

Teachers' Views on the Impact of the Secondary Numeracy Project on the Teaching of Year 11 Classes

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In 2007, the Secondary Numeracy Project operated in some secondary schools for the third year. This study investigates whether the professional development has had an effect on teacher practice in year 11 mathematics classes and on student achievement. The study finds that the impact of the project on teacher practice varies, with those teachers who are teaching year 11 mathematics classes that focus on NCEA unit standards tending to report greater changes in practice than their colleagues who are teaching year 11 classes focusing on NCEA achievement standards.

Background

The Secondary Numeracy Project (SNP), which was formally introduced into 42 secondary schools in 2005, offered professional development to teachers of year 9 mathematics classes. (For further background, see Harvey, this volume.) These teachers received continued support in 2006 to consolidate their teaching of year 9 students and to extend this practice to their teaching of year 10 students. In 2007, these teachers received further support to consolidate their development of mathematics pedagogy.

An extended time frame is usually a requirement for effective teacher professional development (Timperley, Wilson, Barrar, & Fung, 2007). The SNP requires extensive involvement from teachers in the first year and then ongoing professional development over subsequent years. This study investigates the impact of the professional development over time in one area of teacher practice.

Belonging to a supportive community enables teachers to develop their knowledge and practice (Anthony & Walshaw, 2007). Through the SNP, members of schools' mathematics departments experience professional development as a team, with one member of each department being given additional support in order to lead the project within their school. It is through the operation of such departments that the professional issues of teaching can be addressed, a process that may result in enhanced pedagogical practices in mathematics teaching at all levels.

In 2007, the students who were taught as year 9 students in 2005 had progressed to year 11 and, by the end of that year, would potentially have experienced "numeracy project aware" teaching for their three years of secondary schooling.

This study reports on teachers' views of the impact of the SNP on the teaching of year 11 mathematics. Specifically, the research question is:

- What views do teachers hold on the impact of the SNP on the teaching of year 11 mathematics?

Research Method

Five schools that had been part of the initial 2005 professional development were involved in this study. The schools were selected by convenience, in that they were schools where one of the researchers had a professional link. From each school, the school's Head of Mathematics selected three or four year 11 mathematics classes to participate in the study, giving a total of 17 teachers in the study. The classes selected in each school included at least one class that was doing a course that was assessed by NCEA achievement standards and at least one class that was being assessed by NCEA unit standards. The rationale for this distinction in the mathematics classes was that, at year 11, most schools offer students two different types of mathematics courses to pursue. Students who have been successful in year 9 and 10 mathematics usually study the mathematics course predominantly assessed using NCEA achievement standards (mostly assessed externally). Those who found year 9 and 10 mathematics demanding usually study a mathematics course mainly assessed using NCEA unit standards (assessed internally).

Teachers of the classes involved in the study were asked to complete a written survey to ascertain the impact of the SNP on their practices in teaching their year 11 classes and the impact of their approaches on students' achievement. The teacher practice aspect of the survey was organised into 15 sections, including increased use of group work, differentiated teaching, and greater emphasis on understanding key ideas. The participating teachers were asked to indicate if the SNP had impacted on their teaching of years 9, 10, and 11 students and to comment about the impact on their teaching of year 11 students. In addition, the participants were invited to describe any other changes to their teaching of year 11 students that they felt resulted from their involvement in the SNP. Similarly, the participants were asked to rank and describe the impact of the SNP on their year 11 students in four areas, including increased questioning by students and less reliance on calculators. The final section of the survey gave the participants the opportunity to describe any barriers they felt there were to implementing the SNP with year 11 classes and asked them to include any other comments they might have about the impact of the project.

Results

Impact on Teachers' Practice

Teachers were asked open-ended questions about their practice and about their perception of the impact of their practice on the students' involvement, understanding, and achievement. The researchers have made an overall judgment of the teachers' responses by aggregating responses to individual questions, as shown in Table 1.

Table 1
Teachers' Responses about the Impact of SNP on Their Teaching

Main Assessment Used in Course:	Achievement Standards	Unit Standards	Combined Results
Impact:			
Very little impact	3	1	4
Modest positive impact	2	1	3
Positive impact	3	6*	9

* Includes one class completing a two-year NCEA Level 1 course
Note: One survey was not rated because the teacher was new to the school in 2007.

Analysing the overall results by course reveals the strong association between the classes taking the unit standards course and the impact of the SNP. This link will be discussed later in this paper.

For discussion in this paper, the teachers' responses have been grouped by themes.

1. *Students Sharing Their Strategies*

A number of teachers reported extending their use of discussion in developing ideas with their students:

Teacher-student discussion as a class forum. (Teacher 3)

I ask students to explain a lot more of their work to me when helping them one-on-one rather than just [jumping] in and [showing] them what to do. I ask students to explain their working to each other. (Teacher 5)

I usually ask the question "Why?" or "How did you get that?" Probably because of the numeracy project. (Teacher 11)

Students [are] encouraged to give their ideas and solutions and to discuss them with others in the class. (Teacher 2)

Despite many of the teachers embracing greater use of discussion, a small minority of the teachers cautioned against placing too much emphasis on class discussion:

If a student comes up with a difficult or complex strategy, I tend to cut it off and encourage easier, more effective strategies. Too many strategies and the year 11s complain about being confused, so I stick with what strategies are effective and limit them deliberately. (Teacher 7)

2. *Calculator Use*

A focus of the SNP is on developing mental strategies for calculation and on using calculators only when it is appropriate. Many teachers reported more judicious use of calculators in their classes. However, as calculators may be used in almost all assessment situations, some students still depend heavily on their calculators for support:

Students definitely use the calculator less and use it to save time and energy/brain power rather than not knowing what to do. Year 11 is still quite heavily reliant on a calculator. (Teacher 11)

Limiting the use of calculators and placing an emphasis on "the art of approximation" prior to solving problems. (Teacher 14)

Less dependence on calculators. More confidence in estimation. (Teacher 12)

3. *Changes in Student Participation, Work, and Understanding*

The teachers were asked to "Describe any changes to student participation, work, and understanding that you believe are due to the Numeracy Project." The majority of the teachers cited positive influences on student participation in year 11 classes:

My students gradually obtain a better understanding of number. Certain algebra techniques like equation solving and expanding using grids have assisted skills mastery. Some other topics have been neglected. (Teacher 2)

The students want to understand and aren't satisfied if they don't. (Teacher 11)

Students are definitely more prepared to give strategies and ideas. (Teacher 13)

Focused learning, willingness to ask questions and not be afraid of maths. (Teacher 15)

[Students] are more involved and interested [now] because they are able to understand rather than just learn to get the right answer. (Teacher 17)

These statements indicate that, in many classrooms, students are more actively involved in their mathematics learning. However, not all teachers noted this change:

Have not been cognisant of change in this year 11 class. (Teacher 16)

4. *Barriers to Implementation*

Teachers were asked to list factors that prevented them from making greater use of the practices that had been advocated in the SNP. Workload was the most commonly cited factor. Other frequently cited factors were the exam expectations of the school, the students, and the community. Factors that are primarily beyond the scope of the SNP include student behaviour, student motivation issues, and staff turnover.

Additional Comments

There is a big leap from strategy stage 7/8 to year 11 achievement standards. Many of our students [are] still working at strategy stage 5/6 and yet [are] expecting to do the achievement standard course. (Teacher 11)

... this course [unit standards] exists [because] there is a lack of numeracy among certain year 11s. If the numeracy project had worked, this course would be redundant. (Teacher 16)

I feel my students (at year 11) have missed picking up on the basic principles at a younger age, so the further on they get in their schooling years, the further behind they get. Their confidence in maths is poor, so they are hesitant to think they can do maths without a calculator. (Teacher 13)

It has opened my eyes to some new ideas and techniques. It has made me aware of how much we need physical resources and how few we have. It has made me aware of how much assessment drives our teaching. (Teacher 4)

I like the questioning I am able to do now. (Teacher 9)

Our year 9 programme has greatly assisted my year 11 teaching. (Teacher 15)

This year group was our first (we are still learning), and the students were new to numeracy ideas as well. When the students come through having had the numeracy project from year 1, I believe the impact will be higher. (Teacher 11)

Discussion

This study was designed to look for impact on practices of teaching and learning in year 11 mathematics classes, despite year 11 not being the focus of the SNP. Many of the teachers have indicated that they have made adjustments to their practice at year 11 that have built on the ideas that they have trialed in their year 9 and 10 mathematics classes.

It is notable that, in general, the teachers of the unit standards mathematics classes felt that the SNP had had a greater impact on their teaching of these year 11 students than it had on the teaching of their peers in achievement standards classes. A possible reason for this is that there is a greater focus on number in the unit standards courses compared with the achievement standards courses and, hence, the emphasis on mental strategies is more easily applied in the unit standards courses. Another reason could be that the teachers of unit standards classes recognise that their students found year 9 and 10 mathematics demanding, and so these teachers are able to see benefits in adopting different pedagogical strategies.

The survey indicated that there is considerable variation in the degree to which teachers feel that their teaching has been influenced by their participation in the SNP. In order to sustain and extend the changes instigated by the SNP (changes that many teachers may consider to be modest), it may

be beneficial for mathematics departments to have explicit discussions about the ways in which individual teachers have enhanced their teaching of year 11 mathematics classes.

A goal of the SNP is to change the way in which mathematics is taught in secondary schools. Such changes to the methods of teaching are unlikely to be achieved quickly or easily. The changes that teachers have made to date should be acknowledged and used to support the continued growth of teacher practice.

Recommendation

Mathematics departments in their third and subsequent years of involvement with the SNP should be encouraged to explicitly discuss the ways in which the pedagogies of the SNP can enhance the teaching of mathematics in the senior secondary school.

Ongoing support should be provided to enable mathematics teachers to continue exploring and developing their practices.

References

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