



MINISTRY OF EDUCATION

Te Tāhuhu o te Mātauranga

New Zealand

Competent Learners @ 16: Competency levels and development over time

Report to the Ministry of Education

C. Wylie and E. Hodgen

RESEARCH DIVISION

Wāhanga Mahi Rangahau

ISBN 978-0-478-13638-8

Web Copy ISBN 978-0-478-13639-5

RMR-835

© Ministry of Education, New Zealand — 2007

Research reports are also available on the Ministry's website: www.minedu.govt.nz/goto/2107 and on Education Counts: www.educationcounts.edcentre.govt.nz/research/index.html

Opinions expressed in this report are those of the authors and do not necessarily coincide with those of the Ministry of Education

Competent Learners @ 16: Competency levels and development over time

Cathy Wylie and Edith Hodgen



NEW ZEALAND COUNCIL FOR EDUCATIONAL RESEARCH

TE RŪNANGA O AOTEAROA MŌ TE RANGAHAU I TE MĀTAURANGA

WELLINGTON

JANUARY 2007

New Zealand Council for Educational Research

P O Box 3237

Wellington

New Zealand

NZCER, 2007

Acknowledgements

We are very grateful for the continued involvement of the study's participants, their parents, and teachers, and their interest in the understanding that their contribution has enabled us to continue to deepen by following them through their education.

The Ministry of Education's continued funding and support has also been vital to the continuation of this project.

The fieldwork undertaken when the study participants were aged 16 took place in 2005, with most of the work having to be done in an intense effort over a six-month period. The fieldwork co-ordinators who made this possible were Cathy Lythe and Tineke Fijn, working with a great team of fieldworkers: Marion Bayne, Clare Falkner, Betty Irons, Lorraine McKay, Averill Manning, Patricia Meagher-Lundberg, Chloe Parton, Marilyn Weir, Anna Wildey, Brigid Wikinson, and Kath Wood. The data entry was undertaken scrupulously by Denise Falloon, and Christine Williams similarly did an excellent job in the final formatting of the first two reports from the age-16 phase of the project.

The project advisory group has been very helpful in our instrument design. We are particularly grateful to Sharon Cox, Heleen Visser, and Lynne Whitney from the Research Division of the Ministry of Education, and to Robyn Baker who provides NZCER's internal review, and to Sandie Aikin, Jude Allison, Dick Harker, Clive McGee, and Anne Meade.

The NZCER research team working on the age-16 phase comprises Cathy Wylie, Edith Hodgen, Rose Hipkins, Karen Vaughan, and Sally Boyd.

Table of Contents

1. Introduction.....	1
2. Cognitive competencies.....	3
3. Attitudinal competencies.....	5
Thinking & learning	6
Focused & responsible.....	7
Social skills.....	9
Social difficulties.....	9
4. Relations between the competencies.....	11
Competency levels and social characteristics.....	12
5. Development of competencies over time.....	15
Different paths over time.....	17
Social characteristics and competency development over time.....	18
6. Development and change.....	23
Links with policy	23

Tables

Table 1	Age-16 cognitive competency tests.....	3
Table 2	Age-16 attitudinal competencies	6
Table 3	Percentage of age-16 young people scoring above the median in the cognitive competencies	13
Table 4	Social characteristics' contribution to the variance in age-16 scores	14
Table 5	Consistency of composite cognitive competency between ages 8–16 by gender and ethnicity	19
Table 6	Consistency of composite cognitive competency over ages 8–16 by maternal qualification and age-5 family income	20
Table 7	Consistency of composite attitudinal competency score between ages 8–16 by gender and ethnicity	20
Table 8	Consistency of composite attitudinal score between ages 8–16 by maternal qualification and age-5 family income	21

Figures

Figure 1	Responses to items on the thinking & learning scale.....	7
Figure 2	Responses to items on the focused & responsible scale	8
Figure 3	Responses to items on the social skills scale.....	9
Figure 4	Responses to items on the social difficulties scale.....	10
Figure 5	Retention in quartile groups between age 5 and 16 and age 8 and 16 in composite cognitive competency score	16
Figure 6	Retention in quartile groups between age 5 and 16 and age 8 and 16 in composite attitudinal score	17

1. Introduction

The **Competent Children, Competent Learners** study is a longitudinal study of a sample of New Zealand young people, who have been followed from their final early childhood education centres in the Wellington region. The main aim of the project is to chart the development of competencies in the context of home, leisure, and educational experiences that may account for differences in patterns of development and young people's performance. Reports from the study and associated papers are available on the NZCER website, www.nzcer.org.nz. The project is funded by the Ministry of Education, with some additional funding from NZCER.

In this first report for the age-16 series of analyses, we describe the competencies for the sample at age 16, and any differences in competency levels that are related to social characteristics. Then we look at how the competencies are related among themselves, both currently and over time. Finally, we look at how well the 16-year-olds' competency levels could be predicted by their earlier levels, and at different trajectories of development over time. This includes a comparison of those still in the study at age 16 with those who left in their adolescent years, and a comparison of those still attending mainstream schools with those who had left school. This overview draws from the longer companion technical report, which provides more detail of these findings and the analysis behind them.¹

For the three *cognitive competencies*, we have the marks from assessments of literacy, numeracy, and logical problem-solving (pattern completion tasks) for 448 young people. For the *attitudinal* competencies, we have ratings from subject teachers (teachers of English, teachers of their favourite subject, and teachers of their least favourite subject) for the 412 young people who were still at school. We took a different approach to the way we formed the attitudinal competencies at age 16. In previous analyses, each competency was made up of a group of items that preceded our analysis: we tracked these groups of items through from age 5 to age 14 (communication, perseverance, social skills, curiosity, self-management, and at age 14, self-efficacy). With the age-16 competencies, we also drew on the work that had been done to identify key competencies for inclusion in the revised New Zealand Curriculum Framework (currently in draft form) so that there was more information available to policy makers and educators about current levels of dispositions, skill, and knowledge. We were not sure how these additions would mesh with our previous groups. So at age 16 we did not ask items in discrete groups, and we undertook factor analysis afterwards to see what groupings emerged. We found four distinct groups. We have called these: *focused & responsible*; *thinking & learning*; *social skills*; and *social difficulties*. The items that go into each of these groups are detailed shortly.

The **Competent Children, Competent Learners** sample was originally chosen in relation to the main focus of the first phase of the study, which was the role of early childhood education experiences and quality. This meant

¹ Hodgen, E. (2007). Competency levels and patterns over time for the Competent Children, Competent Learners sample at 16. Technical report. Wellington: New Zealand Council for Educational Research.

our units for sampling were early childhood education types, other than *ngā kōhanga reo*, rather than social characteristics. This and the fact that our sample was chosen from the Wellington region, has resulted in a sample that is not nationally representative in terms of social characteristics. Our sample has higher proportions of young people from high-income families, and those whose mothers have trade or tertiary level qualifications, than the national average, and lower proportions of Māori and Pacific young people. We shall see that social characteristics have a bearing on competency levels. Thus, the overall competency levels found for this sample are likely to be higher than if our sample had been able to be nationally representative.

2. Cognitive competencies

Table 1 describes the literacy, numeracy, and logical problem-solving tests used for the three cognitive competencies and the range of scores achieved. The range of performance was wide on all three tests. Literacy scores were slightly higher on average than numeracy scores, and logical problem-solving scores were higher than both literacy and numeracy scores.

Table 1 **Age-16 cognitive competency tests**

Test		Mean	Range	Mean & range on 1–10 scale
Numeracy	International Adult Literacy Survey subset on numeracy	266 (s.d. 49.6)	114.5–377.7	6.0 (s.d. 1.5), range 1.4–9.7
Literacy	International Adult Literacy Survey subset on prose & document literacy	280.7 (s.d. 38.73)	164.9–357.9	6.4 (s.d. 1.2), range 2.9–9.7
Logical problem-solving	Standard Progressive Matrices	48.3 (s.d. 6.7)	17–59/60	8 (s.d. 1.0), range 3.6–9.9

The IALS subsets had items selected on the basis of results for New Zealand 16-year-olds on the full IALS tests, to provide good discrimination, or spread of results. The scores here have been converted to a Rasch scale (this has no upper limit).

The purpose of doing these tests was not to see how this sample compared with other populations (and, indeed, there are no comparisons we can make), but to provide evidence about performance levels that we could then use in relation to other material collected as part of the study, for example in this report, in relation to earlier performance levels, so we could see how predictable student performance is over time, and in the reports to come from this phase, in relation to student engagement, NCEA experiences and results, and the transition to secondary school.

3. Attitudinal competencies

As in previous phases of the project, we asked teachers to rate the students they taught in terms of the frequency with which a particular student showed the particular behaviour or approach described in an item, e.g. “finishes all class work”. When students were in primary classes, we could ask just one teacher, since class teachers would work with students across subject areas. At secondary level, students are likely to have six or more teachers, and it was possible that they would behave differently in different classes. At age 14, English, mathematics, and science are compulsory, so we could ask teachers of those subjects to rate our study participants. We also asked students to nominate their favourite subject, and asked teachers of that subject to rate them also. (We did not use that rating in our analyses, since for some it was one of the compulsory subjects, and for others, for subjects where teachers felt they did not see students often enough to rate them.) At age 16, only English is compulsory. We therefore tried to get a range of class situations by asking students to nominate their favourite and least favourite subjects, and asked the teachers of these subjects, plus their English teacher, to rate them. As at age 14, we used the average of these scores to give an overall score for each student.

Teachers of subjects that a student nominated as his or her favourite tended to be more positive about that student—and teachers of subjects that a student said was his or her least favourite were less positive. Ratings by English teachers were generally in between.

As noted earlier, four distinct competencies were identified through factor analysis. Before we describe each of them in detail, we provide an overview of the scores for these four attitudinal competencies, and the conceptual links of these new groups with the ones we used before, and with the key competencies.

Table 2 shows how these four groups of items relate to the earlier groups used in the **Competent Children, Competent Learners** project (column 2), how they relate to the Key Competencies in the new draft New Zealand curriculum (column 3), how well the items in each group cohere together (the reliability measure in column 4), and the mean scores and range on a 10-point scale (column 5).

Table 2 **Age-16 attitudinal competencies**

Age-16 Competency	Links with earlier Competent Learners study Competencies	Links with Key Competencies in new NZ curriculum	Reliability measure^a	Mean & range on 1–10 scale
Thinking & learning	Communication Curiosity	Thinking Participating & contributing	0.96	6.3 (s.d. 1.5), range 1.6–10
Focused & responsible	Perseverance, Self-management, Self-efficacy, Communication	Managing self	0.97	6.8 (s.d. 1.6), range 2.8–9.8
Social skills	Social skills	Relating to others	0.79	6.3 (s.d. 1.6), range 1.6–10
Social difficulties	Social skills	Relating to others	0.79	8.7 (s.d. 1.1), range 4.6–10

^a Cronbach's alpha; a value of over 0.8 is usually taken to indicate good reliability, and one over 0.7 to indicate adequate reliability.

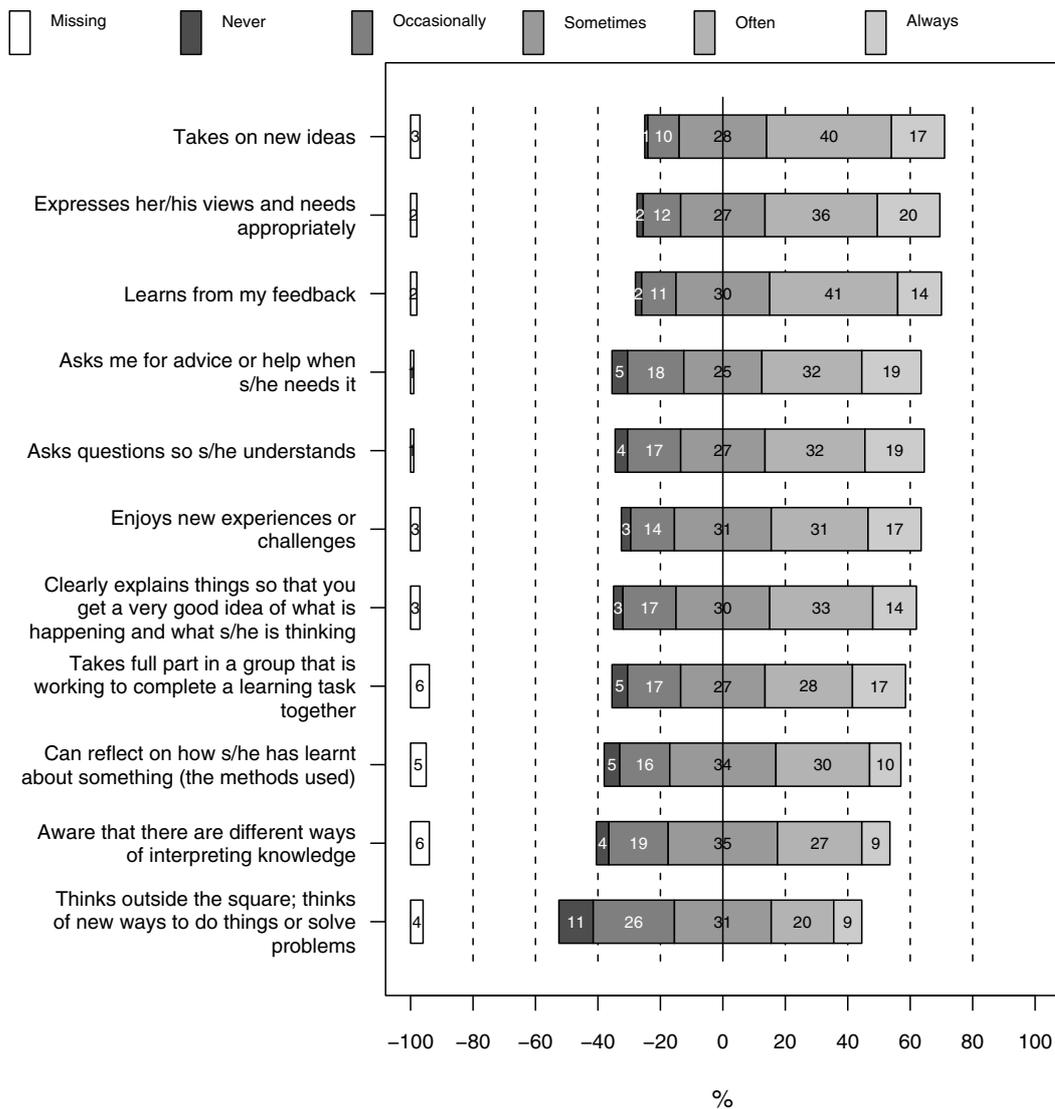
The range of scores on these four attitudinal competencies is also wide. The range of scores is narrowest in relation to *social difficulties*. A few students had marked difficulties (a *low* score). Most students had few social difficulties (*high* scores). The average score was slightly higher for being *focused & responsible* than for *thinking & learning*.

The items that compose each of these attitudinal competencies are of practical interest, so we look at each of these in turn.

Thinking & learning

We called the first attitudinal competency *thinking & learning* because these two activities underlie most of the 11 items that the factor analysis found were most likely to be similar for individual students; that is, that a student who often learnt from feedback was also likely to often ask questions so s/he understood.

Figure 1 on the next page ranks the items that make up this competency group: the top item “takes on new ideas” had the highest proportion of students showing this behaviour often or always (57 percent), and the bottom item, “thinks ‘outside the square’; thinks of new ways to do things or solve problems” had the lowest proportion of students showing this behaviour often or always (29 percent).

Figure 1 *Responses to items on the thinking & learning scale*

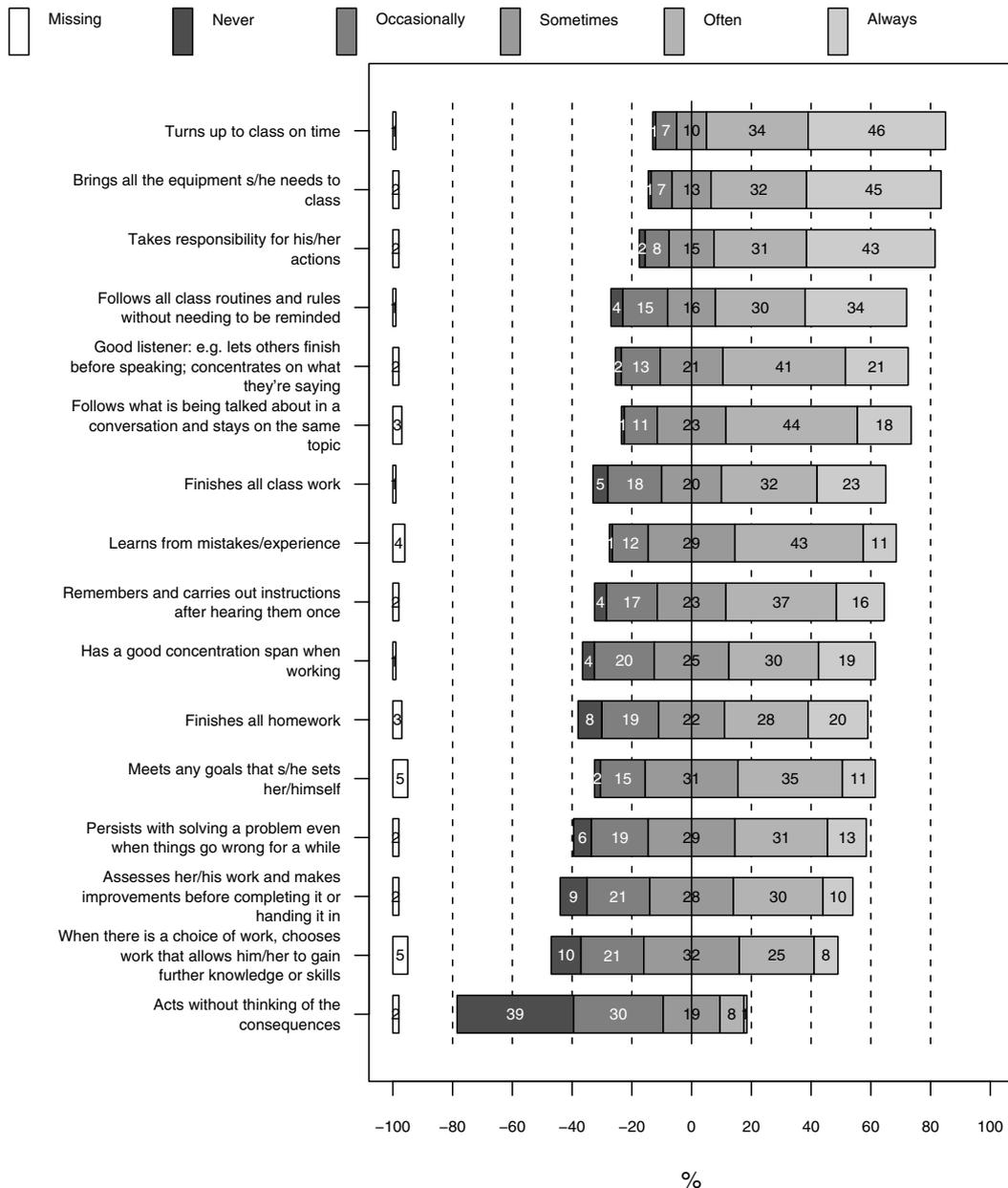
Most of these items were new or phrased somewhat differently from the age-14 phase. There are three items that are similar. Teachers' views of those who thought "outside the square" gave similar proportions at both ages. Fewer students were seen by their age-16 teachers to enjoy new experiences or challenges (48 percent cf. 57 percent at age 14); or to express their views and needs appropriately (56 percent cf. 63 percent at age 14).

Focused & responsible

Sixteen items were identified by the factor analysis as "hanging together" in terms of individual student performance. At age 16, students were most likely to be seen as often or always turning up to class on time (80 percent); this is the top item in Figure 2. They were least likely to be seen as often or always acting without thinking of the consequences (10 percent); this is the bottom item in Figure 2.

On the whole, the teachers' views show that the age-16 students were reasonably well organised. More than three-quarters of the age-16 students often or always turned up to class on time, brought all the equipment they needed, and took responsibility for their own actions. They did not do everything asked of them: just over half often or always finished all their class work, and just under half, their homework. In terms of stretching or challenging themselves, 40 percent assessed their own work and made improvements to it before handing it in, and around a third chose work that allowed them to gain further knowledge or skills.

Figure 2 **Responses to items on the focused & responsible scale**

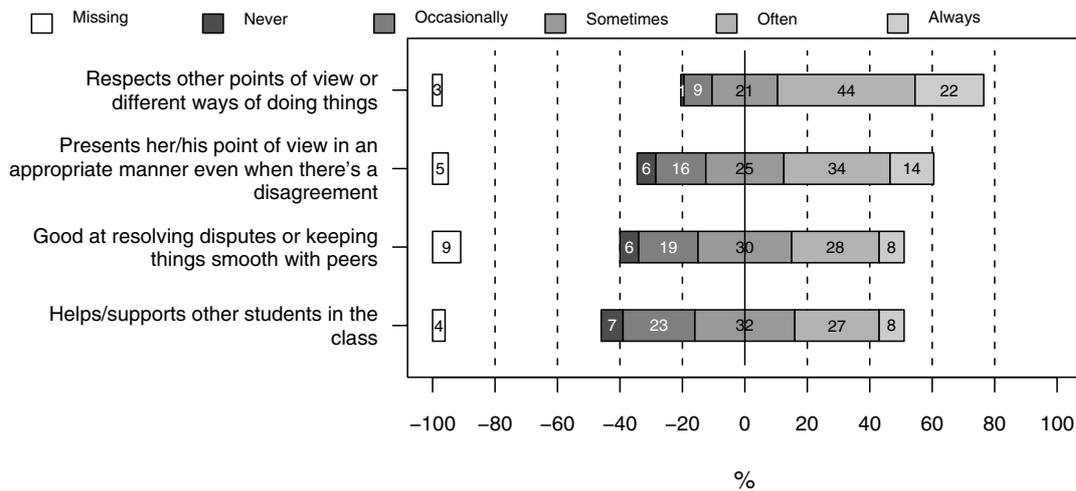


All but one of these 16 items was also asked at age 14. Four of the 15 items that were asked at both ages had similar proportions often or always showing the behaviour asked about. But the overall picture at age 16 showed somewhat lower proportions showing their teachers the focused and responsible behaviours we asked about than the overall picture at age 14.

Social skills

Student responses were consistent on four items that formed the *social skills* competency at age 16. The top item in Figure 3 is “respects other points of view or different ways of doing things” (66 percent did this often or always). The bottom item is “helps/supports other students in the class” (35 percent did this often or always).

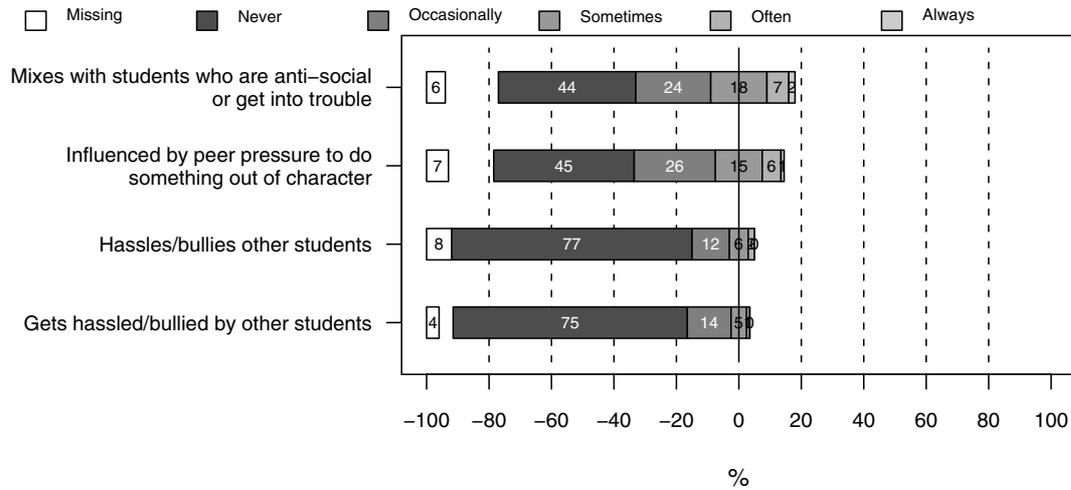
Figure 3 *Responses to items on the social skills scale*



Three age-16 items are comparable with the age-14 items. Now students were somewhat better at helping/supporting other students (35 percent cf. 28 percent at age 14), but they were less likely to present their point of view in an appropriate manner, even when there was a disagreement (48 percent cf. 68 percent at age 14). There were similar proportions who were good at resolving disputes or keeping things smooth with their peers at both ages.

Social difficulties

Students who were seen by their teachers to have marked levels of social difficulties were a small minority. Less than 10 percent often or always mixed with anti-social peers, or were influenced by peer pressure to do something out of character, though this has increased since age 14. Involvement in bullying (that teachers knew about) was also uncommon, and much the same as at age 14.

Figure 4 **Responses to items on the social difficulties scale²**

We had a choice between forming this score so that those with many or marked difficulties had a high score, or so that they had a low score. If a student with difficulties had a high score, this competency score would be negatively correlated with all the other competencies (a high score on this competency would be associated with a low score on the other competencies). If a student having difficulties was scored with a low score (second option), this competency score would be positively correlated with the other competencies.

We decided to score social difficulties so that it is *positively* correlated with the other competencies, although this does give the score a slightly counter-intuitive name, as those with marked difficulties have a low score for this competency. It is, however, important to use a descriptor that emphasises that this competency measure identifies the minority of students showing “undesirable” behaviour of one kind or another.

² The competency scale for this factor was constructed to be consistent with the other scales, so that those who had ratings of often or always for the items scored at the low end.

4. Relations between the competencies

While each of the four attitudinal competencies formed a distinct group, we also found that students who had high scores for one of the three “positive” competencies—*thinking & learning*, *focused & responsible*, and *social skills*—were likely to have high scores for the other two of these competencies (the correlations ranged from 0.73 between *focused & responsible* and *social skills*, to 0.85 between *focused & responsible*, and *thinking & learning*). Conversely, those who had low scores for one of these competencies were likely to have low scores for the other two.

Those who had high scores for the *social difficulties* competency—those who were not experiencing social difficulties—were likely to have higher scores on the three positive attitudinal competencies. However, the correlation (or consistency of score level) was lower: the range was from 0.48 with *thinking & learning*, to 0.65 with *focused & responsible*. Thus, some students who were engaged in anti-social activity or overly subject to peer pressure were nonetheless able to show engagement in learning in their classes, and to have good social skills as well.

Can you tell how well 16-year-old student would do on the numeracy or literacy tests from their score on the (teacher-rated) attitudinal competencies? The short answer is: to some extent. Correlations between the attitudinal and cognitive competencies were lower than between the attitudinal competencies. They ranged from 0.33 (between *social skills* and *numeracy*) to 0.48 (between *focused & responsible* and *numeracy*, and between *thinking & learning* and *literacy*).

When we built a path model containing all of the competencies to see whether we could predict scores on the three cognitive competencies (*literacy*, *numeracy*, and *logical problem-solving*) on the basis of scores on the attitudinal competencies, we found that the *thinking & learning*, *focused & responsible*, and *social difficulties* competencies did allow some prediction of the cognitive competencies. They did this in tandem with each other, and with two of the cognitive competencies.

For the numeracy test, 52 percent of the variance (or spread of scores) could be accounted for statistically by scores for logical problem-solving, literacy, and the *focused & responsible* scale.

For the literacy test, 36 percent of the variance in scores was accounted for by scores for logical problem-solving, *thinking & learning*, and the (absence of) *social difficulties*.

For the logical problem-solving test, 23 percent of the variance in scores was accounted for by scores for *thinking & learning*, *focused & responsible*, and (the absence of) *social difficulties* competencies.

Overall, *thinking & learning* and *focused and responsible* were the two more important attitudinal competencies for scores on the cognitive competencies.

Competency levels and social characteristics

Social characteristics continue to account for some of the variance in competency scores, as Table 3 shows. Higher maternal qualification tends to be associated with higher competency scores for both the cognitive and attitudinal competencies. A similar trend was evident for family income for numeracy and literacy scores only, though there was little difference between the average scores for those who came from homes where the family income had been between \$60–\$80,000 when they were preschoolers, and those where the family income had been more than \$80,000. Young women had higher literacy and attitudinal competency scores than young men, and Pākehā/European or Asian 16-year-olds had higher numeracy and literacy scores and scores on the *thinking & learning* and *focused & responsible* competencies than Māori or Pacific 16-year-olds.

Table 3 **Percentage of age-16 young people scoring above the median in the cognitive competencies**

Competency measure → Group ↓		Logical problem-solving (n = 446)	Numeracy (n = 444)	Literacy (n = 444)
Maternal qualification				
None	(n = 57)	26	23	28
Mid-school/Trade	(n = 220)	42	46	47
Senior secondary/Tertiary	(n = 80)	65	55	54
University	(n = 83)	75	77	71
ρ -value for χ^2 tests		< 0.0001	< 0.0001	< 0.0001
Family income group at age 5^a				
Under \$30,000	(n = 108)	36	31	32
\$30,000 to \$60,000	(n = 198)	49	51	51
\$60,000 to \$80,000	(n = 61)	62	64	66
Over \$80,000	(n = 64)	64	67	64
ρ -value for χ^2 tests		0.0019	< 0.0001	< 0.0001
Gender				
Female	(n = 217)	51	46	59
Male	(n = 227)	49	54	42
ρ -value for χ^2 tests		0.778	0.087	0.0006
Ethnicity				
Pākehā/Asian ^b	(n = 369)	52	53	52
Māori/Pacific ^c	(n = 63)	37	29	35
ρ -value for χ^2 tests		0.044	0.0011	0.0216

^a We use family income at age 5 here because in earlier study phases early family income levels had more bearing on student competency levels than current family incomes; and we used it in our age-14 models.

^b 360 Pākehā and 13 Asian young people.

^c 45 Māori and 18 Pacific young people. The two groups shown here bring together the ethnic categories whose age-14 competency levels were most similar, so that we had groups of sufficient size for comparison. The numbers of Māori and Pacific young people left in the study at age 16 are lower than desirable. However, our caveats about this low number are tempered by the fact that our findings for this sample are consistent with other studies of Māori and Pacific students' performance.

The association between maternal qualification and family income at age 5 and the competencies is somewhat less strong than that found at age 14. There are two likely reasons for this. First, the students are young adults now, and making their own paths more and more. Second, those we lost from the study between the ages of 14 and 16 were more likely to come from families that had been low-income when they were young. The fact that our age-16 sample is under-representative of low-income students indicates to us that family income might well play more

of a substantial role in student competency levels than it shows here. Nonetheless, even in a wider sample, maternal qualification is likely to show the largest contribution to the variance in student scores of the four social characteristics we analyse. In Table 4 below, we see that maternal qualification, which is likely to indicate how language-rich a home environment is, is the biggest contributor for all seven of the age-16 competencies we include. Gender is the next most frequent (but not for numeracy or logical problem-solving), and it carries more weight than ethnicity or family income.

Table 4 ***Social characteristics' contribution to the variance in age-16 scores***

Competency	Maternal qualification <i>(% variance accounted for)</i>	Family income at age 5 <i>(% variance accounted for)</i>	Gender <i>(% variance accounted for)</i>	Ethnicity <i>(% variance accounted for)</i>	Proportion of variance accounted for by all social characteristics %
Numeracy	Maternal qualification (8.3)	Family income age 5 (2.1)		Ethnicity (1.2)	15
Logical problem-solving	Maternal qualification (11.3)				14
Literacy	Maternal qualification (7.1)	Family income age 5 (1.8)	Gender (5.9)	Ethnicity (1.3)	16
Thinking & learning	Maternal qualification (6.1)		Gender (2.8)	Ethnicity (3.0)	13
Focused and responsible	Maternal qualification (8.9)		Gender (4.4)	Ethnicity (3.8)	16
Social skills	Maternal qualification (5.2)		Gender (5.3)		10
Social difficulties	Maternal qualification (6.0)		Gender (6.9)		13

5. Development of competencies over time

There is reasonable consistency over time in the cognitive competencies (literacy, numeracy, logical problem-solving). From age 8 onwards, the correlations between test scores at age 16 are 0.6 or above. Age-5 mathematics shows a higher correlation with age-16 scores (0.54) than do age-5 literacy (0.36) or logical problem-solving (0.41) scores. That may reflect a greater consistency in what the tests covered: the age-5 early literacy test could not measure actual reading performance.

Consistency over time for attitudinal competency scores only reaches 0.60 between age-14 and age-16 scores for *thinking & learning* and *focused & responsible*. To some extent, this will reflect the greater changes in items in these attitudinal competency groups over time, but it also reflects the more contextual nature of these competencies: for example, someone can be more articulate and confident in their home interactions than at school, and also teachers at different levels of the education system may judge some of these skills and dispositions differently, according to what they emphasise in their approach.

The two social skill competencies are even more contextual, and their highest correlation levels, also between the ages of 14 and 16, are 0.32 (between our age-14 measure of *social skills* and age-16 measure of *social difficulties*) and 0.46 (between our age-14 measure of *social skills* and our age-16 measure of *social skills*).

When we modelled how the two different kinds of competency (cognitive and attitudinal) contributed to each other over time, we found much the same pattern as we had in the last two phases of the project:

- attitudinal competencies are useful to predict:
 - cognitive competencies at the same age, and
 - attitudinal competencies at the next two ages; and
- cognitive competencies are useful to predict:
 - attitudinal competencies at the next age, and
 - cognitive competencies at the next two ages.

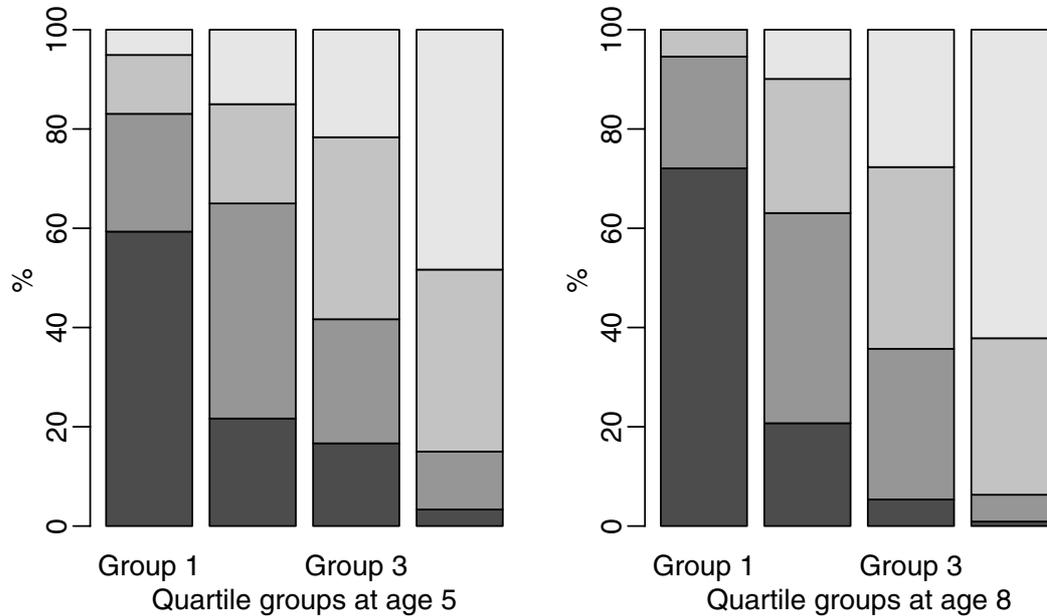
Around 80 percent of the variability in age-10–16 cognitive composite scores is accounted for (statistically predicted by), in decreasing order of influence: the previous age cognitive composite scores; the cognitive composite score before that (four years earlier); and the current attitudinal composite competency level.

Between 30–50 percent of the variability in the age-10–16 attitudinal composite competencies is predicted by, in decreasing order of influence, the previous attitudinal composite competency score, the attitudinal composite competency score before that (four years earlier), and the previous age cognitive composite score.

The consistency in scores is strongest for students who were in the lowest quartile of scores, or in the highest quartile. This is shown in the following figures, which show the proportions of students who stayed in the same

quartile group (“retention”) at both ages 5 and 16, and at both ages 8 and 16. In these figures, Group 1 refers to the lowest quartile group, and Group 4, to the highest quartile group.

Figure 5 **Retention in quartile groups between age 5 and 16 and age 8 and 16 in composite cognitive competency score**

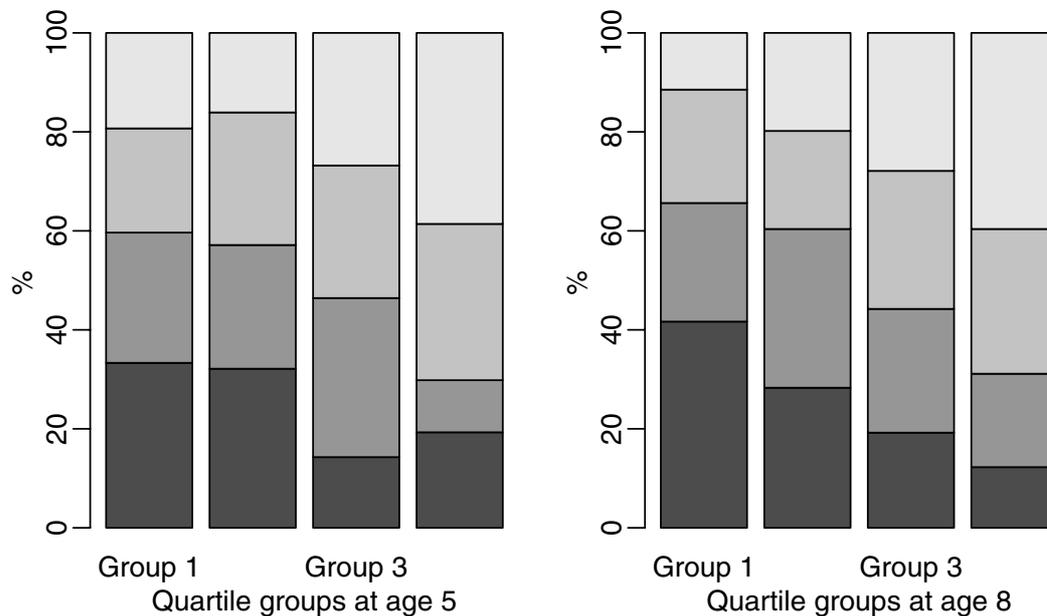


Retention rates (the proportion of those who stayed in the same quartile group) between age 5 and age 16 were 59 percent for the lowest quartile (Group 1) and 48 percent for the highest quartile (Group 4). Between age 8 and age 16, retention rates rose to 72 percent for those in the lowest quartile group at age 8, and 62 percent for those in the top quartile group at age 8. Retention rates from both age 5 and age 8 to age 16 for the second-to-lowest quartile group (Group 2) were 43 percent, and for the second-to-top quartile group (Group 3), 37 percent.

It was harder to move up from the lowest quartile groups (Groups 1 and 2) than it was to move down from the two top quartile groups (Group 3 or 4). Very few students moved from the lowest to the top quartile group, or between Groups 1 and 4: 5 percent of those in Group 1 at age 5 and none of those in the same group at age 8 were in Group 4 at age 16; in the other direction, 3 percent of those in Group 4 (the top quartile group) at age 5 and 1 percent at age 8 were in Group 1 (the bottom quartile group) at age 16.

Retention rates in quartile groups were lower for the attitudinal competencies than they were for the cognitive competencies.

Figure 6 **Retention in quartile groups between age 5 and 16 and age 8 and 16 in composite attitudinal score**



When we look at retention in relation to the composite attitudinal score, we see that only a third of those in Group 1 (the lowest group) at age 5 and not much more of those in this group at age 8 (42 percent) were still in the same group at age 16. Almost a fifth of those in Group 1 at age 5 had moved to Group 4 (the top group) by age 16, and the same percentage had shifted down from Group 4 to Group 1. Between age 8 and age 16 there was slightly greater retention: 42 percent and 40 percent for Groups 1 and 4, respectively, with correspondingly lower rates of about 12 percent shifting each way between Groups 1 and 4.

These different rates of retention for the attitudinal and cognitive competencies fits with what we have found out in earlier phases of the project. The cognitive competencies are more strongly related to what was in place by age 5: innate aptitude and level of family advantage, reflected in opportunities for early learning and development of dispositions. The attitudinal competencies appear more strongly related to the students' current situation: the current family income; peer pressure; and school culture.

Different paths over time

We compared the different paths of students who had progressed over time with their peers who had not moved upwards. Those who did make progress upwards from the bottom quartile at age 5 to score above the median at age 16 for the composite cognitive competency had somewhat higher starting points than their peers who started in the same quartile group and continued to score below the median. Their progress over time was gradual rather than steep: on average it was not until age 10 that they reached the median, and their average score was much the same at age 12.

Those who also started in the bottom quartile at age 5 for the composite cognitive competency but only reached the second quartile group at age 16 also showed gradual progress over time, rather than sudden leaps.

Looking at loss over time, we found that those who started in the top quartile group at age 5 but scored below the median at age 16 had declined to just below the median by age 8; and their trajectory also shows steady declines.

Similar patterns were evident for different trajectories on the attitudinal composite competency, though there was also an indication that those from the top quartile group at age 5 who scored below the median at age 16 could have been affected by the transition to secondary level.

Social characteristics and competency development over time

We also looked at whether patterns of retention in quartile groups, or movement up or down between ages 8 to 16 were different in relation to the four social characteristics. We divided the sample into six groups—those who mainly stayed in one of the quartile groups, those whose scores increased over time, and those whose scores decreased, and then compared proportions for each of the social groups. Table 5 below shows the patterns for gender and ethnicity.

There were few gender differences. Females show a slightly greater tendency to do better over time. Differences between the ethnic groups were more marked. Māori/Pacific young people were more likely to have been in the lower two quartile groups, and to have stayed in or near their starting group. Those who shifted up or down quartile groups were more likely to have been Pākehā/European or Asian.

Table 5 **Consistency of composite cognitive competency between ages 8–16 by gender and ethnicity**

Quartile group	Female (n = 217) %	Male (n = 229) %	Māori/Pacific (n = 63) %	Pākehā/European & Asian (n = 371) %
Mainly Group 1 (lowest)	19	25	37	20
Mainly Group 2	24	25	32	23
Mainly Group 3	22	23	21	23
Mainly Group 4 (highest)	24	19	6	24
Decreasing	2	4	2	4
Increasing	8	3	3	6

Table 6 looks at maternal qualification and early family income. There were marked differences for both social characteristics. Young people whose mothers had fewer qualifications tended to be in, and remain in, the lowest two quartile groups. Those whose mothers had more qualifications tended to be in, and remain in, the higher quartile groups, and this trend was stronger for those with mothers with university qualifications. Students whose scores showed a downward trend were more likely to have mothers without university qualifications, and those whose scores showed an upward trend were more likely to have mothers with at least senior secondary-school or tertiary qualifications.

The pattern for family income was similar, but not quite as marked: those whose preschool homes had been low-income tended to be in, and remain in, the lower quartile groups, and those whose preschool homes had been higher-income homes to be in, and remain in, the higher quartile groups. Those whose preschool homes had been the lowest-income homes were more likely to have decreasing scores than those whose preschool homes had had higher income levels.

Table 6 **Consistency of composite cognitive competency over ages 8–16 by maternal qualification and age-5 family income**

Quartile group	Maternal qualifications				Age-5 family income			
	None (n = 58)	Mid-secondary school/ Trade (n = 220)	Senior secondary school/ Tertiary (n = 80)	University (n = 84)	Under \$30,000 (n = 110)	\$30,000–\$60,000 (n = 198)	\$60,000–\$80,000 (n = 61)	\$80,000 and over (n = 64)
Mainly Group 1	43	24	14	7	32	24	11	8
Mainly Group 2	28	29	20	11	24	24	21	14
Mainly Group 3	14	22	25	30	16	22	30	30
Mainly Group 4	2	18	29	39	9	20	31	39
Decreasing	3	4	4	1	5	3	2	3
Increasing	0	4	9	12	4	7	5	6

The percentage of young people in each of the attitudinal competency score groups for each of the gender and ethnicity groups is shown in Table 7. We see more gender differences here. Males were slightly more likely to be in the lower groups (Groups 1 or 2), and females to be in the higher groups (Groups 3 or 4). There are relatively marked differences between the ethnic groups: Māori/Pacific young people were more likely to have been in the lower two groups, and to have stayed in or near their starting group. There was more evidence of shifts over time, both up and down. But these shifts were not strongly associated with gender or ethnic group.

Table 7 **Consistency of composite attitudinal competency score between ages 8–16 by gender and ethnicity**

Quartile group	Female (n = 217) %	Male (n = 229) %	Māori/Pacific (n = 63) %	Pākehā/European & Asian (n = 371) %
Mainly Group 1	5	17	13	11
Mainly Group 2	23	34	44	25
Mainly Group 3	24	22	21	29
Mainly Group 4	17	8	0	15
Decreasing	13	9	14	10
Increasing	8	10	8	9

Young people whose mothers had fewer qualifications tended to be in, and remain in, the lowest two quartile groups for the attitudinal composite. Those whose mothers had more qualifications tended to be in, and remain in, the higher quartile groups. Students whose scores showed a downward trend were less likely to have mothers with university qualifications.

The pattern for family income was similar, but not quite as marked: those whose preschool homes had been low-income tended to be in, and remain in, the lower quartile groups, and those whose preschool homes had been higher-income homes to be in, and remain in, the higher quartile groups. Those whose preschool homes had been low-income were more likely to have decreasing scores than those whose preschool homes had had higher income levels.

Table 8 **Consistency of composite attitudinal score between ages 8–16 by maternal qualification and age-5 family income**

Quartile group	Maternal qualifications				Age-5 family income			
	None (n = 58)	Mid-secondary school/ Trade (n = 220)	Senior secondary school/ Tertiary (n = 80)	University (n = 84)	Under \$30,000 (n = 110)	\$30,000–\$60,000 (n = 198)	\$60,000–\$80,000 (n = 61)	\$80,000 and over (n = 64)
Mainly Group 1	17	14	6	4	15	12	8	5
Mainly Group 2	40	31	24	19	42	27	15	23
Mainly Group 3	21	24	30	40	19	27	41	33
Mainly Group 4	0	10	20	21	5	12	23	19
Decreasing	9	13	13	5	14	11	7	9
Increasing	14	8	8	12	6	11	7	11

6. Development and change

These patterns of competency development over time show a reasonable consistency in student performance through their schooling years. However, they also show that performance does change: that individuals do respond to changing experiences, opportunities, and relationships, and build on what they achieve. Sustained improvement of performance is likely to occur gradually, rather than through sudden large leaps.

The ways in which the cognitive and attitudinal competencies are related and support one another also indicate the importance of both in ongoing learning, and particularly the importance of gaining some mastery and skills in literacy and numeracy at an early age, since this underpins the likely ongoing path through school. The importance of making early progress in literacy and numeracy is evident when we compare the competency scores of those who had left school by age 16, and those who remained. Those who had left school had lower average cognitive scores from age 5, and the gap grew wider with time. They had much the same average attitudinal scores at age 5: the differences in these scores started later, probably reflecting their growing discomfort in the central role of literacy and numeracy in school work. But because of the ‘feedback loops’ between attitudinal and cognitive performance, their decreasing attitudinal scores would indicate that making progress in or enjoyment of the academic aspects of learning would be even harder.

Differences in competency levels at age 16, and patterns over time, also point to differences in experiences and opportunities. Maternal qualification levels are by far the most important indicators of these differences; to a lesser extent, early family income. Males are more likely than females to develop and show less positive attitudes to schoolwork. Ethnicity has an association with levels of literacy, and attitudes, with our results consistent with other research showing Māori and Pacific students performing at lower levels in the school environment.

Links with policy

Our study indicates that where students become disengaged in learning, they tend to do so before age 12, with the lack of engagement escalating in adolescence and at secondary level. This would underline the importance of making efforts to engage students in learning and develop the knowledge and attitudes that support that learning, early on, before students reach school, and in their first school years.

As with previous reports from the Competent Children, Competent Learners project, the conclusion is that we need to provide greater support for children from homes without the advantages of good levels of maternal qualification and reasonable levels of family income, and to continue to provide it, rather than limit it to one-off interventions. Current early childhood education policy aimed at increasing participation in early childhood education by children from these groups is headed in the right direction, if this education is of sufficient quality to provide rich experiences that develop language and pattern. (Our age-14 report on the contribution of early

childhood education to competency levels found that these did in fact continue to show associations, nine years after the study participants had finished early childhood education.)

Current educational policy encouraging parents to provide richer home experiences and encouragement of early childhood education centres to work with parents to support them in this are also headed in the right direction, as are initiatives to provide parents with more understanding of how student needs and progress are assessed during school years, and the kinds of activities and support parents can give to complement school learning.

The Ministry of Education's focus on providing useful assessment tools for diagnostic use, and ideas for "what next" curriculum and pedagogy, supported by professional development is also in the right direction in terms of improving outcomes for students, and needs to be sustained.

It would in fact be very interesting to see if a similar longitudinal tracking of competency levels with a new generation of students (which may be possible with the introduction of unique student ID numbers) which enjoyed the results of the current policy focus on enriching curriculum and pedagogy and matching it to more specific diagnosis of student needs and interests in order to scaffold learning, would show similar patterns to the ones found in this study, or whether we would see higher initial levels of performance, feeding into more consistent patterns of higher scores. Even so, it would seem likely that the relations we have found between the attitudinal (key competency) and cognitive aspects would continue.

In a more population-based sample than we were able to have for this study, one would expect to see family income carry somewhat more weight than it does in this sample, though one would also hope that educational policies that should provide better learning opportunities for children would mitigate its effects.