in a cultural context. Because of the special circumstances of their class, multi-grade teachers need to implement social-constructivist principles. Their necessity to work some if not most of the time with sub-groups (different grades) in their class means they must rely on the other learners being able to learn from and with each other. Peers are important for both academic and social development and learning (Cornish, 2006).

In turn, in order to implement successful social-constructivist principles, a multi-grade teacher must be able to match learning needs and learning strategies to the learners in the class. In other words, the teacher must demonstrate Shulman's different types of knowledge: content knowledge, general pedagogical knowledge, curriculum knowledge, pedagogical content knowledge, knowledge of learners and their characteristics, knowledge of educational contexts, and knowledge of educational ends, purposes and values. Shulman's work has been highly influential and his ideas about teacher knowledge have been developed by many other educators, as discussed in the next section.

TEACHER KNOWLEDGE

Teaching is a highly complex activity that draws on many kinds of knowledge (Shulman, 1986, 1987). Calderhead (1991, p. 531) argues that an attempt to seek or to define teacher knowledge presumes that there is a specific knowledge base that underpins the practice of teaching and therefore by defining this knowledge, one is in a better position to prepare pre-service teachers for the teaching task. Buitink (2009, p. 126) holds the view that teacher knowledge is dynamic and encompasses rich and diverse components. Teacher competencies that have been identified include subject knowledge, teaching methodologies, knowledge of the curriculum, ability to manage classrooms, and assessment of learners (Jacobs, Vakalisa, & Gawe, 2011, p. 22). The multi-grade classroom is labour-intensive and requires more planning, collaboration, and professional development than the conventional graded classroom (Joubert, 2007; Juvane & Joubert, 2010; Little, 2001; Vithanapathirana, 2010). Teachers in multi-grade schools are confronted with significant challenges as they have to teach two or more age groups simultaneously and possibly more than one curriculum subject.

Grossman and Richert (1988, p. 54) define teacher knowledge as a body of professional knowledge that encompasses both knowledge of general pedagogical principles and skills and knowledge of the subject matter to be taught. This definition does not take into account the "practical knowledge" that is defined by the different contexts that teachers experience and that results from implementing these other types of knowledge. Loughran (2010, p. 41) reports Fenstermacher's description of teachers' practical knowledge as ways of knowing that are derived from their experiences of classroom teaching. The teacher knowledge they require is not qualitatively different from any other teacher's knowledge in these respects mentioned (subject and curriculum knowledge, methodologies, management, assessment) but the implementation of their knowledge is different because of their different context.

Borich (2000, p. 113) suggests that teachers possess a unique kind of knowledge and refers to that knowledge as "tacit knowledge" or "personal knowledge". It is often 'felt' rather than articulated and can therefore be difficult to extract from the minds of individuals. Borich adds that such tacit knowledge comes from experience and not through reading (although reading can influence tacit knowledge). He further adds that through everyday experiences, such as observation, experience in schools, lesson planning, and teaching, one compiles tacit knowledge that can guide one's actions as effectively as knowledge from texts and formal instruction.

The above discussion shows that most writers believe that teacher knowledge is dynamic and will vary according to different teaching contexts. In this paper we adopt the definition of teacher knowledge as advocated by Grimmer and MacKinnon (1992, p. 438, cited in Loughran, 2010, p. 45), namely, teacher knowledge is craft knowledge based on principles that teachers conceptualise in making tacit knowledge more explicit. Our aim in

this study was to identify a professional knowledge base specific to the multi-grade teaching context by asking teachers to articulate their tacit knowledge.

METHODOLOGY

A simple case study method was used with multiple sites (Bishop, 2010). Data were gathered from both observation and interview. Teacher perceptions were identified through interview, and researcher perceptions through classroom observations and discussion. The interviews were carried out after the observation, to enable exploration and discussion of aspects observed during the teaching. A total of 9 teachers participated (7 Teaching Principals and 2 teachers).

The process of ‘shadowing’ teachers (Ts) or teaching principals (TPs), observing then discussing all the aspects of their daily work, allows a focus on aspects of the teacher’s work that might not otherwise be identified at interview. ‘Shadowing’ is an emerging methodology “developed in response to gaps in the literature and research responses” (Noone & Graham, 2015). It helps to uncover aspects of teachers’ tacit knowledge (Polanyi, 2002 [1958]) and “knowledge-in-action” (Schön, 1983) by allowing a researcher to “observe intimately the everyday life of the insiders” (Baker, 2006, p. 174).

A semi-structured format was used for interviews with the teachers, with additional questions in each interview related to specific aspects of the observations. Questions were designed to explore teacher perceptions of the challenges of multi-grade teaching, what the teachers liked and didn’t like about multi-grade teaching, the teaching and management strategies they used, their access to resources, their preparation for multi-grade teaching and the availability of support. Both the interview transcripts and the notes made during observations were analysed for themes and key words. Checking of the transcripts and of our interpretations of our observations helped to ensure trustworthiness of the data and give confidence in the credibility of the results (Lincoln & Guba, 1985).

ETHICAL ISSUES

Participants were informed that their participation in the research was voluntary and that they could withdraw from the study at any time. Furthermore, participants were informed that audio recording of the interview was done to ensure accurate recall of the information provided. Participants were also informed that they would not be identified by name in any publication of the results. As a result, all names have been replaced by pseudonyms. Written consent was obtained from all participants, as required by the State Education Research Application Process (SERAP). In addition, the university where the researchers were conducting their research granted ethical clearance for the study.

FINDINGS AND DISCUSSION

In this paper, we report the findings in terms of teachers’ knowledge related to their classroom practice and the ways in which they coped with the challenge of teaching children in different grades with greatly varied learning needs. The participating teachers were experienced primary-school teachers but their experience of *multi-grade* teaching varied from a few years to more than 30 years. Differences in their approach to teaching a multi-grade class varied because of the individual context of their school, such as the number of children in each grade, as well as their experience and personal beliefs about teaching and learning. One teacher succinctly summarised a common underlying aspect of all the teachers’ approaches: *the main thing that is needed is a learning culture [Kate, TP6]*.

In this paper we concentrate on seven common aspects of this learning culture that we identified as distinct parts of the teachers’ professional knowledge base: learner grouping, organisation and routines, curriculum mapping, differentiating the curriculum, multi-level assessment, planning, and time management. All teachers in this study used these strategies in some way, and many identified strong links between the strategies. For example, relevant group learning might mean identifying similarities in the curriculum of the different grades (curriculum mapping) so students in different grades can work together on a common activity (learner grouping). Although the activity is common, the teacher’s assessment of it might be different, with different expectations for different students (multi-level assessment). Alternatively, different groups might work on different activities (differentiating the curriculum), such as ability groups in mathematics. For successful learning in groups, children need to be trained in particular routines and need to learn to become independent and self-directed learners. When routines are established, classroom organisation is more efficient and time pressures are reduced. Implementing all these strategies requires careful planning, and planning was seen by all teachers as the ‘glue’ that holds the other strategies together.

LEARNER GROUPING

“Frequent and flexible grouping” is identified in the literature (Cornish, 2006; Hoffman, 2002) as an essential aspect of successful mixed-grade teaching. All the teachers were flexible in their use of groups, using individual (group of 1), pairs (group of 2), grade group (all the children in a particular grade), cross-grade group (older children working with younger children), ability group (within-grade or cross-grade), and whole-class group. As Kate expressed it: *I had to quickly work out, one shoe can't fit every child, so I had to get group work happening [Kate, TP6].*

Genuine cooperative or collaborative learning occurs when learners are grouped together and given a common learning goal to be demonstrated by a group product. This type of learning with and from others has a strong record as a way of encouraging learning (Jacobs et al., 2011; Johnson & Johnson, 1994; Marzano, Pickering, & Pollock, 2001). Teachers in these multi-grade contexts recognised that the purpose of the learning should determine the structure of the grouping (Cornish, 2006, p. 34) and they therefore selected different types of grouping for different purposes, including both management and learning purposes: *I use a lot of group work in terms of the way in which I operate the classroom. [I use] grade groups, but also ability groups depending on where the children are sitting on the learning continuum [Adrian, TP1].* If, for example, the aim is to consolidate a particular skill in mathematics, then ability grouping will be suitable while whole-class grouping helps with classroom management and time pressure. Individual and small groups help children take more responsibility for their own learning, encouraging them to become independent learners: *it's about independent learning, getting the kids, from Kinder really, so that they can do work independently [Diana, TP5].*

All the teachers used whole-class grouping where possible, and some used it for the majority of the day. Lily described how her teaching strategy had evolved over 11 years of teaching K–2 multi-grade, from teaching children separately in grade groups to teaching them all together: *I have an approach where I provide the same activity. My expectation is what changes, that to me over the time I've been here has had the most success [Lily, T1].* Nelson concurred: *You just teach a group of children and like any group of children you look at the diversity within that group, be that diversity cultural or age, learning difficulties, gifted and talented, all the components that make up a classroom and then you look at that diversity and you teach that way ... with different expectations [Nelson, TP7].*

A common approach was to have a joint introduction and conclusion to a lesson, while in-between children sometimes worked on the same activity and sometimes on different activities: *I tend to start with the whole group with me on the floor ... [After the introduction, some groups move off to do their activities.] I tend to keep one group with me on the floor at a time. ... New concept for them, they stay with me on the floor [Lily, T1].*

Teachers mentioned a range of subjects as appropriate for whole-class teaching:

I use whole-class grouping for a lot of our creative activities in terms of arts and science. ... parts of our English I do together as a whole group especially for looking at language conventions or grammar and punctuation-type activities and certainly writing as well [Adrian, TP1].

You can teach them [literacy] as a whole class so the strategies are the same, so you've got predicting, you've got monitoring, you've got summarising ... with our maths, we do a short sharp focus at the beginning of our maths lessons and that's basically to the whole class, and that's to reinforce whole-number combinations [Annabelle, TP4].

For the other Key Learning Areas [apart from Maths], it's whole class [Barry, TP2].

ORGANISATION AND ROUTINES

Putting students into groups for learning activities needs a lot of organisation and planning and works much more successfully when the students are taught routines for moving around the room, gathering resources, working together, helping each other, and tidying up. All teachers emphasised the necessity of children in a multi-grade class learning to be responsible and independent so that (1) they were not completely reliant on the teacher, and (2) they did not spend time waiting for the teacher but were able to use every minute of the day learning.

Routines were thus seen as essential and time spent training children to learn particular routines was seen as time regained later. Kate described how she used a ‘visual map’ to show students what they had to do now and what they needed to do after they had completed their first activity. A circle divided into quadrants was used and each student's name was placed in one quadrant. All students in that quadrant then worked on the same activity: *They had name tags so the kids needed to learn to read their names, so their names went into this quadrant thing like a circle: “you are doing this, this group is doing that, you're doing that, and you're doing that”. When you've finished it had something coming off each one which showed them where to go. So, once we got that into our*

head that we don't just sit there twiddling our thumbs, playing up, it's smooth sailing, but that all comes down to experience, classroom management, rules, routines [Kate, TP6].

Lily described the way older students helped the younger students to learn the routines, including those related to behaviour: *we quite often just sit back as the educators and watch Kindergarten and Year 1 and Year 2 show new people what to do [Lily, T1].*

CURRICULUM MAPPING

For students to be grouped for learning, including whole-class grouping, teachers must find topics with enough similarities that they can be taught to the whole class together. Teachers therefore need to engage in curriculum mapping to discover broad areas of similarity or topics that are reintroduced and extended via the spiral curriculum during the years of primary schooling: *I would have the same unit — if we were doing angles, we all did angles that week. The only way I could humanly possibly teach properly, to get my head around it, was to have a theme for the week and we stuck with it [Barry, TP2]; Just about everything that I do across all KLAs we would have the same theme or be studying the same topic [Diana, TP5]; if I'm doing a maths concept I can actually bring it down — you may not have seen that today but I can bring it down to Kinder level and extend it higher ... You only saw a snapshot but we do that quite a lot so I think that is an experience thing, to be able to teach across the levels [Sheree, TP3].*

Identifying topics that can be taught concurrently to different grades requires knowledge of the curriculum of all the grades. The process is not always easy or straightforward: *I couldn't do it, I couldn't get it into my head: "How am I going to achieve those outcomes and be sure that I'm preparing for the next part of the curriculum?" [Kate, TP6].*

With experience, however, a teacher learns to recognise similarities in the concepts being taught and is able to plan meaningful learning activities that can be easily managed: *I am able to then program so that we are doing the same concepts each day and then the next week we're changing it to get through the curriculum. That allows me to make sure I'm meeting the needs of the students plus the curriculum has been taught. ... Maths we do have to have the three different activities. They are all linked. So, I'll teach subtraction on the same day but you have your three different activities [Lily, T1].*

An advantage in multi-grade classrooms where students are taught together is the opportunities provided for consolidation and revision: *I do a lot of revision so I have them all together for that revision ... if you've got some very bright kids, you are really extending those because they are exposed to those concepts at a higher order but ... the kids that are up in another grade that might need revision, you're revising with the Kinders and they'll pick that up as well. So you kind of layer it [Sheree, TP3].* With a whole-class introduction to a lesson when a new topic or concept is being introduced to the younger students, older students get the review they need before the teacher goes on to extend their learning: *I think [repetition] is a wonderful advantage [of multi-grade]. We don't get bogged down in that scope and sequence all the time. Obviously there are things that we have to move on to, but ... we can revisit a lot of our work very, very regularly [Adrian, TP1].*

Another advantage in a multi-grade class is that the younger students overhear some lessons given to the older students. So when it is their turn to learn that content, they have already had an introduction to the topic: *They've got one ear on everything that's happening and so they are way ahead of you when you go to teach something new and they go, "no, I know that". So you can actually move your little learning line along and not be locked into the year [grade] thing, you can teach exactly where they are up to [Kate, TP6].*

Curriculum mapping and group learning also provide opportunities for peer tutoring, which is beneficial both to the explainer and the person receiving the explanation (Topping, 2005): *if you can teach somebody else or help them out you obviously understand what you've been asked to do [Diana, TP5].* Much peer tutoring happens informally, as children are working together, but it can also be deliberately arranged: *I formally prepared — I made sure all the materials were appropriate and wouldn't bring about any frustrations [Nelson, TP7].*

DIFFERENTIATING THE CURRICULUM

When any class of students is learning together but particularly in a multi-grade class, there are times when a teacher needs to plan different activities for different groups of students. Curriculum differentiation refers to the mediation of the curriculum at an instructional, content and material level to accommodate learner diversity (Department of Education, 2002). Different students have different learning needs that cannot be ignored in a class where the ages range up to a seven-year difference and sometimes more.

Teachers who practise differentiation “accept and act on the premise that they must be ready to engage students in instruction through different approaches to learning, by appealing to a range of interests, and by using varied rates of instruction along with varied degrees of complexity and differing support systems” (Tomlinson, 2014, p. 2): *you individualise the programs so you differentiate the curriculum and you also are doing learning adjustments [Annabelle, TP4]; Of course we still had our year groups but at the same time, when you approach your teaching, you individualise the teaching. Forget about what year they’re in, you individualise for each child [Barry, TP2]; I write notes every night so the questions that I’ll often target to certain students that I know didn’t do that yesterday, or need to do it so I am always targeting the students because I’m well aware of what they know and what they don’t know [Sheree, TP3].*

While cooperative learning can be difficult to implement in a very small class because of a lack of critical mass, curriculum differentiation can be easy to implement either through advance planning or ‘on the spot’ reacting: *When you’ve only got a small group of kids, it’s so easy to be able to achieve that because you are walking around and you’re hearing a discussion and you’re seeing them struggle or you’re seeing them look [puzzled]. You can ask, “what do you need?” [Kate, TP6].*

The teachers in this study felt that advance planning of different activities is necessary in a sequential subject such as mathematics in order to give students activities relevant to their current level of learning. These teachers therefore differentiated the mathematics curriculum by planning, for each maths lesson, three maths activities at different levels of difficulty. Different activities are also relevant for curriculum differentiation in a non-sequential subject such as social science. In this case, the activities might not be at different levels of difficulty but rather they might allow students to demonstrate their learning in different ways: *So that was easy in [social science] because we followed that time-honoured “who, what, when, where” ... And that gave them something to hang it on and then I could, you know, set up a mock discussion or I could put props out and I could have a little play act [Kate, TP6].*

MULTI-LEVEL ASSESSMENT

As indicated above, these multi-grade teachers often taught the whole class together but had different expectations for each student. In other words, they engaged in multi-level assessment of the learning activity, against the syllabus outcomes for the different grades: *there was a separation there so we could see how they were measuring up to the so-called grade [Nelson, TP7].* At the planning stage, a multi-grade teacher maps the relevant grade outcomes to the learning activity. After the activity, students are then assessed against the different outcomes.

Lily described how she began every lesson with the students together on the floor. When students felt confident to complete whatever activity had been planned for them, they moved to their desks while Lily stayed on the floor to provide further help to those who felt they needed it. This “peel off” strategy (Carleton, 2006) is another successful routine in multi-grade classes. At the same time as helping the classroom operate efficiently, it allows a teacher to assess the learning needs of the students. If a number of different activities have been prepared, a teacher observes the one that particular students feel confident to attempt. This type of assessment is an assessment of learning needs rather than an assessment of learning *per se*. It is also an example of self-assessment, of involving students in taking responsibility for their own learning, a trait that Kate [TP6] stressed was “vital”.

When students from several grades complete a common activity they need to be assessed against the outcomes relevant to their stage of learning. Lily described above how with this approach her expectations change for each student. The strategy has been described as “same group, different outcomes” (Ball, 2000) and differs from the strategy of dividing students into different groups to do different activities, as in maths. Both strategies, however, require multi-level assessment. In the first case, the activity is common and assessment occurs against the relevant grade outcomes: *For instance when we are doing a piece of writing related to a book, the Year 4 students might be expected to focus more on character and plot and using more descriptive words than the students in Year 1 who are being asked to do a recount [Diana, TP5].* In the second case of “different groups, different activities”, students are also assessed against different outcomes. By contrast, multi-level assessment can be implemented by assessing students according to their level of achievement of the outcome (e.g., emerging, developing, achieved).

PLANNING

Planning was emphasised by all teachers as essential, time-consuming and more important than the actual teaching: *Lots of time [planning]. ... You get that right and kids are learning [Barry, TP2].* Teachers’ planning involved planning for relevant learning experiences but also for effective classroom organisation: *So with your*

teaching, at the beginning of the year you spend a lot of time setting up your organisation in your classroom, and if you can do that, I think that makes your day flow a lot better. So your planning and your organisation are important [Annabelle, TP4].

The study also showed that multi-grade teachers plan in advance to ensure that teaching and learning are not interrupted. Without planning, a teacher will not complete the lessons and cover the required curriculum: *You've got to work out what's doable for you [Diana, TP5].* Teachers also plan their lessons to ensure that learners are engaged and that the learning activities are relevant to their stage of learning: *If you don't understand how that curriculum unpacks, you can't guide them in their progress [Kate, TP6].* Jennifer describes her multi-level planning: *[When] I teach a topic, ... I say, Year 3 is core, Year 4 is when they advance to that, and then there's the extension on top of that. So, we'll often have the Year 6 [work] photocopied for Year 5 if they're able to achieve that [Jennifer, T2].*

It was noted during our observations that the teachers have lists of things to be done every day for different grades and they are placed where all learners can see them. Learners take responsibility for their own learning and will only consult the teacher if they are not sure about something. When a teacher has to divide his or her time between the different grades, students need to know what the teacher has planned and not spend time waiting for directions about what to do. Learners will do the first task and then proceed to another task. We observed that teachers have daily activities on the wall so that learners can know what needs to be done next. Kate's 'quadrant' strategy was described above. She explained why she feels it is important for the students to know how to proceed without her: *I had to carefully structure it so the activities were known to them and they were easily able to progress. They knew there was a start and a finish and then they could go on. Otherwise, they'd go over to the play corner and get the dolls out and do whatever and not actually have that idea of finishing anything and, you know, putting it back in its right place, all that sort of training [Kate, TP6].*

All teachers described the importance of planning and teaching routines in order to train learners to become independent and take responsibility for their own learning. Planning routines is important, as is teaching them to the children. The training begins in Kindergarten, and is then reinforced every year after that: *if I can provide the support and build that independence in kindergarten, by the time they are in Year 1, my next kindies then have my time devoted to them [Lily, T1]; usually if you have the same students, by the end of three years they're working really, really well on their own [Sheree, TP3].*

Curriculum mapping across the whole school allows many topics to be taught to the whole class rather than separately to the different grades. With many topics it does not matter in which order they are studied. Many topics in social studies or science, for example, can be arranged in a three-year cycle for a class with three grades. The curriculum rotates so that by the time a student leaves the class, s/he has studied all the topics: *[I had a] 4-year scope and sequence. Because you've got content you need to cover in Science and [Social Studies], I would teach those as a whole class and over the four years, the kids were exposed to every single thing that they needed to be exposed to and they were taught [Barry, TP2].* This strategy of curriculum rotation needs to be carefully planned across the whole school but the rewards are reaped when a teacher only has to prepare one lot of resources and teach one topic to the whole class.

The teachers recognised the role that experience plays in planning for a multi-grade class: *Once you become aware of how it can be done, I think that becomes easier and the more practice that you do at it, you become better at it [Adrian, TP1]; A lot on planning, a lot on planning but the longer you taught, the less time [it took]. Experience was a great help [Nelson, TP7].*

Another aspect of planning mentioned by the teachers was the use of parents to help with their children's learning: *Parents need to be able to take over the reins as well and be a partner in education and coach their kids or give their kids a little bit more direction and just a little bit of support [Kate, TP6].* Parental input was also valued because of its effects on improving relationships: *We encourage parental involvement so that that positive relationship is always there [Lily, T1].* When teachers are supported by parents, that will make them feel closer to the parents and thus enhance their relationship. Partnerships between schools and parents will ensure that parents know that the school appreciates and values their talents and their contribution to the school.

There are many reasons why multi-grade teachers should be recognised for the job they do and supported with resources to help them reduce the enormous amount of time they need to spend planning: *People who have resources, have experience, they're not readily available to you [in an isolated context]. ... You can't teach well if you've spent all night programming. It's impossible [Kate, TP6].* Differentiated lessons would be helpful for any teacher. Kate [TP6] commented that she taught her single-grade classes the same way that she taught her

multi-grade classes, while Jennifer expressed a common sentiment: *I'd probably add there that every class is multi-stage anyway [in terms of students' learning needs] [Jennifer, T2].* If Education Departments are looking to improve schooling and provide quality education, perhaps they should start by looking at the professional knowledge base of multi-grade teachers: *You know, when you work in a small school and a multi-grade class, you have to know how to teach [Barry, TP2].*

TIME MANAGEMENT

With multiple grades to teach and multiple syllabus documents to implement, time management will also be an issue for multi-grade teachers. This simple fact explains why the teachers try to teach the whole class as much as possible while planning for multi-level assessment and differentiated outcomes. Routines were recognised as essential for translating the planning into classroom practice: *I would put them all together, "this is what we are doing today" and try and build on those routines. ... Very structured, very structured and when they'd finished they knew where they were going next [Kate, TP6].*

Annabelle [TP4] emphasised that time spent at the beginning of the year is repaid later, thus helping with time management: *in the first two weeks you will plan a whole lot of things but you'll keep going back over things so you won't get as much done but you're better off to spend that time doing that, at the beginning of the year.*

In spite of careful planning, teachers recognised that time management remains an issue:

Getting around to every student is a challenge. ... We can become a little bit time deficient because we keep moving on to cover those key learning concepts and outcomes ... and because you've got that extensive range in the classroom then maybe each student doesn't quite get that time that they possibly should get with you ... that's probably more of a teacher time management problem than anything else [Adrian, TP1].

We can't do everything in the time [Kate, TP6].

Jennifer described her routine for handling some of these time management issues: *We have children that are age Year 6 but working at a Year 3 level and we say, "alright, all of you start here [on the floor], stand up when you know what's happening" and they can move back, like a line. I have a big focus on our work on the floor. So, I say to the kids ... "if you don't feel confident, sit on the floor with me and we'll work through it. When you go to your desk, that's telling me that you feel confident enough to work at this independently" [Jennifer, T2].*

CONCLUSION

In their lessons, the teachers in this study demonstrated the importance of a social-constructivist learning environment and Shulman's different types of teacher knowledge. Their curriculum knowledge, content knowledge, knowledge of learners, knowledge of educational context, knowledge of educational ends, pedagogical knowledge and pedagogical content knowledge were all evident in their differentiated lessons, their positive relationships with their students, and their classroom routines. In our discussions after the lesson observations, the teachers were able to articulate aspects of their experience and practice that allowed us to identify seven inter-related aspects of the professional knowledge base required for successful multi-grade teaching: grouping students for learning, organisation and routines, curriculum mapping, differentiating the curriculum, multi-level assessment, planning, and time management.

A resource for multi-grade teachers published over fifteen years ago (Vincent, 1999) identified six aspects of successful multi-grade teaching: (1) classroom organisation (of instructional resources and the physical environment); (2) classroom management and discipline (having clear expectations and classroom routines); (3) instructional organisation, curriculum, and evaluation (matching instruction to the needs of students); (4) instructional delivery and grouping; (5) self-directed learning (developing independent learners); and (6) planning and using peer tutoring. The multi-grade teachers in our study confirmed the importance of these aspects of a professional knowledge base for successful multi-grade teaching. Effective time management, an extra aspect identified in our study, underlies the six points listed above. In addition, our teachers gave more emphasis to the importance of planning and were more specific about multi-level assessment.

The conclusion of one teacher quoted above, that the provision of quality education relies on looking at the professional knowledge base of multi-grade teachers, is advice that cannot be ignored in the desire to improve the quality of teaching throughout the world in pursuit of the Sustainable Development Goal of Quality Education.

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