Mathematics Support Teacher (MST) Programme 2014 School Research Overview Report

Report to the Ministry of Education

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Contents

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Executive Summary

Background

The Mathematics Support Teacher (MST) programme started in 2012 as part of the Programmes for Students initiative[1]. The MST programme provides release time for a teacher to work with groups of students with learning needs that require additional support to classroom teaching. The MST role is partly funded by the Ministry of Education.

Analysis of MST student achievement data in 2013[2], summarises the effectiveness of the MST programmes for schools overall. To gain a more detailed understanding of how the MST schools worked with primary students well-below the National Standards in Mathematics to accelerate their progress, case study research was undertaken in 2014 with eight MST schools. The research focused on the effectiveness of the MST programme as a way of raising student achievement, the strategies the schools used with their well-below students and the learning that could be passed onto other schools. Strong evidence of the school achieving accelerated progress for students in their MST programme in 2013 was a key criterion for inclusion in the research.

Interviews were undertaken at each school with the Principal, the MST, the Numeracy Leader (if different from the MST) and a couple of classroom teachers. Interview data was supplemented by other available data to provide a broad picture. Case studies were written up for each school along with an overview report.

Profile of the case study schools

The eight schools selected were from across New Zealand — one in Whakatane, two in South Auckland, one in Rotorua, one in Napier, one in Porirua, one in Wellington and one in Dunedin.

All were low decile schools with high numbers of priority students (Māori and/or Pasifika students). Most of the eight schools had relatively high number of students with English as a second language (ESOL students) and Ongoing Resourcing Scheme (ORS) funded students. All but one of the schools had previously been involved in the Accelerated Learning in Mathematics (ALiM) project and/or the Specialist Mathematics Teachers (SMT) programme.

Addressing under-achievement in maths amongst students was the key driver for up-take of the MST programme. Addressing issues around the capability of some teachers to teach mathematics was also a driver at some of the schools.

In 2014 five of the case study schools were continuing to provide the MST programme at the same 'strength' as they did in 2013 (four receive no funding for this from the Ministry of Education and one was doing this as a result of new funding from the Ministry); two schools were continuing to provide the MST programme but not to the same extent as in 2013 and one school no longer has the programme in place.

Key research findings

Overall, analysis of student achievement data shows that the MST programme is an effective way to raise student achievement for students well-below the National Standard in mathematics in the case study schools. It also impacted positively on the confidence of students in doing mathematics and their attitude towards it.

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[1]   http://nzcurriculum.tki.org.nz/System-of-support-incl.-PLD/School-initiated-supports/Accelerated-Learning-in-Literacy-Mathematics

[2]   Achievement analyses, Programmes for Students 2014. Ministry of Education 2016

Strategies that the case study schools found worked best with students well-below in mathematics can be summarised into eight key areas:

1. get to know your students

2. withdraw students so they can experience an intense focus on maths learning while still receiving their normal class programme

3. create a positive fun maths environment, fostering positive mathematical identities and empowering students

4. identify and target mathematics needs, have explicit goals for learning and high expectations for each student

5. use rich challenging tasks, familiar contexts and equipment

6. focus on teaching mathematics language, problem solving and asking students to explain thinking

7. take a reflective and flexible approach to how needs are met

8. allow students time to think, process, reflect and practice.

The research also gathered some evidence about what needs to be in place in a school for it to run the MST programme successfully and for the programme to be sustainable.

The most significant factor for setting a strong foundation for the MST programme 'to fly' was selecting the right person to be the MST. Along with this, a school culture with high expectations of students, teachers open to being learners themselves and strong links to parents and the local community were also important.

The research found that the degree of programme success varied across the eight case study schools depending on the extent to which the following were in place as part of implementing the programme:

1. a focus on using data and on teaching as inquiry in the school

2. investment in up-skilling classroom teachers and ensuring a whole school approach

3. leadership support from Principal and Board of Trustees and a commitment to making the programme work

4. dedicated teaching resource and ideally a dedicated maths room

5. effective engagement with parents and whānau.

Key factors in creating sustainability in the school once Ministry of Education funding was no longer in place were:

1. leadership, commitment and support from the Principal (an attitude of making it work)

2. planning for sustainability from the outset through investing in up-skilling classroom teachers and ensuring a whole school focus on improving maths achievement (more than just taking specific students out of the classroom for an intense programme)

3. using data to provide evidence to the Board of Trustees and others (e.g. school staff) that the programme has significant value in accelerating progress of students (getting 'buy-in')

4. commitment to the programme and support from the Board of Trustees.

MSTs acknowledged the positive impact of being involved in the MST programme and its associated professional development despite the challenge of the workload involved. They talked about it changing the way they teach (particularly with students that are struggling) and encouraging them to experiment and try different things.

1. Introduction and background

Programmes for Students (PfS) are targeted and tailored initiatives to meet the needs of students achieving below and well-below the National Standards for reading, writing and mathematics. The Mathematics Support Teacher (MST) programme started in 2012 as part of the Programmes for Students initiative[3]. The programme was piloted in 2011 (Specialist Mathematics Teacher) and expanded in 2012.

The MST role is funded partly by the Ministry of Education and partly by the school for a period of two years. The amount of release time funded by the Ministry of Education depends on the decile and/or size of the school.

Students targeted by the MST programme are those that have learning needs that require additional support to classroom teaching and require the support of a teacher with specialist knowledge and expertise. During the year the MST is expected to work with groups of primary school students who are achieving well-below the National Standard in mathematics for up to 20 weeks at a time.

The teacher selected for the MST role is expected to be a highly effective culturally responsive teacher with proven ability to accelerate learning. Whilst in the role, he/she is expected to complete professional development comprising two post-graduate papers over two years. Mentoring support is also provided to the MST from PLD facilitators.

In 2012, exploratory research[4] was undertaken looking at how the MST programme was operating during the first six months of implementation. To gain deeper knowledge and understanding about how schools are successfully working with primary school students to accelerate their progress in mathematics case study research was undertaken with eight schools in mid 2014. This report provides an overview of findings from that research.

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[3] http://nzcurriculum.tki.org.nz/System-of-support-incl.-PLD/School-initiated-supports/Accelerated-Learning-in-Literacy-Mathematics

[4] Programmes for Students 2012 Report on three evaluative studies. Ministry of Education 2016

2. Research questions and how the research was undertaken

The key research questions were:

1. To what extent was the MST programme an effective way to raise student achievement for students well-below the National Standard in mathematics in the case study schools?

2. What strategies did the case study schools use that led to accelerated progress for students well-below in mathematics?

3. What can be learnt about how other schools can run the MST programme successfully with well-below students?

Eight schools were selected for the research on the basis of the following criteria:

- had participated in the MST programme in 2013

- low decile school with high numbers of priority groups (Māori and/or Pasifika students)

- evidence of achieving accelerated success with well-below students on the basis of their Progressive Achievement Test (PAT) data, Global Strategy Stage (GloSS) data and/or any other available achievement data

- evidence of other features of a successful MST programme in the school on the basis of a review of their school report for 2013 and feedback from the PfS National Leaders.

Effort was also made to ensure a range of urban and provincial schools across the country participated. The PfS National Leaders provided input to the final selection of schools.

In-depth face-to-face interviews were undertaken at each school with the Principal, the MST and the Numeracy Leader (if different from the MST). Brief face-to-face interviews were also undertaken with a couple of classroom teachers per school. A telephone interview was undertaken with the regional facilitator working with each school.

Interview data were supplemented by assessment data and the school report on the MST programme from 2013, as well as school planning documents and records to provide a broad picture of the MST programme in each school.

Case studies were written up for each school and a thematic analysis undertaken as part of preparing this overview report. The name of a New Zealand native tree has been assigned to each of the schools to keep their identity anonymous. The schools involved have been provided with a copy of their school summary.

3. Profile of the case study schools and drivers of participation

The eight schools selected were from across New Zealand — one in Whakatane, two in South Auckland, one in Rotorua, one in Napier, one in Porirua, one in Wellington and one in Dunedin. All were low decile schools — one decile 1 school, three decile 2 schools, two decile 3 schools and two decile 4 schools. The size of school roll ranged from just over 200 students to over 500 students.

All case study schools had high numbers of priority groups (Māori and/or Pasifika students). Most had relatively high number of students with English as a second language (ESOL students) and Ongoing Resourcing Scheme (ORS)[5] funded students.

All but one school had previously been involved in the Accelerated Learning in Mathematics (ALiM) project and/or the Specialist Mathematics Teachers (SMT) programme (the forerunner to the MST programme).

Addressing under-achievement in maths amongst students was the key driver for up-take of the MST programme by the case study schools. Addressing issues around the capability of some teachers to teach mathematics was also a driver at some of the schools.

> *We had talked for years about having something like Reading Recovery for maths. MST was an opportunity to meet this need. It provided a structured framework. (Principal)*

A number of the schools reported that they had enjoyed a degree of success already through participation in the Accelerated Learning in Mathematics (ALiM) project or the Specialist Mathematics Teachers (SMT) programme and wanted to build on this foundation through participation in the MST programme.

> *In 2012 the Ministry offered a Student Achievement Function (SAF) practitioner to the school. A lot of children were not meeting national standards in maths. The work that the SAF did was really good with self-review, made us look again and again at what and how we were doing and data, data, data. Then ALiM came up, and from that MST was a logical next step. (Principal)*

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[5]   ORS provides support for students with the highest level of need for special education to join in and learn alongside other students at school.

4. Similarities and variations in how the programme was provided

4.1 MST release time

In five of the eight case study schools the MST did not have an assigned class. They were the MST and in most cases also the Numeracy Leader or another leadership role (such as Deputy Principal) at the school. The teachers felt not having a class allowed a greater focus on the MST role.

At the other three case study schools, the MST retained a role as a classroom teacher and in one case the role of Assistant Principal as well. These teachers talked about the challenge of moving between the roles but also talked about enjoying having their own classroom.

4.2 Selection of students

A similar approach to selecting students for the programme was used across the case study schools. The MST was the key decision maker. School level achievement data was used to identify priority students or target years most in need of assistance. Student level achievement data (such as PAT and GloSS data) was then reviewed to identify students in need of assistance. At most of the case study schools the MST also took views from classroom teachers into consideration about who needed the programme and would get value out of participating in it. Some MSTs also observed students in their classrooms, chatted to them or allowed students to self-identify for the programme as part of the selection process.

Generally the number of students needing the programme outstripped the number of available places on the programme and the MST had to prioritise students. Key factors taken into consideration (to a greater or lesser extent depending on the school) included whether a student:

- was a member of a priority group (i.e. a Māori and/or Pasifika student)

- was motivated to take part in the programme

- was at school regularly or often absent from school

- was having their needs met in a different way (for example, one school did not included ORS funded students in the programme as their needs were being met in a different way)

- had behavioural or special educational needs which might mean that they would get little value out of participating in the programme and/or disrupt the learning of others on the programme

- had been on the programme already (at some schools students that had not been on the programme before were prioritised over students that had attended previously).

4.3 Approach to providing the programme

In all but one of the case study schools MST programme students received their normal classroom mathematics programme along with intensive mathematics on a regular basis from the MST in a small group setting outside of the classroom. This approach was generally felt to be critical to success with students under-achieving in mathematics.

At one of the case study schools a combination of withdrawal groups and in-classroom groups was used. The MSTs involved felt both approaches had merit. Withdrawing students provided benefits for them in terms of an opportunity for quiet, focused time on mathematics. On the other hand, working with them in groups in their usual classroom ensured closer alignment with the classroom mathematics programme and provided more opportunity for the MST to work closely with the classroom teacher. It also increased the likelihood that students received classroom mathematics teaching that reflected the MST's approach.

The eight case study schools varied in the total number of students receiving the programme in 2013 — ranging from 34 to 68 students. To some degree this reflected capacity of the MST (the amount of release time they had) and size of school roll. The number of students in each programme group ranged from 4 per group to 9 per group but was generally around 6–8 students per group. MSTs reported that small group size was an important feature of the MST programme having a positive impact on student achievement. One MST commented that she would have liked to have run smaller groups (around 4–6 students) but that it was difficult to say *no* to students in need of assistance. Another commented that a group of four students works well for younger children and a group of six students works well for older children.

The case study schools also varied in the year groups they targeted. Some MSTs were working with students from across most or all year levels in the school. Others were working with students from two to three year levels at the school (for example, Years 4 and 6; Years 7 and 8; Years 3, 4 and 5).

Some MSTs grouped students into single year groups while others worked with multiple year groups based on need rather than year at school. Some MSTs talked about aiming to have groups of students at similar stages, learning styles and/or personality types (for example, putting quieter students together). Some MSTs reported having boy only or girl only groups when they felt it would enhance student learning. At one school students were partnered with a buddy of the same gender when in a mixed gender group. MSTs noted the importance of being flexible when grouping students and focusing on the best approach to ensure student needs were met for the specific students in question.

> *You have to bring their personalities into it. I have had two kids clash and they were more focused on that, so I separated them but generally with only eight kids they don't bring those outside influences in when they're in the group. (MST)*

> *It's about personality — I put risk takers with risk takers, and quiet ones with quiet ones. I've never found the need for gender groups — but am not against them. (MST)*

Length and number of each session per week and number of weeks each group received the programme varied across the case study schools (see table overleaf). Generally sessions were 30 or 45 minutes in length and usually 3–4 times a week. The number of programme weeks ranged from 10 to 30 weeks but was generally around 15–20 weeks.

School*	Length of session	Number of sessions	Number of weeks
Kōwhai School	30–45 minutes	2 times a week	20 weeks
Kauri School	30 minutes	3 times a week	30 weeks
Tōtara School	45 minutes	3–4 times a week	17–18 weeks
Horopito School	30 minutes	4 times a week	12 weeks
Rātā School	20 minutes for juniors & 30 minutes for seniors	4 times a week	15 or 18 weeks
Pōhutukawa School	30 for juniors and 45 minutes for seniors	4 times a week	20 weeks
Kanuka School	40–50 minutes	4 times a week	12–15 weeks
Rimu School	60 minutes	4 times a week	10 weeks

* Note: the name of a New Zealand native tree has been assigned to each of the schools to anonymise their identity.

MSTs generally reported that frequent regular sessions (at least 3 a week) were important to give students a consistent message, change mind-sets and behaviour and support students to retain what they were learning.

> *Four (sessions) is better but they'll probably only get three sessions anyway as schools are very busy. I always let the kids go to other things, I don't want them to be resentful. I also want to be part of the culture of the school. (MST)*

Some MSTs talked about length of session being a balancing act between 'not too long' and 'not too short' in terms of students being able to focus intensively on maths but not 'running out of steam'. This was reflected in some schools running shorter sessions for junior students than for senior students.

MSTs reported that they tested the students to identify gaps in knowledge and what to work on with each group. The knowledge and/or strategy focus for programme groups varied to reflect the needs of each group. A common theme, however, was the need to work on place-value.

The MSTs also reported monitoring the progress of students and testing them at the conclusion of the programme. Generally, after the programme, students continued to be monitored. At some schools students were given another opportunity to go on the programme or were provided with other mathematics programmes.

4.4 Adaption of the programme to suit a school

Schools adapted the programme to suit their particular circumstances. At one school the MST reported that she interviews each student in-depth to get to know them holistically (their reading levels, home and family life, culture etc.) before working with them.

At another school (an intermediate school with timetable pressures), the MST ran breakfast sessions from around 7am to enable students to attend the MST programme without missing other classes. Food was provided and whānau were welcome to attend. This required significant commitment from the MST, parents and students — particularly over winter, but worked well for this school.

At another school the MST role was shared in 2013 with one person released 0.1 FTE and the second person 0.4 FTE. Both were classroom teachers (and one was the school numeracy lead teacher), and both worked half in class and half in the MST programme. Job sharing had challenges as the two MSTs had to dovetail into each other's lessons and be robust with observations and hand over. But job sharing also had benefits in that the two MSTs could share with each other and support each other and provide informal and formal professional development to other teachers more easily. Changes could be made quickly and they did lots of experimenting, for example, 'two teachers – one group' and 'one teacher per group.' It also helped with sustainability of the programme.

We wanted two people because of sustainability — not having all our eggs in one basket, plus two people could have conversations and it was a lot easier to get maths conversations going in the staffroom, because there were already two people talking. (Principal)
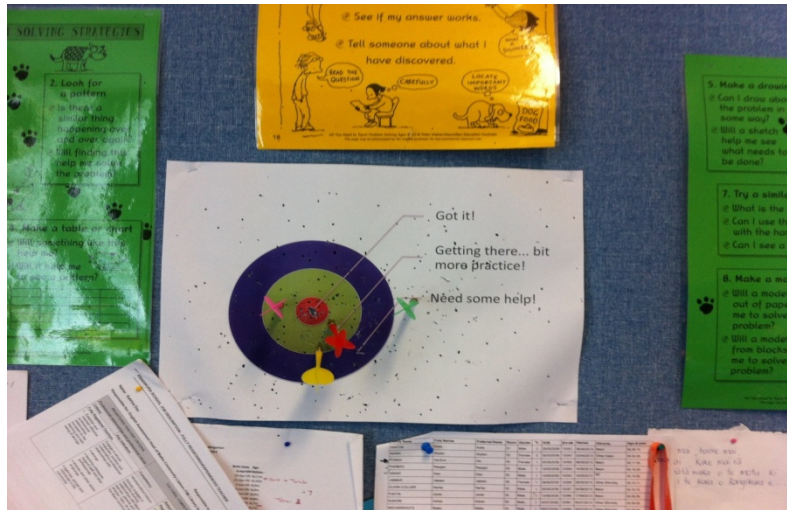
5. Impact on students

5.1 Degree of accelerated progress achieved

All of the case study schools were selected on the basis that they had achieved accelerated progress with students achieving well-below the National Standard in mathematics. Evidence was drawn from their PAT data, GloSS data and/or any other available achievement data available.

The following examples provide a sense of the degree of accelerated progress achieved by students and the way in which degree of accelerated progress varied across the case study schools.

At Tōtara School, shifts in PAT: Mathematics Scores were calculated for the 40 students in 2013 that were in Years 4, 5 or 6. The mean scale score for these 40 students moved up by 6.2 patm units in the two terms that they were part of the programme. This is equivalent to around a full year of growth for these students.

Year level	Number of students	Mean growth of students (patm units)	Yearly growth in Norms (patm units – 2009)*	Percentage of yearly growth
4	28	9	7.7	116%
5	11	4.9	6.2	79%
6	1	4.7	4.5	104%
Total	**40**	**6.2**	**6.1****	**100%**

* The difference between successive yearly norms (Darr et al, 2009, p. 30).
** Average growth per year.

At Kauri School, all students made at least one year's progress in relation to National Standards:

- the 14 students in Year 4 all made one year's progress

- 10 out of the 21 students in Year 5 made at least two years' progress

- three out of the seven Year 6 students made two years' progress

- of the students from Years 7 and 8: two students made at least two years' progress; the other group was made up of five students with special learning needs and they all made one year's progress. This group all started the year working at the National Standard for after two years at school.

At a couple of the schools, students' low starting points prior to their involvement in the MST programme meant that despite making significant shifts in their achievement by the end of their programme participation, they were still below the National Standard for mathematics. For example, at Pōhutukawa School, a Year 8 student started the year at a standard equivalent to Year 3, and finished the year at a standard equivalent to the end of Year 6. This was accelerated progress but still well-below the Year 8 National Standard in mathematics.

The following quotes from MST students in 2014 at one of the case study schools give a flavour of the changes they saw in their achievement in mathematics:

> *I have learnt a lot — like to use the right strategies and I have learnt most of my times table because before I didn't know most of my times table and love maths now. (Year 8 student)*

I have enjoyed the lessons that you have given me. It has helped me a lot. I have become better at my times table and getting 100 out of 100 but I need to work on my time. (Year 8 student)

I think my maths has improved a lot from last year. I have really enjoyed it, with me being in Group 2, we had many great times. I learnt at fractions, times table, ratios and division. I think the fact that I went every day, it really helped me. (Year 8 student)

Some MSTs noted variations in who amongst their students made the greatest progress. A common theme was younger students (Years 4 and 5) making more progress than older students (Years 6 and 7). Some teachers commented that younger students had less of a knowledge gap to be bridged than older students. One teacher noted that as the stages go up, the demands of learning increase so students take more time to grasp ideas and retain them.

Older students didn't make as much progress, there's a bigger gap to fill and enthusiasm for maths has been killed... It is the attitude as well, the idea that maths is not cool — it has a firmer grip. With younger kids it's possible — the earlier the programme the better. (MST)

At one school the MST noted that girls at their school had made greater progress than the boys. Another MST commented that students that made the greatest shifts came from classrooms where the classroom teacher worked most closely with the MST and whose classroom practice was most closely aligned to that of the MST.

At the school running breakfast sessions, groups that attended the breakfast sessions made higher gains than other groups. Follow up observations showed that these students also engaged more enthusiastically with sharing the new skills and knowledge with their classroom peers and teachers. This may reflect a bias in who attended the breakfast sessions – more committed students with greater whānau support might be more likely to attend these sessions.

Some of the MSTs reported that students who made the least progress were generally the students with wider issues–not just maths.

There are usually significant literacy issues and pastoral care issues. We can improve them but getting them to 'at the standard'...there are so many factors involved. (MST)

In terms of sustaining progress post programme, the MSTs and classroom teachers tended to report that while most students sustain their progress, a small number do not. One classroom teacher commented that completing the MST programme just once may not be enough for some students to achieve change that can be sustained.

5.2 Improvements in attitude and confidence

Across the board, MSTs talked about students coming to the MST programme with negative attitudes towards maths and their maths ability. Students would call themselves 'dumb' when they could not answer a question and laugh at the mistakes of others. Some students thought that maths was boring. MSTs reported that by the end of attending the MST programme, MST students had developed positive attitudes to mathematics and had increased confidence in their mathematics ability.

It's really transformational with their ability and their attitude. Students use MST as a confidence boost, no one hates it — they are always really positive. (MST)

Classroom teachers at all schools also reported that their students loved going to the MST programme. They noted positive changes in confidence, attitude, motivation, risk-taking and participation in the classroom maths programme from students who had attended the MST programme. Some students transferred these changes to other subject areas.

I had one student in 2013 going to MST. It worked really well. The student communicated more and helped his classmates working out strategies. He was better than them. Before he couldn't work out things even with my help. Afterwards, he had a different attitude and really enjoyed it. (Classroom Teacher)

It gives them a positive attitude and willingness to discuss and take risks and they are more engaged, will try and get involved and ask questions. (Classroom Teacher)

Students' enthusiasm for maths grows. They work on problems in the MST class, then back in their own class they step up and will do the problems – before they would never have put their hand up. They share with me what they've done in MST. They use more mathematical language. (Classroom Teacher)

Some of my least confident kids from last year are speaking in assembly now. (Classroom Teacher)

Students also reported seeing positive changes in their own attitude and confidence.

Before I joined the maths group I was nervous and scared and I had never heard about the maths club. I didn't like maths — that was my worst subject. I knew I was bad at maths because I was in the lowest group in my class for maths. When I was in the maths group I learnt a lot of stuff like learning about my times tables. Now I think maths is the best subject ever, now it's cool. My favourite maths lesson was measuring and learning about my basic facts. (Year 5 female student)

Before I joined the maths group I felt like I couldn't do anything and I felt stupid. .…When I was in the maths group I liked the Census, I measured how tall I was, I weighed my bag, my favourite maths lesson was when we learned about fractions. Now I think that maths is something that you can use to tell people how to solve things. I think maths is cool! (Year 4 male student)

Positive changes in their children were also noted by some parents.

Our child is very proud to be in the maths group. She often discussed her work and what she has been learning. She is very happy to learn new ways of solving maths problems. (Parent)

MSTs and classroom teachers commented that attending the MST programme has not had any stigma attached to it. Students on the programme are keen to get to their programme sessions and other students in the school want to know how they can join the maths programme or 'maths club'. Some MSTs reported that ex-students of the programme still come to see them for help and support.

6. Creating a successful MST programme

6.1 Factors that set the foundation for the programme 'to fly'

At all of the case study schools, selecting the right person to be the MST was identified as fundamental to success of the school's MST programme.

The ideal person would be a teacher who:

- displays passion for what they are doing

- displays a love of maths

- has excellent maths content knowledge

- has strong pedagogical expertise and is able to anticipate problems students are likely to face

- holds a belief that all students can achieve with the right support

- is able to form caring, respectful and trusting relationships with students, parents and other teachers

- is able to adapt, be flexible and responsive

- is energetic and enthusiastic

- is committed, determined and consistent

- is credible to other staff and is respected in the school (this helps with being able to drive professional development with staff).

    You need a good MST. X makes it a really special working environment so it's a privilege to attend her maths programme even though they (the students) know they have to step up. (Classroom Teacher)

    She brings consistency, commitment, a love of maths — this is her place, she's an old girl of the school and started here as a beginning teacher. She's calm and reflective, no rush, finely tuned. (Principal)

A number of the schools also reported that the culture of the school can make a difference to creating a solid foundation for the success of the MST programme. Schools had (to a greater or lesser extent):

- an inclusive culture

- a strong and explicit set of values

- management and teachers at the school who know the students

- solid links to parents and the local community

- high expectations for students

- a focus on ongoing life-long learning and improvement amongst teachers

- collegiality amongst staff and staff who were open with each other about successes and struggles.

    Our values are about caring, respect, compassion — a very strong faith base. This has an impact on how we work, and how the staff relate to each other — it creates a certain atmosphere.… We're optimistic for our children — have high expectations of kids, and teachers and myself. (Principal)

The staff are enthusiastic about everything, role modelling (school values) in what we do, we are learners as well. We have crappy buildings, earthquake prone prefabs, we have to build our own furniture — but it's what's going on in the classroom that's important. (Principal)

Low staff turnover at some of the schools was felt to support the success of the programme through staff knowing and trusting each other, staff knowing the students and ensuring that work on up-skilling teachers through the programme was retained in the school and could be built on over time.

Low absenteeism and transience amongst students at some schools also helped ensure that all or at least the majority of students on the MST programme completed it and that their progress could be monitored over time.

Degree of programme success varied across the eight case study schools depending to some degree on how strongly these factors were in place.

6.2 Successful strategies in working with students, particularly well-below students

MSTs at the case study schools talked in-depth about what they felt were successful strategies or approaches in working with students, especially those well-below the mathematics standard. There was a high degree of agreement about what works.

Views about what works can be grouped into eight key areas:

1. get to know your students

2. withdraw students so they can experience an intense focus on maths learning while still receiving their normal class programme

3. create a positive fun maths environment, fostering positive mathematical identities and empowering students

4. identify and target mathematics needs, have explicit goals for learning and high expectations for each student

5. use rich challenging tasks, familiar contexts and equipment

6. focus on teaching mathematics language, problem solving and asking students to explain thinking

7. take a reflective and flexible approach to how needs are met

8. allow students time to think, process, reflect and practice.

The meanings of the eight strategies or approaches in practice are described below along with a sense of the degree to which the case study schools varied in how they put these strategies/approaches into action.

Getting to know your students

MSTs talked about the importance of getting to know their students, building strong relationships with them and not making any assumptions about their knowledge or skills or having particular expectations. This allows for better targeting and addressing of their needs in the programme.

You need to find out about kids, their families, look at them holistically. You can bring it into the learning and make it real; you have to acknowledge what different cultures bring to maths. (MST)

There was some variation in how MSTs did this in practice. Most examined student achievement data to identify needs and talked to classroom teachers about specific students. One MST also interviewed each student in-depth prior to participation in the programme to get to know them holistically (their reading levels, home and family life, culture etc.).

At some schools the MST talked about seeking opportunities outside of class to get to know students and build a relationship with them (for example, at lunch time and during sports).

Withdrawing students so they can experience an intense focus on maths learning while still ensuring they receive their normal class programme

Withdrawing students from their normal classroom and placing them in an intense maths focused environment, free from distraction to learn was identified at all of the schools as extremely important.

Small group work ensures that students cannot 'slip under the radar', fosters close relationships, ensures students do not wait too long for attention when they need it and allows more opportunity for sharing and for working with partners. Regular sessions were also felt to be key — ideally 3 to 4 times a week. Having a dedicated maths focused room with materials available and ready for use was also felt to be useful to support learning.

> *MST kids say there are no distractions. They're really focused and it's easier to talk to the teacher. (Classroom Teacher)*

Case study schools found it worked well if the MST students also still received their normal classroom maths particularly when effort was made to ensure the MST programme had continuity with the classroom programme. For example, at one school the MST took problem solving contexts from the particular strand that students were learning in class and kept in touch with classroom teachers to keep them informed of progress and get feedback and share ideas. At another school the MST would pre-empt what the students would be covering in the classroom and build that into the session.

Creating a positive fun maths environment, fostering positive mathematical identities and empowering students

MSTs noted that most students, if not all, arrived with negative views of maths and low confidence that had built up over many years. The first step to accelerating their progress was to address this and create a more positive attitude and foster a risk taking approach to maths learning.

MSTs talked about the need to create a learning environment where students:

- are valued by the teacher and each other
- are active participants and active listeners
- take a co-operative learning approach and teach each other
- take risks and feel comfortable asking for help.

Examples of actions taken to achieve this type of learning environment included:

- creating an attractive welcoming maths room

- starting each session with a game

- using hands on materials and digital technologies such as laptops and cameras

- establishing working rules (a group 'contract')

- getting students to brainstorm what they want out of the session and listening to how the lesson went for them

- looking at the interests of the students and connecting maths to these interests

- using starter cards to help groups focus on talking and listening

- emphasising the importance of attempting challenging tasks and persevering and learning from mistakes

- praising effort and strategies used rather than outcomes

- having a fun maths problem solving day or game day with other MST students in other schools in the region

- doing practical work outside of the classroom, for example;

  o taking a catapult and water balloons outside to learn about measurement and calculating averages,

  o using a trip to an outside maze as an opportunity to practice geometry and statistics

- allowing students to take turns to be the recorder to give them an opportunity to focus on listening to each other's responses

- challenging students to politely disagree with each other and justify their view (analytical explaining)

- creating opportunities for students to develop leadership skills such as presenting a PowerPoint at assembly.

At a couple of schools, buddying or a peer tutoring approach was successful with some students.

Identify and target mathematics needs, have explicit goals for learning and high expectations for each student

MSTs noted the importance of starting from where the students were at and targeting their specific needs. The MSTs used data to support this and to monitor shifts in learning.

MSTs had high expectations of students (something which some students had not experienced in their normal classroom environment). The MSTs generally had goals in mind for individual students or groups of students but varied in the degree to which they were explicit about these with students. Most reported that they talked to students about goal setting, knowing where they are now, what their next step is and knowing how to get there.

> *They do need to know where they are at, particularly at stage 4 moving to stage 5. It's good for them to know they are at a specific level and the steps to take to move on. Kids want to know where they're at. They are not downhearted by the information. It makes for purposeful learning. (Classroom Teacher)*

One of the MSTs stressed the importance of teaching with urgency. Meaning there must be explicit teaching every minute with the child, with no excuses relating to transience or attendance issues. Teachers cannot think, for example, that students have got all year to get to stage 5, they should get them there sooner if they can.

Use of rich challenging tasks, familiar contexts and equipment

MSTs noted the importance of having challenging, rich, mathematical tasks because students rise to the challenge and the importance of using familiar and relevant contexts.

Examples were:

- re-writing problems by using the names of the students

- having a visual picture which may give a problem solving clue

- changing the context to a familiar context like a Pasifika theme (for example, siapo pattern for symmetry, familiar grocery items such as coconut cream)

- using te reo in maths teaching

- focusing on recent school events such as a zoo trip or camp

- using pictures that students drew themselves

- asking students to write story problems of their own to solve so they could connect better to mathematical ideas (for example, at one school a student discussed collecting cockles at the weekend which lead to much discussion about quotas and size limits. At the end of that lesson one student said "Why have we been talking about fishing and not maths?" and another replied "Oh I get it, it was maths, that was real maths").

They also highlighted the importance of using materials (such as tens frames, Slavonic abacus, hundreds boards, dices) — regardless of age of students — so that students can touch and move objects to help them to solve a problem and to help explain mathematical ideas.

> *You must use [materials]. There are still teachers who say seniors don't want them but it's nonsense.*
> *Kids will use them when not feeling judged. I might demonstrate new materials but kids choose. (MST)*

At one school the walls of the maths room featured a toolkit of ideas and strategies students could look at when thinking about how they might solve a problem.

A number of the teachers reported that over time they have taken an increasingly flexible approach to how ideas are recorded and that it is the thinking that matters. Using mini white boards was a popular approach (it allows students to take risks without committing their thinking to paper) along with shared modelling books.
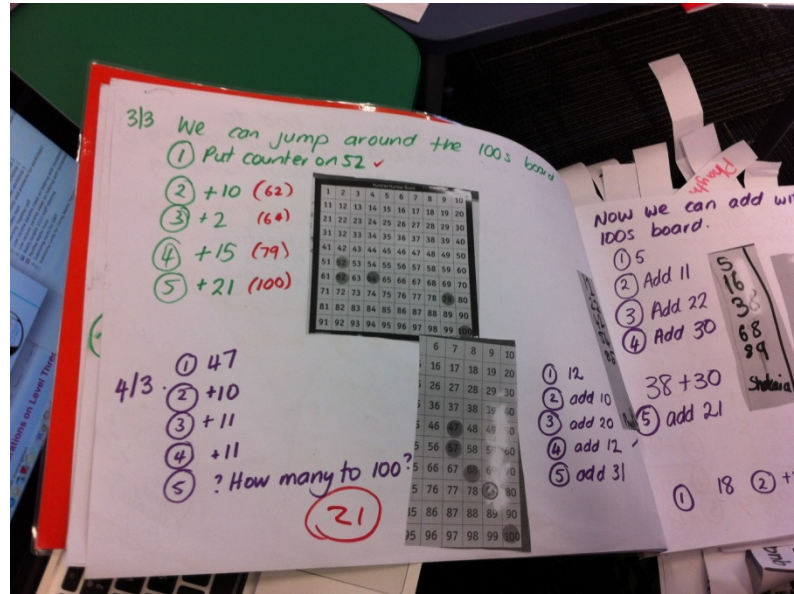
Focus on using maths language, problem solving and asking students to explain thinking

Most of the MSTs talked about focusing on teaching the language of mathematics, problem solving and getting students to explain their thinking.

A wide range of actions were used by teachers including the following examples:

- As a teacher:
  - talking less and focusing on helping students to explain and justify their thinking (rather than telling them what to do)
  - asking students questions to support them making connections for themselves
  - thinking aloud and modelling how to work out a problem
- starting each session with 'number talk' to engage students in mathematical argumentation
- teaching the language of mathematics, for example, spending time ensuring they know what a key word means; highlighting proper mathematical language; helping identify key words in a word story problem; spending time ensuring they understand the question before they go on to work on answering the question
- encouraging students to break down strategies into 'small chunks' or steps to follow and getting them to explain and justify each step
- giving students turns at being the 'teacher' and 'recorder' and giving feedback to others on how they solved a problem
- getting a student who needs more help to repeat an effective strategy used by another student and getting that student to become the 'teacher' and listen to whether the student had explained their 'strategy' accurately
- getting students to communicate their thinking using modelling books, learning walls, white boards, videos, photos etc.
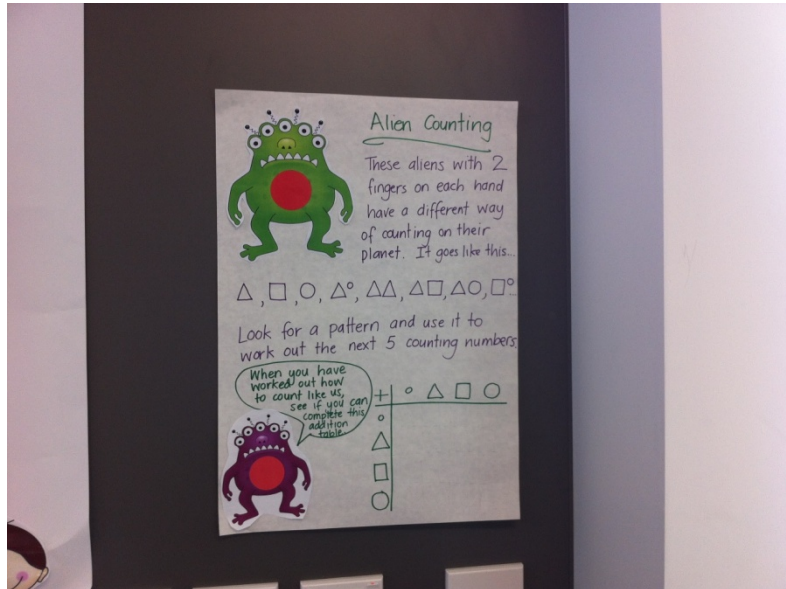
Taking a reflective and flexible approach to how needs are met

MSTs talked about continuously reflecting on their own teaching practice, listening to the students, thinking about what has gone well and not gone so well and making decisions about how to teach in the future based on these reflections. This means that it can be hard to write a 'recipe' for the programme.

Key areas identified for reflection included:

- reviewing group dynamics to ensure students were in a group which supports their learning and making changes to the make-up of groups if need be (e.g. creating a girl only group).

- modifying lessons to better meet the needs of students (e.g. changing tasks to create a familiar context)

- asking students to choose topics as a group and responding to this feedback

- spending more time on a topic or activity than planned when it appears needed

- identifying when a particular student may need some intensive support and providing additional one-on-one time to this student.

Allowing students time to think, process, reflect and practise

A number of the MSTs noted the importance for students struggling with maths of:

- allowing students time to reflect and process new information (more than they might get in their normal classroom)

- encouraging them to take their time — not to be fast! (speed is not what is important, the thinking process is)

- providing multiple opportunities to practise the same concepts over time.

Specific actions to achieve this included:

- revisiting specific confusions that students had

- allowing students time to record the steps taken to get their answer after they have had time to solve problems and share their mathematical thinking

- each group having a shared modelling book to encourage ownership of their thinking and provide opportunities for revisiting learning

- getting students to keep learning journals to record their thinking, their goals and changes in feelings towards maths

- opening the maths room before school for ' maths club' and encouraging students to come in and do problems to practise what they have learned

- providing a maths challenge each week in the school newsletter.

6.3 Important factors in supporting success with students

Across the eight schools visited five key factors were identified as important in supporting the MST programme to achieve success with students:

1. A focus on using data and on teaching as inquiry in the school

2. Investment in upskilling classroom teachers and a whole school approach

3. Leadership support from the Principal and Board of Trustees and a commitment to making it work

4. Dedicated teaching resource and ideally a dedicated maths room

5. Effective engagement with parents and whānau.

The eight cases study schools varied in the degree to which these factors were in place at their school. When a factor was not strong at a school, it was identified as an area where the school felt more could have been done (or done more effectively) to support the MST programme.

A focus on using data and on teaching as inquiry in the school

Most of the schools reported that they had improved their use of data over time and that they have a focus on teaching as inquiry in the school. Use of data in the school had generally been strengthened through involvement in the MST programme – some described it as having 'sharpened their focus on data'. These schools had become more confident in their use of data and are using it in more sophisticated ways to inform planning.

> *We've always tried to use data to identify student needs but over the years tools and interpretation have become better, for example, using PAT maths, GloSS and teacher observations. So the quality of data has improved and hopefully the programme helps the children at a finer level than in the past. (Classroom Teacher)*

> *Before we used it to set goals etc. but [involvement in the MST programme] has seen it become more fine-tuned, and in depth — for all teachers not just senior management. We use it for goal setting for all students. (Principal)*

> *The kids change — every cohort is different, that's why data is so important. It would be easy to go along blindly but we constantly review and adjust. (Principal)*

Specifically, data was used to drive the MST programme, for example, helping to:

- identify specific years and students within those years to be targeted for maths support

- identify specific areas of maths weakness to be addressed

- monitor students to check that they continue to be on track

- identify areas for staff professional development.

Data also allowed schools to see that the MST programme was beneficial and demonstrate the success of the programme to the Board of Trustees. In some cases this resulted in a decision to continue with the programme in the school following the end of the funding period from the Ministry of Education.
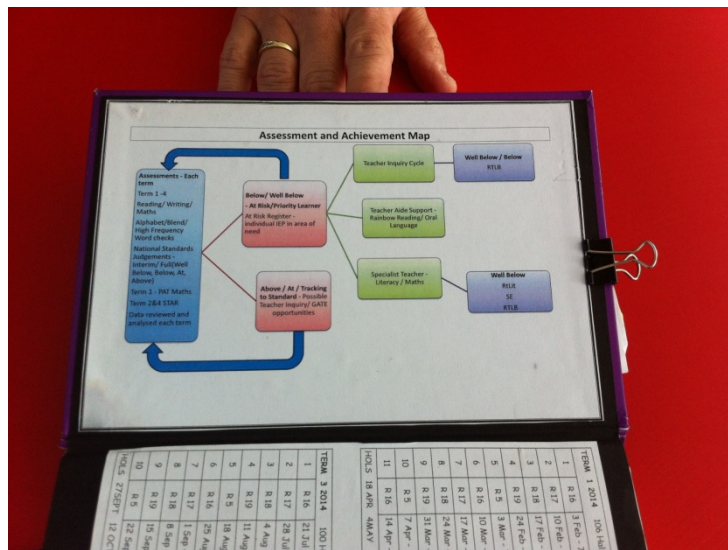
Investment in upskilling classroom teachers and a whole school approach

In most of the case study schools the MST worked with other teachers at their school to support the MST programme students and other students at the school. The MSTs worked on upskilling teachers and ensuring that teachers across the school were reflecting the MST approaches in their maths delivery (thereby reinforcing the MST programme).

Having the MST as the numeracy leader and/or deputy or assistant principal in the school gave them status in the school, and enabled them to drive what was happening in the wider maths programme in the school — well beyond their MST responsibilities.

> *Teachers have become more consistent with teaching and assessment. X has supported us with that. Having someone strong leading numeracy, she always knows what to do. (Classroom Teacher)*

> *I don't understand why [the MST] wouldn't be the maths leader in the school — that's the person looking at planning and resourcing programmes and it's essential that the MST is involved in those decisions... It would definitely not work as well if not in one role; you would not get the same movement with the professional development focus — you need an experienced person. (MST)*

The number and nature of specific actions taken by the MST to upskill teachers and ensure a school wide approach varied across the case study schools but included:

- keeping in touch with classroom teachers of students on the programme to keep them informed of progress, get feedback and share ideas

- meeting with teachers and going through results of assessments and discussing the outline of the programme and any concerns

- engaging in professional discussions with teachers, both formally and informally (for example, in the staffroom or 'on the run')

- undertaking learning conversations with the maths curriculum team

- sharing knowledge, information, readings, games, activities and other resources

- running workshops with staff to share what has been learnt from the professional development provided as part of the MST programme

- having staff observe MST working with students

- modelling lessons to teachers in their own classrooms

- undertaking observations of classroom practice of teachers and providing detailed feedback and feed forward[6]

- up-skilling teacher aides through workshops and monitoring their work

- selecting teachers from syndicates (curriculum teams) to form an inner circle team to model what the MST is doing

- providing an open door to teachers if they have questions or need ideas or help.

Some MSTs felt that discussions with specific classroom teachers worked best when done informally or through a mix of formal and informal approaches.

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[6] Feedback focuses on past or current performance while feed forward focuses on future performance and is about providing constructive guidance on how to do better in the future.

There used to be a 15 minute slot to discuss the students' progress but trying to find the time was very difficult and a shame factor crept in — when it was a formal process it was seen as a mini appraisal rather than me giving feedback about the student. It's better if I see the class teacher in the staff room to have an informal chat, or I volunteer to do sport and talk to them during that. (MST)

The degree of success in upskilling teachers and ensuring a whole school approach varied across the schools. Credibility of the MST and ability to work sensitively with teachers was important in driving change (see earlier discussion about characteristics of an effective MST). Trust and respect are extremely important components. A school culture where staff are open to learning, see themselves as learners and feel comfortable asking for help also makes a difference (see earlier discussion about school culture).

Lots of teachers are excited about [the MST] coming in to the class. We all probably feel a bit uncomfortable but every term we are observed for something and it's natural to feel uncomfortable being watched. I will probably be very nervous but I know it will be helpful and non-judgemental and will drive student achievement. (Classroom Teacher)

Classroom teachers talked about the positive impact on their knowledge and teaching practice.

Observing [the MST] working with students has made a difference to me as a classroom teacher. For example, it has made me think more about the pedagogy of it, what students need to scaffold them, to get students to talk about their learning. Also, using students to model and teach each other more, it helps others to click on doing partner work and discussing it in a group – these things have helped hugely for me. (Classroom Teacher)

My teaching practice has improved markedly. Having a specialist teacher, I know I can refer to her and I do. She will know the answer or will find it. R will look at your programme, ask if you're maximising the learning time. It's a fresh set of eyes. There's a lot of feedback and observations and it's useful. I know I can always go to her. (Classroom Teacher)

This year the main thing I do differently is when I have a maths group everyone has a buddy and it's not me posing problems and one person answering. Now it's you all talk about it and how you worked it out. It's working so much better because they are all involved and all accountable. (Classroom Teacher)

Principals and classroom teachers at some of the schools talked about seeing school wide changes happening such as:

- maths being at the forefront in the school

- increased talk about maths between teachers and teachers using more maths language

- teachers becoming more confident in maths assessment and the use of data

- having a greater understanding of the maths curriculum and how to deliver it

- changed practice observed in the classroom (for example, a more hands on approach and less 'teacher up front')

- teachers setting numeracy goals in their professional development planning

- a generally more consistent and cohesive whole school approach.

You've got to accept it as something important and embed it, have consistency and consider it as part of the school. … MST is part of the daily conversation — feeds in and out of school maths programme. The strategy and approach [the MST] uses with delivery is part of it. A lot of what [the MST] is doing

with kids e.g. getting kids to reflect on learning — is spinning off into classes. Has certainly influenced how we deliver the curriculum. (Principal)

Working with teachers, and management input — keep communication open. Teachers see a lot of programmes come and go... you need them on board and to share learnings. That helps when kids go back into the classroom.... Everyone is on the same page with learning a strand, using the maths language. (MST)

Professional conversations are had more readily; they are part of staff and syndicate meetings. MST was the starting point for doing this across other areas. Teachers have come a long way with observations, more open to it, taking feedback and critique. [The MST] knows her stuff and other teachers take on board what she says, and teachers use it to set goals. (Principal)

Leadership support from Principal and Board of Trustees and a commitment to making it work

MSTs and Principals talked about the importance of the programme being underpinned by leadership support from a Principal who values the programme and commits to making it work.

In schools where this has been the case, the Principal has demonstrated his/her support by a range of actions. These varied somewhat across the schools but generally included most or all of the following:

- putting trust in the MST to 'get on with it' while providing support through engaging in dialogue with the MST about the programme

- organising staffing so the MST does not have a class of their own and not removing the MST to do other duties

- providing a classroom that is set up as a maths learning environment

- providing additional funding for mathematics resources

- providing opportunities for the MST to facilitate staff meetings and other professional development with staff

- ensuring that the MST is able to attend all necessary professional development seminars

- allocating time at Board of Trustees meetings for reporting on the progress of the programme and on student achievement

- talking positively about the MST programme to staff in the school.

  We all walk the talk. I think its commitment, consistency and no compromise. My role is to have the relationships and structures in place to make it happen. For example, I tried to get staffing support for a third year of MST but I couldn't — I could have given up. You need a leader committed to it and that's my role. (Principal)

  Always when I'm feeding data back to staff [the Principal] tells them we're moving children on and acknowledges my work. (MST)

  My leadership is on the strategic side — pushing to get MST in the school and having a quality MST, having withdrawal groups as well as professional development, getting the resourcing to keep effective programmes going. (Principal)

The importance of having the support of the Board of Trustees was also acknowledged by MSTs and Principals. Where this has worked best, the Board of Trustees has been kept well informed of the progress of the MST programme and has

been provided with evidence of the programme impact. This has resulted in the Board of Trustees supporting the programme. For example, at one school the Board spent $20,000 on resources for maths materials.

Some MSTs and Principals talked about it being important for the Board of Trustees to place trust in the Principal and for the Principal to trust the MST in order for the MST programme to be successful in a school.

> *The [MST] can just [make changes] but she'll tell me if it is working or not. She's the numeracy leader and I trust her. (Principal)*

> *Once a term I give feedback to the Board on the data and they have funded it this year and next year and asked what else they can do. They're very supportive. They can see the results for the school and the community. (MST)*

Reflecting the MST programme in the annual plan and charter was another way of showing the school commitment to the programme and ensuring it was embedded in the school.

Dedicated teaching resource and dedicated maths room

Principals and MSTs at most of the case study schools felt it was important for the MST to be a dedicated teaching resource. In 2013 at five of the case study schools, the MST did not have a class. In most cases, they focused on being the MST along with fulfilling the numeracy leader and/or another leadership role at the school. At schools where the MST retained a role as a classroom teacher they talked about this being a challenge. One school talked about seeing the advantages of having a full time MST but not being able to do this as a result of resourcing issues.

> *I've tried doing this as a classroom teacher and you're so busy — there are things you just can't do. Being able to focus on this makes a big difference. I wouldn't recommend doing this and being a classroom teacher. (MST)*

> *MST has no class, and is not pulled out for relieving — there's no compromise. X is 4 days MST and 1 day release — the MST programme is not compromised (Principal)*

A dedicated maths room where materials are readily available was also regarded as ideal. The room supports the focus on maths and the commitment to the programme and provides a room without the distractions of the classroom. It can also create a sense of ownership amongst students.

In schools where there was a dedicated room, this room was generally decorated with examples of learning, ideas for maths strategies, photos of students etc. and had workstations and materials set up in the room ready for use. At some schools classroom teachers also made use of the maths room with their own class when they wanted to use work stations and materials and/or students were allowed to use the room before school or at lunchtime. Having a dedicated room was not achieved in all of the case study schools.

> *Last year we decided we wanted a room, as a priority. …Now Room X is the maths room — a dedicated person and space and teachers see it as a key place for maths. They don't think of MST as a programme — it's part of the curriculum, part of learning. (Principal)*

> *You need a decent, specific place to run it — it shows respect to the teacher and why you are running it, shows a commitment to it. (Principal)*

Engaging parents and whānau

Principals, MSTs and classroom teachers generally felt that effectively engaging with parents and whānau is an important factor in supporting the success of the MST programme with students. Positive maths talk and support at home can make the difference to a student progressing and getting the most out of the MST programme.

> *It helps because the child thinks there is a purpose. If their parents are not interested the children are not. (MST)*

All of the schools struggled, however, with engaging with parents and whānau and felt they could have done better in this respect. It was noted that parents are not as familiar or confident with supporting maths learning as they are with supporting learning to read. Parents may also hold their own negative attitudes towards maths or are busy with work and other commitments.

Some MSTs felt that it is less important for parents to be able to help their children to do maths and more important that they encourage their children to see the value of maths and to persevere with it (rather than taking the attitude that 'you're born with a maths brain or not' or saying 'don't worry I was no good at maths either').

> *Just encourage kids — parents don't need to know the answer, it's the working on problems, and getting children to persevere. (MST)*

Schools reported using a range of strategies to engage parents and whānau. Some strategies were more successful than others. Less successful strategies appear to be the more formal approaches such as letters and leaflets, inviting parents to come to the MST programme, parent teacher interviews, sending home portfolios of work for parents to comment on.

More successful strategies appear to be less formal and less potentially threatening. The following are some examples of approaches which were found to be relatively successful:

- Texting parents to touch base and provide positive feedback on their child's progress in maths (this builds trust and can lead to parents ringing or coming in to meet the MST of their own volition).

- Holding a family maths session rather than a parents only maths session and using MST students as maths helpers on the night along with having different fun work stations set up for families to work on.

- Getting the students themselves to bring their parents into the MST programme for a visit which was more casual and not appointment based.

- Holding an afternoon tea or a maths evening with a free take home pack of maths activities.

- Providing an after school Doing Maths Together programme (3 workshops held over several weeks) where students made the invitations and food was provided.

- Holding a whole school maths evening which was open to all families but targeted the families of MST students. Students made personalised invitations for their parents. Parents registered attendance to get a free gift pack with games from Spring into Maths, and a few chocolate coins, dice etc. There was a gold coin barbeque to start the evening and families played maths games.

- Taking a whole school approach to the engagement of parents and whānau rather than a maths specific focus. One school opened itself up as a community resource. Every week there is a community event at the school, for example, yoga and boxing. The school is also using the Mutukaroa[7] approach to home-school partnership. This includes interviews with parents, sharing data with them, giving tuition in what the data means, and setting home and school goals — across all areas. The numbers of parents coming to interviews have increased. Mutukaroa starts in the junior school and now the school is looking at doing this with senior students.

Getting students involved can be a successful strategy (parents will come if their children ask them rather than the school asking) along with creating a non-threatening environment. Providing food and take home packs can also make it more likely that parents will attend.

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[7] http://mutukaroa.org.nz/

6.4 Value of MST professional development and other useful resources

All of the MSTs acknowledged the positive impact on themselves by being involved in the MST programme and its associated professional development (particularly the MST post-graduate papers) despite the challenge of the workload involved. They talked about it changing the way they teach (particularly with students that are struggling) and encouraging them to experiment and try different things. They talked about gaining a greater appreciation in a range of areas including:

- the importance of having high expectations

- the importance of providing students with more processing time

- knowing where children are at and how to push them

- the learning progressions from stages 1 to 8 and how to identify with ease the gaps in knowledge that restrict students to apply strategies to solve mathematical problems

- the difference between students doing 'procedures with connections' versus 'doing mathematics'

- how to use more scaffolding and mathematical talk with low achievers

- the value of having mixed ability groupings

- the value of using a talk-moves approach (asking questions that motivate student reflective thinking, asking students to restate someone else's reasoning, using wait time, etc.)

- the value of using videos as a reflective tool.

> *[The papers] gave me strategies to help struggling students. Prior, I had done papers in maths and as part of X Numeracy Cluster I had done papers — all have really helped with knowing what is effective. Without it I wouldn't know how to move students. You need the post grad papers to make the MST effective. (MST)*

> *Working with intelligent, passionate people with a wealth of knowledge — you can't put a value on it... it's the most amazing learning I've ever done. The first paper challenged my teaching and understanding of students' maths anxiety. The paper made me reflect on my ability as a practitioner and exposed me to the research and practical experience. In your normal geographic cluster you wouldn't get the exposure. If you're always in one school that's all you know. (MST)*

> *I've grown a lot with the professional learning from university, I've really enjoyed it — though it was bloody hard time wise. I go to maths professional learning meetings and I really enjoy it but I miss the MSTs being together and sharing ideas. I didn't do the same papers as the others because I didn't have a degree — I did a research paper and one other and really enjoyed it. (MST)*

Some of the specific resources identified as particularly useful were:

- Carol Dweck — Growth versus Fixed Mindsets

- Judy Storeygard (editor) — My Kids Can

- Best Evidence Synthesis — Effective Pedagogy in Mathematics.

Other resources also mentioned as useful included:

- Professor John Hattie — Visible Learning

- www.nzmaths.co.nz/alim-resources

- NZCER's Assessment Resource Banks

- the Ministry of Education's Curriculum and Numeracy Books; Ka Hikitia and Tātaiako

- Education Review Office documents: Mathematics in Years 4–8; Accelerating the progress of Priority Learners in Primary Schools; Teaching as Inquiry: Responding to Learners

- the Current Issues in Teaching Mathematics university paper.

Some MSTs found that working closely with other MSTs in the local area providing mutual support and collaboration was very helpful. One region had in place a Facebook page as a forum for reflection and discussion of the programmes running in their schools.

7. Creating sustainability after the programme finishes

Key factors identified in creating sustainability were:

- leadership, commitment and support from the Principal (an attitude of making it work)

- the school planning for sustainability from the outset through investing in up-skilling classroom teachers and ensuring a whole school approach (not just taking specific students out of the classroom for intense programme)

- using data to provide evidence to the Board of Trustees and others (e.g. school staff) that the programme has significant value in accelerating progress of students (getting 'buy-in')

- commitment to the programme and support from the Board of Trustees.

    I'm hoping my successor (next year) will recognise this as something of value. The attitude of some schools is if the Ministry of Education doesn't support it we won't do it but you can make things work. (Principal)

    Initially my plan was two years with maths as a curriculum development area, extended to three years now. I think even next year we will run MST and I hope it will be full time still. (Principal)

    Do it in the early years, have parents on-board, have the support of the Principal and Board. With other teachers you should try and up-skill but it all depends on the person – they need to be open to it. If management are willing to make a difference, you will see it — it has to come from the top down. …There should be testing of children every term not just twice a year or once a year. Teachers should have maths targets and discuss results. We must support children and teachers. That would take commitment from the senior management team — it needs to be driven otherwise it will just fall by the wayside, teachers are so busy. (MST)

These findings fit with 2012 research findings on conditions for success and sustainability in relation to the MST programme.

Achieving sustainability was felt to be a challenge and the eight case study schools varied in the degree to which the MST programme continued to be in place in 2014:

- four of the case study schools are continuing to provide the MST programme at the same 'strength' as they did in 2014 despite no longer receiving funding for the programme from the Ministry of Education and finding it a real challenge financially

- one school is providing the programme as a result of new funding from the Ministry of Education but noted that they will not continue the programme when this funding runs out due to other priorities[8]

- two schools are continuing to provide the MST programme but not to the same extent as in 2013

- one school no longer has the programme in place and little appears to have been sustained at the school from the programme.

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[8] This school has extremely high numbers of students with English as a second language and Ongoing Resourcing Scheme funded students.

Some schools noted that without funding from the Ministry of Education it becomes a year by year decision and while the programme may still be in place in 2014, this may or may not be the case in 2015. Factors impacting on this included other priorities for spending school resources, staffing entitlement and roll growth. Some schools were more confident than others that they had embedded the programme sufficiently for it to be part of normal school practices.

> *If it gets results and nothing better comes up — we're always looking, cherry picking from other ideas — should it be for a longer period? A shorter period? For example we've changed the timetable to have maths five days a week, we're constantly reflecting and reviewing. In an intermediate, every year you lose half the roll, it is very hard to plan, there are fluctuations with cohorts. There is no certainty — teachers, programmes may have to go. (Principal)*

Some Principals felt confident that they could sustain their MST programme even if their MST left. Others were not.

> *If [X] left there is enough knowledge and skills in the school. MST would be sustainable, and others could step into the role competently to lead junior or senior teachers- maybe not the whole role, as [X] is very competent throughout the syndicates. (Principal)*

> *If [MST] left — that's my concern — who would step up? [She] is helping with succession plans but she has big shoes to fill. Something as good as MST we don't want to lose. (Principal)*

A couple of Principals noted that they have taken what they have learnt from the MST programme into other areas of the school and ideally would like to do more of this type of programme.

> *The philosophy of it and the way we manage it. I would structure a W(riting)ST in the same way — and there's a real student need there. (Principal)*

8. Conclusions

The MST programme was an effective way to raise student achievement for students well-below the National Standard in mathematics in the case study schools. It also impacted positively on the confidence of students in doing maths and their attitude towards it.

Strategies that the case study schools found worked best with students well-below in mathematics can be summarised into eight key areas:

1. get to know your students

2. withdraw students so they can experience an intense focus on maths learning while still receiving their normal class programme

3. create a positive fun maths environment, fostering positive mathematical identities and empowering students

4. identify and target mathematics needs, have explicit goals for learning and high expectations for each student

5. use rich challenging tasks, familiar contexts and equipment

6. focus on teaching mathematics language, problem solving and asking students to explain thinking

7. take a reflective and flexible approach to how needs are met

8. allow students time to think, process, reflect and practice.

The research provided findings about what needs to be in place in a school for it to be able to run the MST programme successfully with well-below students and for the programme to be sustainable.

The most significant factor in setting a strong foundation for the MST programme 'to fly' was selecting the right person to be the MST. A school culture with high expectations of students, teachers open to being learners themselves, and strong links to parents and the local community also helped.

The degree of programme success varied across the eight case study schools depending on the extent to which the following were in place during the programme:

1. a focus on using data and on teaching as inquiry in the school

2. investment in upskilling classroom teachers and ensuring a whole school approach

3. leadership support from Principal and Board of Trustees and a commitment to making it work

4. dedicated teaching resource and ideally a dedicated maths room

5. effective engagement with parents and whānau.

Key factors in creating on-going programme sustainability once Ministry of Education funding was no longer in place were:

1. leadership, commitment and support from the Principal (an attitude of making it work)

2. the school planning for sustainability from the outset through investing in up-skilling classroom teachers and ensuring a whole school approach (not just taking specific students out of the classroom for intense programme)

3. providing evidence to the Board of Trustees and others (e.g. school staff) that the programme has significant value in accelerating progress of students (getting 'buy-in')

4. an on-going commitment to the programme and support from the Board of Trustees.

MSTs acknowledged the positive impact for themselves of being involved in the MST programme and its associated professional development despite the challenge of the workload involved. They talked about it changing and improving the way they teach (particularly with students that are struggling) and encouraging them to experiment and try different approaches.