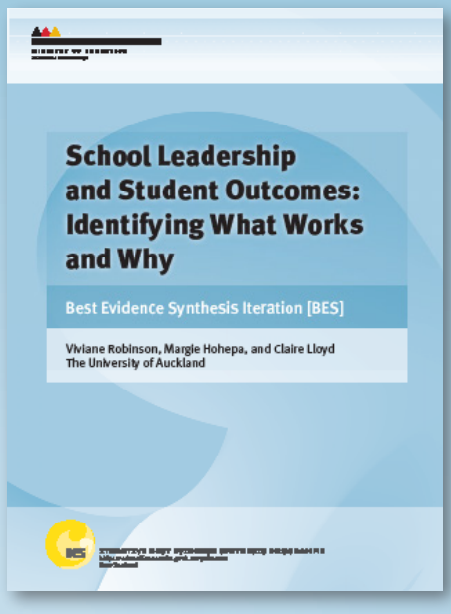
Use pedagogical leadership to enable more equitable and effective teaching for all learners

This is one of a series of cases that illustrate the findings of the best evidence syntheses (BESs). Each is designed to support the professional learning of educators, leaders and policy makers.



BES cases: Insight into what works

The best evidence syntheses (BESs) bring together research evidence about 'what works' for diverse (all) learners in education. Recent BESs each include a number of cases that describe actual examples of professional practice and then analyse the findings. These cases support educators to grasp the big ideas behind effective practice at the same time as they provide vivid insight into their application.

Building as they do on the work of researchers and educators, the cases are trustworthy resources for professional learning.

Using the BES cases

The BES cases overview provides a brief introduction to each of the cases. It is designed to help you quickly decide which case or cases could be helpful in terms of your particular improvement priorities.

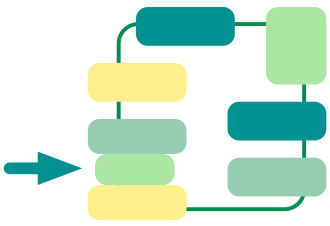
Use the cases with colleagues as catalysts for reflecting on your own professional practice and as starting points for delving into other sources of information, including related sections of the BESs. To request copies of the source studies, use the Research Behind the BES link on the BES website.

The conditions for effective professional learning are described in the Teacher Professional Learning and development BES and condensed into the ten principles found in the associated International Academy of Education summary (Timperley, 2008).

Note that, for the purpose of this series, the cases have been re-titled to more accurately signal their potential usefulness.

Responsiveness to diverse (all) learners

Use the BES cases and the appropriate curriculum documents to design a response that will improve student outcomes



The different BESs consistently find that any educational improvement initiative needs to be responsive to the diverse learners in the specific context. Use the inquiry and knowledge-building cycle tool to design a collaborative approach to improvement that is genuinely responsive to your learners

Use pedagogical leadership to enable more equitable and effective teaching for all learners

Teaching approaches influence student identity and social outcomes as well as academic outcomes. Research shows fixed-ability grouping or streaming can have negative outcomes on all three types of outcome, especially for underachievers.

In this case, a primary principal encourages his teachers to review their beliefs about mixed-ability grouping by giving them the experience of working on a mathematical problem with a heterogeneous group of colleagues. Although the context for the case is primary mathematics, it has relevance across all levels and areas of the curriculum.

The case highlights the importance of leaders' knowledge of teaching and learning and provides a number of useful thinking tools and processes.

See also BES Exemplar 1: *Developing communities of mathematical inquiry*.

3 A principal uses pedagogical knowledge to lead teacher learning for student success

Introduction

- What do school leaders need to know in order to support teachers in improving student outcomes?
- How are the management decisions that leaders make on matters such as student grouping, timetabling, and assessment influenced by their knowledge of the discipline concerned and how to teach it effectively?

In this case, we explore the experiences of a primary school principal, Mr Nash, who used his knowledge of mathematics teaching and learning to transform a management issue (student grouping) into an opportunity for teacher professional learning. While it is about a primary principal, we believe the case has relevance for any curriculum leader, primary or secondary.

Nash believed the introduction of a new mathematics curriculum provided an excellent opportunity to critically examine the current policy of separating students into maths ability groups.
The principal had clear, and largely sceptical, views about ability grouping. Initially, he didn't share these views with his teachers because he wanted them to consider the issue for themselves. He designed two activities that would help his staff to explore their ideas about grouping and connect these ideas to their own practice:

Activity 1: A discussion, led by himself, of an article describing the implications of heterogeneous grouping for the teaching and learning of mathematics.

Activity 2: A group task in which the staff explored a mathematics word problem that he had designed.

Research context

Nash was one of five principals involved in a study of how school management practices such as student grouping are influenced by changes in leaders' knowledge of subjects and how to teach them. All five were leading schools that were involved in a national initiative to improve the teaching of mathematics. As part of this initiative, principals participated in a series of workshops. This case concerns just one of the five principals and focuses on how his pedagogical leadership was shaped by his knowledge of mathematics and mathematics teaching.

Nash's school was a small, high-decile primary school. At the time of the study, he had been principal for five years. His own early experience of learning mathematics had largely involved mastering the basic facts and procedures for calculation, with a reliance on memorisation.
After "getting stumped" by Algebra II, he didn't pursue tertiary mathematics any further. But his knowledge of mathematics did advance to the conceptual level—the point at which he was able to make sense of mathematical ideas and processes—when he first began teaching. He noted:

> *When I first started teaching at the [primary] level, and had to teach mathematics for the first time … I really became interested in it and excited about it … I was seeing the patterns and making connections, and thinking about how a system of knowledge … is put together and how different people put that together.*

Nash's knowledge of elementary mathematics and his ideas about how children constructed mathematical knowledge shaped many aspects of his pedagogical leadership. Added to this, he had a commitment to equity in education and an awareness of how educational practices can advantage some students and disadvantage others.

Leadership dimension 4

Knowledge, skills and dispositions—leadership content knowledge

In Chapter 8, we defined leadership content knowledge as that knowledge of teaching and learning that shapes management practices. The leadership content knowledge that shaped Nash's approach to student grouping included:

- knowledge of the discipline of mathematics;
- knowledge of how to promote teacher learning about the teaching of mathematics;
- knowledge of diverse learners and how diversity can promote learning in mathematics classes.

This knowledge enabled Nash to help his teachers better understand the issues around heterogeneous grouping in mathematics. When leaders are actively involved with their teachers in both formal and informal professional learning, there is evidence of greater impacts on student outcomes. This leadership dimension had the greatest impact of all the dimensions identified in this BES.

Nash's active involvement included:

- leading staff discussions about teaching and learning;
- being an accessible and knowledgeable source of advice on teaching.

Below, we discuss the two activities Nash used to lead the professional learning of his staff.

Activity 1: Discussion

Nash's goal was to provide his staff with concrete examples of maths teaching that was effective with diverse learners. In a staff meeting, he used an article in which a teacher described two examples of mixed-ability grouping in her grade 5 (year 5) maths class:

> *[The teacher, Mrs] Riddle was concerned that the most competent children in her mixed ability math class found it 'too easy' and were missing some of the intellectual richness that mathematics had to offer. She tells the story of the developing partnership between two children in her fifth-grade mathematics class who she had paired together to solve a complex math problem: Nate a 'math star' who could solve maths problems quickly and Brian who struggled in math, but was a strong visual learner. Working together, the students were able to combine Nate's flexible sense of how to work with numbers with Brian's concrete and visual sense of what the problem actually meant. As Nate slowed down and tried to understand what Brian was doing, he discovered conceptual depths to the mathematics that he had not considered before.*

To guide the teachers' reading of the article, Nash gave them a series of questions. These were designed to encourage them to explore and develop their own ideas and to give him insight into their thinking. The questions reflected Nash's own knowledge about effective teaching for diverse learners and his beliefs about student grouping.

The questions	How the questions worked
What are Riddle's underlying assumptions—that appear either explicitly or implicitly in her text—about why 'stars' and 'less able' students are best served by working with each other rather than separately? Which of the experiences Riddle reports appear to confirm her assumptions?	Drew attention to the assumptions underlying the idea that it is good for students of mixed abilities to work together.
According to Riddle, what mathematical skills are often not evident in maths 'stars'? What are the competencies she appears most interested in developing in her students?	Introduced the idea that the criteria teachers use to identify students who excel at maths might mask what these students do and do not know.
How would you characterise the teaching practices that Riddle promotes for heterogeneous maths classrooms? What knowledge and know-how are essential for someone to teach the way that Riddle teaches?	Highlighted the idea that teachers require specific skills and knowledge to teach heterogeneous classes well.

Leadership dimension 4

In the staff meeting, each teacher wrote individual responses to the questions and then shared their thoughts with the rest of the group. They identified Riddle as a teacher who was highly reflective, knew her students' abilities, built upon their strengths, and was able to deepen their conceptual understanding. The teachers wanted to know how Nate became stimulated by Brian's thinking and how to address the different pace at which students worked. The teachers also questioned the extent to which student achievement gains were a product of thoughtful teaching or ability grouping.

The teachers' responses to the article suggest that it had clearly worked in the ways that Nash intended: it gave them the opportunity to discuss important ideas about heterogeneous grouping for mathematics and to consider its pedagogical implications. In the next section, we explore how the principal's pedagogical content knowledge enabled him to lead this learning opportunity for his teachers.

Leadership knowledge, skills, and dispositions

Principal knowledge and skills to promote teacher learning

Knowledge of the discipline

Nash knew that mathematical problem solving is multi-dimensional, requiring the use of a variety of cognitive processes and skills: conceptual understandings, concrete and numerical representations, calculation procedures, etc. This knowledge enabled him to select an article that contained important ideas about teaching mixed-ability classes—and put them across in ways that teachers would find accessible and transferable to their own practice. The article:

- highlighted some of the advantages of mixed-ability groupings by illustrating how students with different strengths can learn from each other;
- provided a window into how teachers' orientation toward mathematics, attention to students' mathematical thinking, and creative approaches support the learning of diverse students.

Nash also drew on his knowledge of the discipline to develop questions that would focus attention on the diverse skills that students bring to maths problems.

Knowledge of how to promote teacher learning

The principal knew that ideas about mathematics and mathematics teaching are embedded in practice. For this reason, he used a story that provided rich images of teaching practice to highlight the ideas he wanted his teachers to explore. The story:

- provided a model of 'good practice';
- made explicit a teacher's decision-making process as it related to the issue of student grouping;
- provided a concrete description of two students with different approaches working together to solve a maths problem.

Nash used the ideas in the story and the set of questions as a basis for discussion at a staff meeting. He also gave teachers the opportunity to think about the grouping issue prior to the meeting. He ensured that the discussion focused on the teaching and learning implications of grouping rather than on the policy itself.

His approach to structuring this staff meeting was open-ended and adaptable. This enabled teachers to develop their own thinking and make links to their own classroom practice. He also knew enough about the relationships between different kinds of mathematical thinking to build upon the ideas the story raised and to facilitate in-depth discussion.

Knowledge of diverse learners and how diversity promotes learning outcomes

The principal believed that ability grouping restricts students' opportunity to explore different ways of solving mathematics problems. In addition, he believed that such grouping contributes to a de-skilling of teachers since it does not help them build the skills they need to teach students of diverse abilities.

He believed that these ideas could be best communicated to teachers via an in-depth, conceptual account of teaching practice that:

- showed students of differing abilities developing their maths problem-solving skills by working together;
- illustrated the limitations of maths teaching that does not support diverse abilities;
- provided a rich description of pedagogical decision making that would extend his teachers' thinking about mathematics teaching.

The structured questions developed by Nash challenged his teachers' assumptions and focused their attention on how diversity within maths groups can promote a range of student learning outcomes. Nash's teachers began to understand the potential benefits of heterogeneous groups.

Activity 2: Teachers working together on a mathematical word problem

Nash designed a second activity, based on what he had learned from his involvement in the first meeting:

> *I felt that I just need to think of this [first] session as time to hear them, listen to them talk about the topic, something related to the topic and to get them to generate some ideas. Now I have something to work with.*

He wanted to extend his teachers' understanding of ability grouping by demonstrating to them that the use of different strategies to solve a problem may reflect different ways of understanding mathematical ideas rather than different developmental stages. He designed an an open-ended mathematics problem that would give teachers themselves experience of working in mixed-ability groups.

A maths problem

> Recently Paul learned how to construct small rafts with Popsicle sticks. Each raft is made with five Popsicle sticks. Paul bought five packages of Popsicle sticks, and there are 11 Popsicle sticks in each package. How many rafts will Paul he able to construct?

The answer to this word problem, which is essentially a factoring problem, is 11 rafts of five Popsicle sticks each. In concrete terms, there are 55 Popsicle sticks altogether, which are first bundled into five packages of 11 sticks each and then into 11 rafts of five sticks each. In abstract terms, 5 x 11 = 55, and 55 ÷ 5 = 11.

As the group shared the strategies they used to solve the problem, they could see that they varied considerably. Some used very concrete, visual methods that involved manipulating the objects (sticks), while others employed more abstract techniques that involved identifying an appropriate calculation (multiplication and/or division).

Having had this experience of working in heterogeneous groups, the teachers were able to discuss the implications of having a classroom in which the students use a range of problem-solving strategies—particularly the implication that students might learn from observing strategies other than their own. Nash ended the discussion by identifying what teachers needed to do to maximise the learning potential of mixed-ability mathematics classes.

Leadership knowledge, skills, and dispositions

Principal knowledge and skills to promote teacher learning

Knowledge of the discipline

Having developed a good understanding of his teachers' views about heterogeneous grouping during the first activity, the principal was then able to design a practical task that would extend their thinking. Given his conceptual understanding of mathematics and his awareness of how children learn, he was able to tailor the task so that it would show teachers:

- that students can learn from each other (as the teachers did in activity 1);
- how learning occurs in heterogeneous groups.

Teachers were given an opportunity to examine the mathematical structure of the problem, explore extensions, and experience what it would feel like to be a student in a heterogeneous group. In doing so, they were able to see that, even though some solutions were more mathematically sophisticated than others, each represented a subtly different way of interpreting the problem, and that these differences had the power to extend the understanding of everyone in the group.

Knowledge of how to promote teacher learning

While Nash's conceptual knowledge of mathematics enabled him to design an appropriate activity, it was his practical judgment that alerted him to the value of having teachers work collaboratively on a problem. By having his teachers work together, Nash strengthened the ideas introduced during activity 1. This allowed them to experience heterogeneous grouping from the perspective of their students. Through subsequent discussion of the strategies that they had used to solve the problem, the teachers could see that:

- ideas embedded in a mathematics problem can be quite complex;
- the basic ideas underlying a mathematics problem can be developed and connected to other mathematical ideas.

By running the staff meeting as a 'doing mathematics' community, the principal encouraged a pedagogical exploration of learning mathematics in a heterogeneous classroom that could then inform discussion of grouping.

Knowledge of diverse learners and how diversity promotes learning outcomes

One of the key ideas Nash wanted to convey to his teachers was that diverse students in heterogeneous classrooms don't simply know more or less than each other, they approach mathematics in different ways. By giving the teachers the opportunity to work in diverse groups, they were able to experience for themselves their potential benefits. As they explored the complexities of a seemingly simple mathematics problem, they saw that different but equally valid solution strategies were possible. In this way, they could see the importance of moving beyond the obvious ('some students work faster') to considering how learning actually occurs ('children have different ways of understanding mathematical ideas'). This discussion gave the principal what he needed to begin helping his teachers develop the skills they needed to support diverse learners in their own classrooms.

Key questions

1. Which management practices in your school could be explored by teachers for their pedagogical implications?
2. How could you design an activity to find out what teachers know about heterogeneous grouping and its implications for student learning? (The activity might perhaps involve a reflective article, guiding questions, or a focused discussion.)
3. If you do not have in-depth knowledge of effective pedagogy in mathematics (for example), how might you, nevertheless, still promote the sort of discussion that occurred in this case?

Source

Nelson, B. S., & Sassi, A. (2005). *The effective principal: Instructional leadership for high quality learning.* Columbia, NY: Teachers College Press.

Further reading

Anthony, G., & Walshaw, M. (2007). *Effective pedagogy in mathematics/pāngarau: Best evidence synthesis iteration.* Wellington: Ministry of Education.

Robinson, V. M. J. (2006). Putting education back into educational leadership. *Leading & Managing, 12*(1), pp. 62–75.

Stein, M. K., & Nelson, B. S. (2003). Leadership content knowledge. *Educational Evaluation and Policy Analysis, 25*, pp. 423–448.