

How can working together help children learn?

Investigating the impact of cross-sector collaboration using achievement data to improve the progress of Kaikohe students in numeracy

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Introduction

In 2006, schools in Kaikohe came together to talk about the new New Zealand Curriculum document and its implications. The teachers split into learning areas to talk about their particular subjects. The discussion amongst the mathematics teachers resulted in the formation of a cluster group: the Kaikohe Mathematics Cluster (KMC). Their stated mission was ‘to raise achievement in mathematics for all students in Kaikohe’. The kaupapa was to ‘throw no stones’: rather than blaming others or criticising, the group agreed to work together, develop a shared language and try to be active in improving numeracy outcomes for their students. Communication between schools and the sharing of ideas and knowledge were the central concepts.

Initially the teachers met after school on Fridays, along with their local numeracy facilitator. After several such meetings, they decided to invite a researcher to become involved. Three years later, the KMC is comprised of representatives of seven schools (primary, intermediate and secondary), a facilitator, and a researcher, who work as a team on devising and implementing interventions to improve numeracy outcomes for Kaikohe students. The group has come a long way from meeting in their own time on Fridays. They now have the recognition of their principals and the community, and are providing leadership

in their schools. In 2009 the research aspects of the KMC's activities are being funded by CERT.

The KMC's activities are firmly rooted in teacher concerns about student learning. Students who had shifted school within the region expressed frustration at the inconsistency in expectations. The teachers were concerned that progress was not occurring – the students seemed to be getting stuck, and not fulfilling their potential as learners of mathematics. This meant that many Kaikohe students were leaving school without qualifications in mathematics, and this was limiting their choices for work and further study. These are common concerns for teachers, but in Kaikohe two unusual things happened: the teachers decided to collaborate on the problem, and they turned to research to inform their choices and to drive the process.

The students in the seven KMC schools are predominantly Maori. Six of the seven schools are Decile 1, and one is Decile 2. Key issues in the area are transience, poor attendance and underachievement. The KMC teacher members are classroom teachers. Some are lead teachers of numeracy in their schools. They all share a particular interest in mathematics teaching and learning, and a passion for their students.

An essential element of the KMC is its self-determination. It is organised by the Kaikohe teaching community for the students of Kaikohe. Its agenda is driven by the teacher members, not by researchers or facilitators. Many hours of discussion resulted in a plan to look at basic facts, place value, and how children solved 'word problems' – three key areas of concern that the teachers identified as going across age levels and school boundaries. The KMC group identified that one of the issues was a lack of data on which to base decisions, which prompted the use of an iterative data collection, analysis and feedback cycle with the KMC schools. This is described in detail below.

How do we work together to improve students' numeracy?

The KMC works to improve students' numeracy by organising and carrying out testing of students, designing and arranging appropriate professional development experiences and resources for teachers, and striving, through discussion and examination of evidence, to gain a deep understanding of what is happening for students.

One of the key issues that the KMC teachers identified in their early meetings was a lack of a common language and understanding about students' progress in mathematics. There were differences in expectations and assessment, and differences in the amount of professional development in numeracy that the schools had received. It was necessary to find common ground. The starting point needed to be manageable, seen as valuable, and easy to communicate about. The KMC teachers were keen to undertake a shared activity across schools, to understand what was really happening for students in Kaikohe. The teachers had been involved in other schooling improvement initiatives that had used student data as the basis of decision-making about professional development and changes to instruction. They decided to employ this methodology to investigate the numeracy issue they had identified. Their collaborative activity in schools began in Term 1, 2008, with testing the students' knowledge of basic facts. From this starting point, a shared understanding, language and excitement about students' progress has emerged.

In 2009, with the aid of external funding from CERT, the KMC schools are collecting two types of data for collation at cluster level: data on Basic Facts progress, and data on Place Value knowledge. The Basic Facts assessment is in two parts: addition/subtraction and multiplication/division. The students have five minutes to complete as many facts as they can. There are 50 examples of each operation, yielding a score out of 100 for

addition/subtraction and out of 100 for multiplication/division. The Place Value assessment tests students' knowledge of the structure of the number system, including fractions and decimals. It is presented as a Powerpoint, with a narration to reduce the negative effect of having too much reading in the test. The students have limited time to respond to each question, as the slides are timed and change automatically. This also standardises administration of the test between schools. Students receive a score out of 50 for the test. This can also be converted into an equivalent Number Framework stage for the teachers to use in planning and reporting to parents. The tests are given in the same week of each term, and scores for each child on both assessments are submitted to the central community database for analysis. The longitudinal database provides robust evidence of improvements in the students' test performance.

The information in the database is converted into graphs, and tests of significance are performed by the researcher in order to give the KMC a picture of what the raw numbers show. These figures are the basis of a termly meeting of the KMC. The results are considered, queried and discussed by all the KMC members. The group works together to determine the story that the data is telling, and to consider what its implications might be for their schools and students.

Each KMC member takes the data back to their school, and the teachers use it to complete a brief action plan. The action plan outlines what the teachers see as the key messages from the data for their class, and what actions they intend to take as a result of seeing the evidence. In subsequent terms, the teachers are asked to briefly review their last plan and to complete a new one. This process is overseen by the KMC facilitator, and represents a significant professional development opportunity for the teachers, as well as a source of evidence for the research project.

In 2008 and 2009, the KMC group has responded to the student data by providing additional support for teachers in Kaikohe. Some activities have been within their own schools, for example: running staff meetings, working alongside colleagues, getting the facilitator to come in and focus on particular areas. Other activities have occurred between schools, such as running staff meetings or sharing resources and ideas. Two activities have been cluster-wide: a professional development day for all staff, focussed on basic facts; and an extension group for students at high levels of the Number Framework, taught by a mathematics specialist.

What have we found?

In 2008, data was collected and analysed for the purposes of informing the KMC and their schools about their students' performance. It was cohort data, and it provided sufficient evidence of student gains to warrant more formal investigation. In 2009 a research programme was added to the KMC's activities. Data is being collected from the students in a longitudinal database, as described above. The teachers' action plans are being collected and analysed to explore the links between the data and teacher intentions, actions and expectations. KMC members are being interviewed to investigate the key factors underpinning the group's success.

Our findings are therefore just emerging at the time of writing this chapter. We have two sets of Basic Facts and Place Value data in the database, and one set of teacher action plans to consider. Interviews of KMC members are currently underway. However, a few preliminary comments can be made.

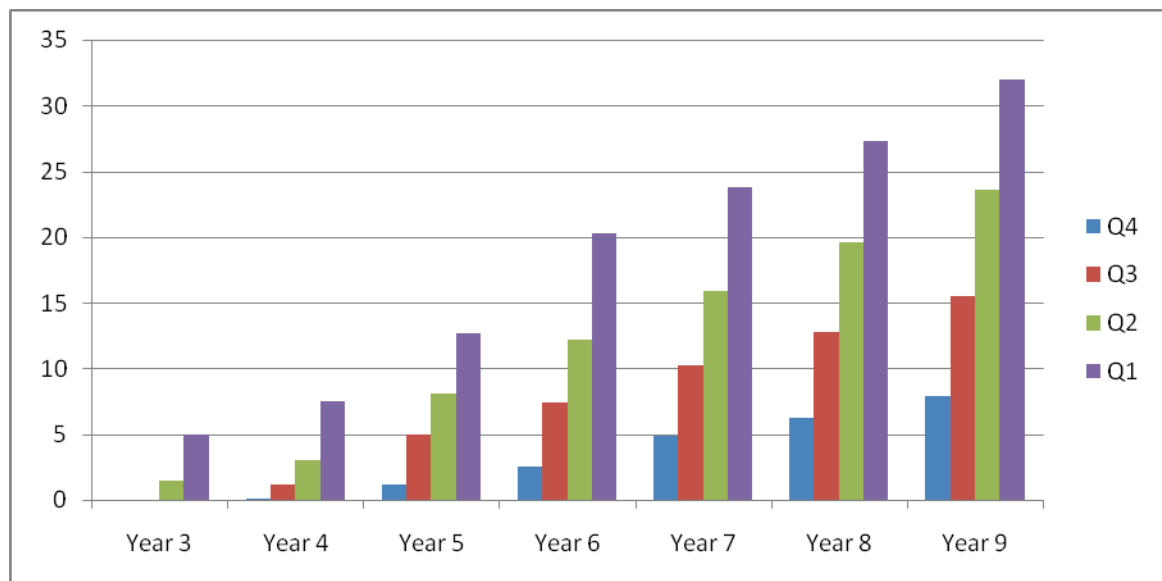
The KMC was formed to improve outcomes for students. The student achievement data provides both the evidence for the effectiveness of the programme, and the 'fuel' that drives the KMC's initiatives. In striving to improve student outcomes, the KMC's activities also

produce several important ‘side effects’: professional growth for the KMC members as they interact with the data and their colleagues to bring about change; formal and informal professional development for the teachers in the seven KMC schools; and the emergence of a community of practice that includes principals, boards of trustees and whanau.

There have been highly statistically significant increases in the students’ Basic Facts knowledge between when we began collating data from the seven schools (Term 1, 2008) and Term 2, 2009. This result is based on cohort data rather than longitudinal data, so claims about growth need to be cautious. This significant improvement has occurred in all quartiles of achievement. There is a transition effect as the children shift to intermediate school, with students in all quartiles of achievement levelling off or losing ground at this point. The ‘summer effect’, where students' scores drop over the long summer holidays, is present only in some year levels and quartiles. Not all students go backwards over summer, but those who do tend to be in the lower quartile of achievement.

The first round of Place Value data was collected in Week 7 of Term 1, 2009. Figure 1 shows the initial results.

Figure 1: Place Value average scores for quartiles within each year group (x/50), Term 1, 2009



These results show that Place Value is indeed a key area for improvement with Kaikohe students. Even the highest achieving Year 9 students are averaging only 32 out of 50. As the years pass, the disparity between the higher-achieving students and the lower-achieving students increases. The lowest quartile of Year 9 students has a average score similar to that of to the higher-achieving Year 4 students.

The second set of data is currently being analysed, and shows that these scores are already beginning to improve. In response to these results, all the teachers in the seven schools have written action plans based on the data, and a cluster-wide professional development day is being held to provide information for teachers about how to teach Place Value.

These results provide fascinating material for the KMC to consider and work with. With only one set of action plans, we cannot comment on growth in teacher understandings; but an important feature of the KMC meetings has been increasing depth of understanding and discussion about the data. At each meeting, the group has posed new questions and called for more in-depth analyses of the data. The longitudinal database format allows schools to request their own data alongside the cluster data, so that they can see how their students fit into the overall picture. The action plan process has encouraged this, with the prompt

questions encouraging deep discussion about the issues present in the data. As each cycle unfolds, both the KMC group and the teachers in the schools are engaging in more depth with the evidence of student achievement.

As this project is just beginning formally, publishable findings are few. However, the pilot data on Basic Facts and the discussion observed within the KMC and the participating schools are all strong indicators of a significant positive effect on student achievement as a result of this collaboration. We are looking forward to quantifying this as our project progresses.

Where are we going?

In 2009 we will collect Basic Facts and Place Value data in each of the four terms. In addition, we will build a picture of teacher thinking, with four action plans in response to each set of data, and improve our undertaking of the KMC's functioning with interviews of KMC members. In our analysis, we will attempt to understand the complex interplay between the levels of activity in the KMC, and cast light on the mechanism by which the students' results are improving. Our analysis will include investigation of the properties of the Place Value test. If this test gives valid and reliable results, it may prove useful in other schools.

There are many additional issues which arise from this work. Two particular examples are exploring the best 'intervention point' to bring about improvement in student achievement, and analysing the effect of sharing results with the students. The link between teacher knowledge (of content and of students), teacher instructional practices and student achievement needs examination. Where is the 'leverage point' for making the biggest difference to student achievement? Where can we best direct our efforts – towards teacher knowledge, or classroom practices, or the intersection between them? The cluster results are

shared with students by some teachers. Considering the sharing of results and the setting of goals with students, as well as with teachers, may be a fruitful direction for future research.

The third area identified by the KMC teachers in our initial discussions was reading and understanding word problems. The teachers felt that Kaikohe students were disadvantaged in mathematics examinations at secondary level because they struggled with reading the problems. There is considerable literature suggesting that this problem is not confined to these students. Comprehending the special language of mathematics problems is a skill that is distinct both from ordinary reading comprehension, and from understanding the mathematics of the problem. In addition, mathematics problems couched in words rather than symbols are often given a 'real-world' context. This context can clarify the mathematics for some students, but obfuscate it for others. The need to translate from the real world to the world of mathematics and back to the real world in solving these problems is also a challenge. This area may be the next focus for KMC activity, as we try to systematically address these issues with students at all levels of schooling.

What are the implications?

Our initial results suggest that the KMC is operating as an effective agent for the improvement of student achievement in numeracy in Kaikohe. If that is the case, then how can its successes be translated to other clusters of schools in other areas of need? There are other examples of highly effective clusters of schools using evidence to improve student achievement, principally in literacy. The Schooling Improvement Initiative has built on these examples to use clusters as a mechanism for addressing underachievement. However, not all clusters enjoy the same levels of success.

What makes the difference? If we have something that works, the imperative is to share it with others so more students can benefit from it. 'Scaling up' and transfer are two of the key

challenges for any educational intervention. Many promising projects founder when they are implemented at scale. Intuitively, we can see why this would be true. So much of the operation of a group such as the KMC is predicated on trusting, long-term relationships, patience, multiple iterations, and the passion of key people. These types of relationships cannot be legislated. Time is needed for them to be facilitated.

Perhaps the policy implications of this are that funding and resources need to be provided flexibly enough for initiatives such as the KMC to be nurtured where they arise. Facilitation in areas of need should be driven by a long-term view, with stable staffing structures and time allowed for the emergence of strong relationships of trust and respect.

The most significant aspect of the KMC is that it originated with teachers, and is driven by teachers. Its agenda is one of self-determination. The KMC has sought and used outside resources to serve its ends, rather than having people or methodologies imposed upon it. Perhaps a starting point for developing clusters has to be teacher identification of need. Many projects do this by engaging teachers with the collated results of an initial round of data collection. A slightly longer and more cumbersome – but perhaps more sustainable – approach might be to have teachers' concerns about student achievement driving the investigative process. In the case of the KMC, this has been brought about by skilled facilitation over a period of more than five years, so it is by no means a quick or easy 'fix' for achievement issues.

Where does the knowledge about how to improve outcomes reside? A second implication of the KMC project is related to how we can make best use of the expertise that resides in teachers and communities. Researchers, facilitators, teachers and parents all have a valuable perspective on student achievement. In the case of the KMC, very little outside input was necessary to make a difference to student achievement in Basic Facts; the knowledge and the

power resided in the KMC teachers, who were able to make a difference when they were given the time and space to collaborate and share their knowledge. Adding the perspectives of researcher, facilitator and BOT member to the group has enriched the outcomes, but the expertise was distributed among the group members, not held by one particular person. In creating education policy, we need to consider how we can bring different perspectives and sources of knowledge to bear on student achievement issues, valuing the contribution of each piece to the complex jigsaw. The KMC is an example of research being used in the service of teachers, rather than teachers being used in the service of research. This distinction makes a significant contribution to the KMC's success.

The theory-practice dichotomy is often discussed in education. Education is both highly theorised and essentially practical, and the articulation between these two dimensions is often poor. This results in research which is of little use to teachers, and teaching that makes little use of research. We need to consider how models such as the KMC begin to use the theory-practice dichotomy to the advantage of students, and what conditions make this happen. Education theory and practice are not the same, but neither exists in the absence of the other. The aim is not to resolve or dissolve the dichotomy, or to ignore or deny it, but to use its potential to improve outcomes for students.

Finally, whenever a story of success is told, the perpetual issues of sustainability and scalability arise. There is little point in researching a process which has nothing to offer other schools and students who have similar problems. Nor is it worthwhile creating an effective but unsustainable practice. We want to be able to identify the 'magic ingredient' and give it to others. Unfortunately, the problems of education cannot be solved simplistically. When our research with the KMC concludes, we hope to be able to comment on these issues with insight from our experience. In this way, we hope that the passion and dedication of the KMC

teachers will reach beyond the results they achieve with their own schools and students, into the wider education community.