

Individual Students' Pathways of Achievement in Mathematics, Reading and Writing

In this study, we were particularly interested in seeing how the performance of individual students changed over time, to provide a basis from which to investigate the factors that may impact on how different students progress at school. While the previous chapter looked at the overall achievement trends for all students over the four phases of the study the analyses involved did not enable us to see how individual students' scores altered from phase to phase. In this chapter, we now look more closely at student achievement pathways in each of mathematics, reading and writing.

For the analyses below, students' achievement has been grouped for each subject according to whether their results improved, stayed relatively the same, or declined between each phase of the study. For the purposes of this simple analysis, scores that stayed relatively the same were calculated using the 95 percent confidence interval between each of the phases.

No students were consistently in the bottom quartile for mathematics, reading and writing across all phases.

Potentially, there were 27 different pathways that a student's achievement could take in each subject area. The following discussion examines the main patterns which emerged when we looked at individual students' achievement in mathematics, reading and writing over the four phases of the study. Different trends were evident for each of the three subject areas but generally there appeared to be greater movement, both up and down, in students' scores in mathematics and writing than in their reading scores.

We found that no students were consistently in the bottom quartile for mathematics, reading and writing across all phases, whereas three students were consistently in the top quartile for each of these subjects across all phases.

Changes in individual students' achievement in mathematics

Mathematics achievement of eight students continually improved over all phases.

Although average student achievement in mathematics decreased as students moved from Year 8 to Year 9, as evidenced in Figure 1, we found that when we looked at individual student achievement pathways there were eight students whose mathematics scores continually improved over all phases. These students were predominantly middle to high achievers.

Around a third of students (N=27), however, displayed less consistent achievement patterns, with their scores deteriorating between Phases 1 and 2, improving between Phases 2 and 3, and then dropping again between Phases 3 and 4.

The achievement pattern for a further third of students also showed a decrease in scores between Phases 1 and 2, improved scores from Phase 2 to Phase 3, but then either improving again (N=16) between Phases 3 and 4 or remaining relatively the same (N=11).

The achievement pathways of the remaining 22 students are not reported on as the numbers in each group were small and their patterns varied.

As evidenced in Figure 3, the mathematics achievement of students in this study followed 16 different pathways. The main trends, as discussed in this section, are depicted in Figure 3 by means of the 'bolded' (black) lines.

One student's performance in mathematics consistently decreased over all phases. A brief profile of this student, Samantha²⁵, follows.

²⁵ This is not the student's real name (nor is it the name of any other student in our study).

Samantha

By Phase 4, Samantha had one of the lowest mathematics scores of all students in our sample.

Although she had been extremely positive about mathematics in Year 8 (selecting the most positive options on the asTTle attitude questions) and told us that mathematics was one of the subjects she liked best, once in secondary school (Phases 2, 3 and 4 of the study), her attitude scores consistently fell within the lowest quartile when looking at participating students' attitudes overall towards this subject.

Her achievement scores progressively decreased from 582 in Year 8, when she was achieving in the middle half of all students, to 433 in Year 10.

During our interview with her at the end of Year 9 she said that mathematics was now one of her least favourite subjects. At the same time, she also described her relationship with her mathematics teacher as 'not very good', stating that:

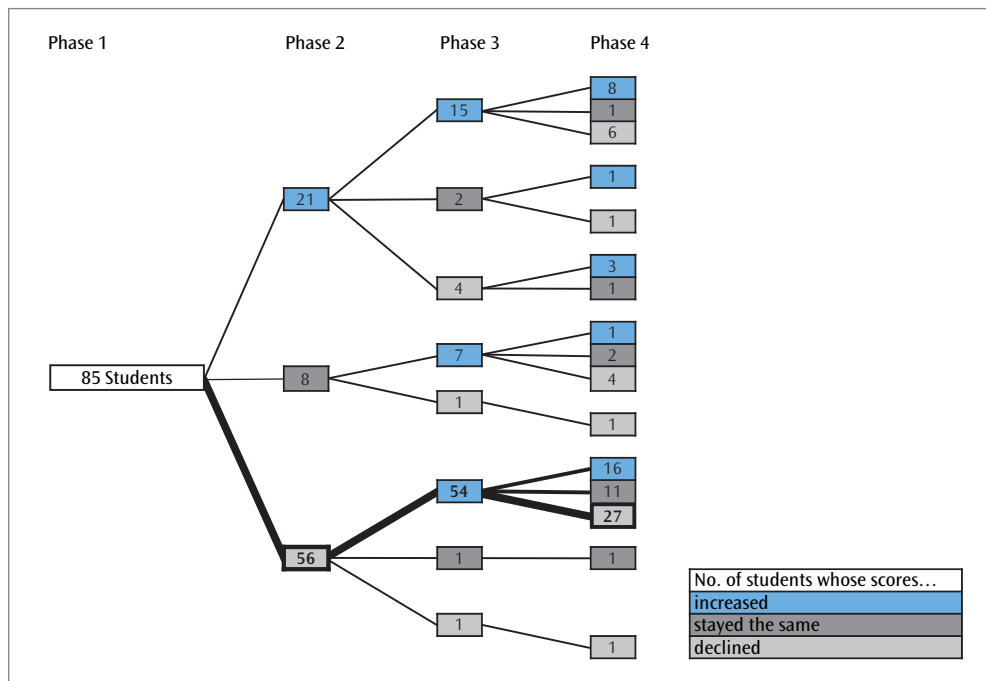
"Sometimes he can get very grumpy and he takes his anger out on other students [in the class] that didn't cause the problem."

Interestingly, however, her mathematics teacher in Year 9 felt their relationship was mostly positive and that Samantha liked mathematics.

Despite not enjoying, or doing well, in mathematics at secondary school, there were many aspects of school that Samantha enjoyed and subjects she did achieve in. She particularly enjoyed English, performing arts and music.

Samantha did reasonably well in our asTTle writing assessments, scoring in the middle half of all students in Phases 1, 3 and 4 and in the top quartile in Phase 2. She was less consistent in reading, however, achieving in the middle half in Phases 1 and 3 and in the bottom half after the transition to secondary school (Phase 2) and again after the transition into Year 10 (Phase 4).

Figure 3: Students' achievement pathways in **mathematics** (85 students)



Changes in individual students' achievement in reading

Fourteen individual achievement patterns in reading were identified.

An analysis of individual students' reading achievement revealed 14 different pathways; however, over half of the students followed two main trends, as illustrated in Figure 4 (in bold).

One of the two main pathways showed that around a quarter of students (N=20) improved their reading scores at each phase of the study, suggesting the transition from primary to secondary school had little or no adverse impact on their reading achievement: to the contrary, there appeared to be a positive effect (leaving 'maturation' aside). Most of these students had been achieving in the middle half or bottom quartile in Phases 1 and 2.

However, an even larger group of students (N=27) exhibited a different achievement pattern. Their achievement dropped between Phases 1 and 2, increased between Phases 2 and 3, and then increased again between Phases 3 and 4. These students had been mainly achieving in the top quartile in Phase 1.

The scores of a further nine students improved from Phase 1 to Phase 2 and again from Phase 2 to Phase 3, but either remained much the same (N=5) or dropped (N=4) when the students were assessed in Phase 4. Eight students, whose achievement scores stayed relatively the same between Phases 1 and 2, improved their scores between Phases 2 and 3 and improved once more between Phases 3 and 4.

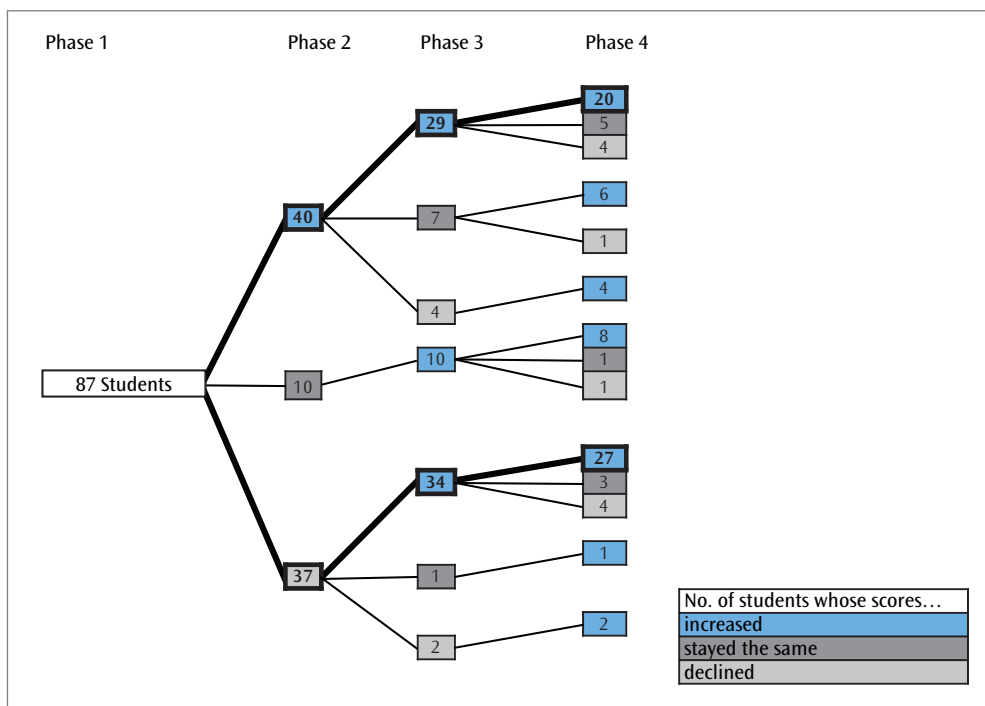
Reading scores achieved by the remaining 23 students varied considerably, with no clear patterns evident.

The majority of students improved in reading once they were in secondary school; the same trend was evident in the national asTTle dataset (see Figure 2). However, this trend, while true overall, was not consistent for all students at all phases. For example,

the reading scores of six students decreased from Phase 2 to Phase 3, but by Phase 4 (when they were in Year 10) had improved again. In contrast, while nine students' reading achievement scores improved between Phases 2 and 3 they declined in Phase 4.

The majority of students improved in reading once at secondary school, repeating the overall trend in the asTTle national dataset.

Figure 4: Students' achievement pathways in reading (87 students)



Changes in individual students' achievement in writing

There was considerable variation in the movement of students' writing scores as they progressed from Phase 1 through to Phase 4, with 23 different pathways of achievement evident. We were, however, able to identify two main patterns, which are highlighted in Figure 5.

There was considerable variation in writing scores over the course of the study.

In the first case, students' scores improved between Phases 1 and 2, improved again between Phases 2 and 3, and then declined between Phases 3 and 4 (N=11). In the second case, students' achievement decreased between Phases 1 and 2, improved between Phases 2 and 3, and then decreased again between Phases 3 and 4 (N=11). The scores of a further six students decreased between Phases 1

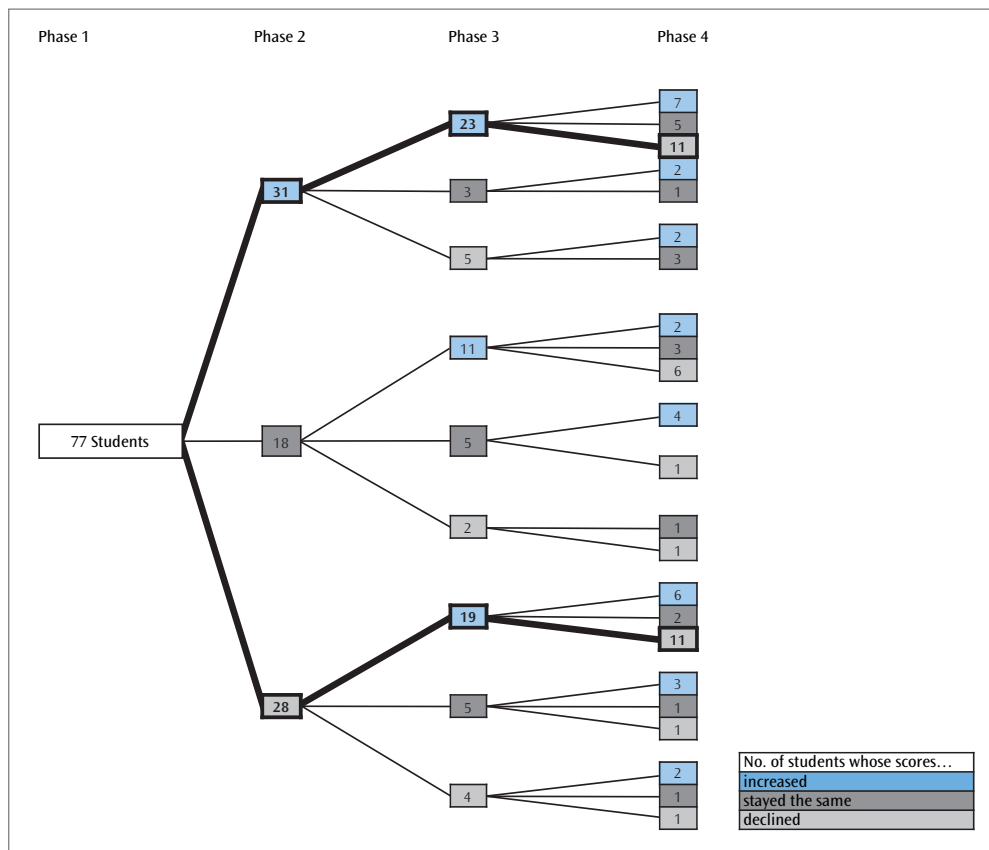
and 2, increased between Phases 2 and 3 and then increased again by the final phase of the project.

Seven students continually improved in writing at each phase. Three of these students were achieving in the top quartile and four were in the bottom quartile.

The achievement scores of a further six students stayed relatively the same between Phases 1 and 2, increased between Phases 2 and 3 and then decreased between Phases 3 and 4.

The writing scores of one student consistently dropped over the course of the study. Further details about Ramesh²⁶ are outlined in the following mini case study.

Figure 5: Students' achievement pathways in writing (77 students)



²⁶ This is not the student's real name (nor is it the name of any other student in our study).

Ramesh

In Year 8, Ramesh scored slightly below the 25th percentile for participating students' writing scores. However, his scores progressively worsened over the next three phases of the study, with his Phase 4 (Year 10) writing score being one of the lowest achieved by our students overall. His attitudes towards writing were also particularly low. In Phase 4, his attitude towards writing was the least positive of all the students in the study.

Ramesh is from India and when we interviewed him in Phase 1 he had only been in New Zealand for three years. English was not his first language. While it is not surprising that writing was not one of Ramesh's strengths, it is of concern that there was no improvement in his writing scores over the course of the study.

In Year 8, his teacher commented that his reading and writing were 'below average' and that he had received reading support during the year. His aTTle reading results were in the middle half of all students in Phases 1 and 3 but in the bottom quartile in Phases 2 and 4. His English teacher in Year 9 also described his achievement as 'below average'. She commented that:

"Ramesh attends class regularly but is not focussed. He has not settled into class routines and is usually off-task."

In contrast, mathematics was one subject he consistently said he enjoyed and considered he was good at. His Year 8 teacher described his overall level of achievement in mathematics as 'average but very good in some aspects'. His Year 9 mathematics teacher also assessed his ability in this subject in the same way. One of the reasons Ramesh felt he was good at mathematics was that his father helped him with it at home.

Other subjects he enjoyed at school were PE and social studies and despite not liking writing and not doing well at it, Ramesh also nominated English as a best liked subject.

When we looked at the achievement pathways in writing for the remaining students (N=35) the numbers in each grouping were too small to warrant further discussion.

Summary of students' pathways of achievement in mathematics, reading and writing

There was greater variability in students' mathematics and writing aTTle scores over the four phases of the study than there was in their reading scores.

We found that almost all students improved in reading once at secondary school. While there were a few students whose reading scores either dropped between Phases 2 and 3 and then improved in Phase 4 or, conversely, improved between Phases 2 and 3 and then dropped in Phase 4, there were no students whose reading scores consistently decreased at each phase of the study.

In mathematics and writing, however, there was one student in each case whose achievement scores in that subject declined throughout the study.

In mathematics, around a third of students experienced a drop in their achievement over the transition from Year 8 to Year 9 (i.e. Phase 1 to Phase 2), improved their performance during Year 9 but then experienced another drop in their scores as they moved from Year 9 to Year 10 (i.e. Phase 3 to Phase 4), suggesting a second 'transition effect' as they moved on to a different year level at secondary school. Eight students continually improved their mathematics scores at each phase.

Students' writing scores fluctuated over the course of the study. Seven students, however, continued to improve at each successive phase.

Three students consistently achieved in the top quartile for mathematics, reading and writing in all phases. We look more closely at some of the characteristics of one of these high achieving students, Marcus²⁷, in the case study which follows.

There was greater variability in individual students' mathematics and writing achievement than in their reading achievement.

²⁷ This is not the student's real name (nor is it the name of any other student in our study). As well as the name change, we have altered certain identifying details about the student in the interests of preserving anonymity.

Marcus

Marcus was one of the highest achieving students in our study, consistently scoring in the top quartile for mathematics, reading and writing at each phase.

Although very academically able, his Year 8 teacher had worried that he might struggle socially with the transition to secondary school as he did not fit in well with many of his Year 8 peers and could be perceived as a “geek”.

His parents also expressed concern that Marcus would not cope very well with the transition and felt that his primary school had not prepared him well for the move in terms of coping with the increased workload and responsibilities. They were concerned too that the secondary school their son was enrolled at did not have the best facilities to cater for his interests in music and computing. This school was not their first or second choice of secondary school for him. But despite this Marcus settled in well at secondary school and made new friends.

Views about his friends

The larger pool of students at secondary school enabled Marcus to find like-minded people to hang out with and he enjoyed a range of new activities and became more self-confident as he progressed through Year 9 and into Year 10. He told us that one of the best things about being at secondary school was the different mix of students and making new friends.

Marcus was consistent in how he felt about his friends over all four phases of the study, each time considering he ‘definitely’ had good friends at school. He also mentioned having friends who went to other schools. He felt he could trust his friends most of the time and could talk to them if he had a problem. His friends did not get into trouble, wag school, or push him to do stupid things.

Although in Year 8 his class teacher felt that his friends had no particular impact on his learning and on his behaviour in class, at the end of Year 9 his form teacher, as well as his mathematics and English teachers, all agreed that his friends had a positive impact on his learning and behaviour.

Views about his parents

Marcus also appeared to have a good relationship with his parents and indicated that he felt close to his family. He considered that he usually got along well with his parents and that they trusted him. Although he felt his parents cared about him and would be there for him if he needed help, he did not always feel he could tell them his problems and troubles and sometimes felt they did not understand him.

His interests and hobbies

Marcus was very proficient on the computer and told us he would like to pursue a career in the computer industry when he left school at the end of Year 13. He watched very little television and in his spare time said he would mostly do things on the computer, read, or play electronic games. Outside of school, he also regularly played the guitar and attended a youth group.

Marcus told us he ‘definitely’ enjoyed reading and in Year 10 said he read for fun or interest every, or almost every, day. Marcus estimated that there would be somewhere between 200 and 500 books at his house.

In Year 9, he also joined one of the school’s cricket teams, which he enjoyed.

Marcus – *continued*

Views about school and learning

At each phase of the study, Marcus ‘definitely’ enjoyed going to school and knew education was important in order to eventually get a good job.

In Year 8 at primary school the subjects he liked best were mathematics, reading, science, music and technology. Early in Year 9 he was enjoying music and computers, as well as the experiments they were doing in science. At this stage, he mentioned liking mathematics and social studies least because he said most of the lessons involved copying from the whiteboard or from text books, which he said was “*boring*”.

By the end of Year 9, mathematics was one of the subjects Marcus liked best, as well as least. Although he enjoyed it when they were learning new and interesting things he was critical of his mathematics teacher and how she taught the subject.

“She doesn’t seem to be very good at managing the class and we hardly ever do anything fun – only book work.”

In Year 10, Marcus had a different teacher for mathematics and was more positive about the subject than he had been the previous year. He also enjoyed music and computers and, along with mathematics, described these subjects as interesting, useful and fun. English and social studies were his least favourite subjects mainly because he felt what they were learning about was boring and they were repeating work that they had already covered.

He consistently said he was best at mathematics, music and computing.

When we asked him to reflect on what helped him to be a good learner, in Year 10 Marcus said that he worked best when there were no distractions in the class and when he liked the subject being taught. He told us that he thought the teachers usually expected him to do well in his studies because he was in one of the top classes.

How teachers viewed his learning

His teachers in Year 8 and in Year 9 described his overall ability as ‘superior’, particularly in mathematics, and his asTTle assessment results support their assessments of him. His teachers in Year 9 felt he had made very good progress during his first year at secondary school, with one teacher saying he was “*socially and academically very able*”, quite a different view from his Year 8 teacher in relation to his success socially.

How his parents viewed his learning

Although his parents were not happy initially with the secondary school Marcus was enrolled at, by the end of Year 9 they were generally satisfied with the way he had settled in and with his overall progress. A consistent theme from the questionnaires we received from his parents over the course of the study, however, was that they felt he could achieve much more if he was pushed harder at school and they believed he was not being challenged enough. They were particularly concerned in Year 9 that Marcus was not being extended in mathematics and were not happy with his progress in this subject. But both his parents and his teachers acknowledged that he often would not put any extra effort into his work, particularly into subjects he did not like. His Year 8 teacher commented:

Marcus – *continued*

“[He] sometimes takes advantage of being able to perform without having to extend himself or set himself higher goals.”

Marcus’s parents attended parent–teacher evenings and felt they were kept well informed about how he was getting on at school. Marcus’s teachers at primary and secondary school considered his parents to be very supportive of him.

What can we learn from Marcus’s story?

Marcus is a high achieving student, particularly in mathematics, who knows he has ability and that he can achieve with minimal effort. The transition to secondary school could have been difficult for him as the school he was to attend was not his school of choice and did not, according to his parents, have the best facilities to cater for his interests. Nevertheless, Marcus settled in well, made new friends, enjoyed most of his subjects, got on well with most of his teachers and made very good academic progress, albeit probably not as much as he was capable of.

Very able students like Marcus, however, need to be extended and stimulated and it was obvious that Marcus found certain subjects tedious and boring, particularly when the lessons were not varied, involved mainly copying work or when they were studying work that they had already covered. The challenge for schools is how to ensure that students like Marcus are encouraged and appropriately challenged so that they maintain a positive attitude towards learning and remain engaged at school.

Research has found that students’ involvement in sports, arts and other activities, both in and out of school, are correlated with their academic success²⁸. Marcus had a number of interests outside of school, enjoyed reading and watched minimal television. As he gained confidence at secondary school he also participated in one of the school’s sports teams. He had very supportive parents, as well as supportive friends who did not get into trouble at school, two further factors which have been linked to higher school performance.

Most New Zealand schools have developed transition strategies to help familiarise students with their new environment and help them settle in at secondary school.²⁹ Activities may involve prior visits to the school, orientation days, visits by the secondary school principal and other senior staff to the primary or intermediate schools, and peer support programmes.

In Year 8, Marcus attended a special evening at the secondary school with his parents and had visited the school for a morning with other students from his class. The principal and Year 9 Dean had also visited his primary school to explain to students what they should expect at secondary school the following year. In addition, Marcus’s first day at secondary school involved Year 9 students only, providing an opportunity for students to get to know other students in their class and year without having to cope with large numbers of older students as well. Once students were put in their form classes they were assigned Year 13 peer supporters to look after them and show them around the school, which was a popular strategy with Marcus and many other students.

School strategies such as these are important and do help to ease the transition for students. However, Marcus felt that just being at secondary school for a while and becoming familiar with everything at his own pace had been enough for him to settle in well. He also felt that making new friends at school had made the transition to secondary school easier for him.

²⁸ McGee et al (2003).

²⁹ Ibid.