# On The Edge Of Adulthood: Young people's school and out-of-school experiences at 16

Technical report

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**ISBN 978-0-478-13952-5**

**Web Copy ISBN 978-0-478-13953-2**

**RMR-902**



Research reports are available on the Ministry of Education's website Education Counts: www.educationcounts.govt.nz/publications.



CL @ 16 is the seventh phase of the Competent Children/Competent Learners longitudinal study.

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# 1. Introduction

This technical report has been written to stand alongside *On the Edge of Adulthood: Young people's school and out-of-school experiences at 16* (Wylie & Hipkins, 2008). In it the variables used are described, as is the statistical methodology, and detailed results of the models fitted are presented.

These reports explore the home, school, and out-of-school life of the young people; their engagement in school, and how that relates to their out-of-school life; and their achievement, both in terms of the Competent Children, Competent Learners competency measures and, where available, their NCEA results. We also compare outcomes as measured by NCEA results and our competency measures.

# 2. Scale variables, cluster variables, and history variables

The students, their teachers, and parents were asked series of questions about their attitudes to or opinions about aspects of the students' school and out-of-school life. The responses were measured on Likert-type scales. These questions were used to construct the scale variables.

Where the questions were of the "tick if true for participant" type (binary responses), we used cluster analysis to define clusters of participants who tended to give similar responses to groups of the questions of interest.

We have, for the past several rounds of analysis, used some history variables, based on responses to similar questions asked each time we interviewed the participants or their teachers or parents. In many ways these history variables are similar to the cluster variables, but the method of defining the categories for the history variable has been more subjective.

There are a few other derived variables that are described in this section.

We describe for each of these types of variables in turn:

- the methodology used to obtain the new variable
- the list of all such variables, their characteristics (where relevant), and the constituent items used to derive them.

## Scale variables

These variables were constructed from:

- Student responses to the stems:
    - School is a place where …
    - English/most enjoyed subject/least enjoyed subject is a class where …
    - I feel I'm doing well at school when …
    - When I'm at home …
    - In the past year I've had happen to me …
    - My friends are …
- Parent responses to the stems:
    - Relationships at home
    - Student's way of doing things (at home)
    - Teacher responses to the stem: Characteristics that describe the student in your class … were used to construct the attitudinal competencies described in the first report on the Competent Children, Competent Learners study at 16 (Hodgen, 2007).
    - Dean (or equivalent) description of hindrances and support for students in the participants' year.

## Method

### *Likert-type scale items*

We used principal factor analysis with varimax rotation using SAS/STAT ® (SAS Institute Inc, 2002-2003) to determine which items should constitute possible scales, and used Cronbach's alpha to get a measure of the reliability of the scales.

The actual scale variables were calculated as the unweighted mean of the Likert-scaled items indicated by the rotated principal factor analysis (where necessary, items were scaled to be on a scale with the same number of points), and converted to a 1–10 scale by a linear transformation.

The scale scores used as explanatory variables were constructed so that a higher value corresponded to more of the attribute. Sometimes this is "good", as in supportive family, or engaged in school, and sometimes this is "bad", as in disrupted learning environment or being disengaged in learning. The signs of the correlation coefficients and regression coefficients reflect the relationship between "good" and "bad" attributes: two "good" attributes tend to have a positive association, as do two "bad" ones, whereas one "good" and one "bad" have a negative association.

### *Other items*

For the student hindrances and teacher hindrances scales we calculated the mean of the items involved. For the hindrance scales, this was the mean of the 4-point scale items, converted to a 10-point scale by a linear transformation.

## Listings of scale variables and their items

Where students and/or parents and/or teachers were asked similar questions and we put all such items into a single analysis, we found each time that they loaded onto different possible factors or scale variables. In consequence we tended to analyse each of the banks of items indicated above separately, and the scale variables derived all tend to be derived from items from a single bank of questions; all the items are student responses, or parent responses, or teacher responses. Almost always, all the items in a scale are responses to a common stem ("School is a place where …" for example).

We obtained a number of possible scale variables that had Cronbach's alpha values of at least 0.7, each constructed from a minimum of four items. Possible scale variables with lower alpha values, or fewer items, were not used. The only exception was *satisfied with subject mix*, which has $\alpha = 0.7$ and is constructed from three items.

In the lists that follow, an (r) indicates that the scale of the item was reversed before being used to form the scale variable.

## *School is a place where …*

### Scale 1 Engaged in school

A high score corresponds to positive (good) engagement in school.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.79) Item–scale correlations between 0.41 and 0.61; *n* = 416 | ($\alpha$ = 0.79) *n* = 447 |
| • I like my teachers<br>• I keep out of trouble<br>• I enjoy learning<br>• I want to leave school as soon as I can (r)<br>• I get bored (r)<br>• I get tired of trying (r)<br>• I skip classes (r)<br>• I feel restless (r) | • The discipline rules are fair<br>• I keep out of trouble<br>• I like my teachers<br>• I enjoy learning<br>• I get tired of trying (r)<br>• I get too much work to do (r)<br>• I skip classes (r)<br>• I want to leave as soon as I can (r) |

### Scale 2 Affirmed at school

A high score corresponds to being affirmed.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.80) Item–scale correlations between 0.32 and 0.55; n = 416 | ($\alpha$ = 0.73) n = 447 |
| • I feel I belong<br>• I am treated like an individual<br>• Students have a say in how our school runs<br>• I am treated like an adult<br>• The discipline and rules are fair<br>• I feel safe<br>• Teachers ask for our views about how to make the school and our class better<br>• I learn most things pretty quickly<br>• I can take leadership roles if I want to<br>• It's important to do my best<br>• I get all the help I need | • I am treated like an individual<br>• I feel I belong<br>• I feel safe<br>• I get all the help I need<br>• I learn most things pretty quickly<br>• It's important to do my best<br>• I am treated like an adult<br>• I have good friends |

### Scale 3 Satisfied with subject mix

A high score corresponds to satisfaction with the subjects taken.

| ($\alpha$ = 0.70) Item–scale correlations between 0.46 and 0.56; *n* = 420 |
|---|
| • I am happy with my subjects this year |
| • My parent/s are happy with my subjects this year |
| • The subjects I am doing will help me do the subjects I want to do next year |

## *I feel I'm doing well at school when …*

A high score on both scales corresponds to using internal/external markers of success.

### Scale 4 Student uses internal markers of achievement

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.86) Item–scale correlations between 0.55 and 0.70; n = 420 | ($\alpha$ = 0.86) n = 447 |
| • I do my very best | • I solve a problem by working hard |
| • I learn something interesting | • I learn something interesting |
| • I solve a problem by working hard | • I do my very best |
| • I work really hard | • I get a new idea about how things work |
| • I get a new idea about how things work | • Something I learn makes me think about things |
| • Something I learn makes me think about things | • I work really hard |
| • What I learn really makes sense | • What I learn really makes sense |
| • I catch on quickly | • I catch on quickly |

### Scale 5 Student uses external markers of achievement

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.84) Item–scale correlations between 0.53 and 0.72; n = 420 | ($\alpha$ = 0.86) n = 447 |
| • I know more than other people | • I know more than other people |
| • Others get things wrong and I don't | • Others get things wrong and I don't |
| • I'm the only one who can answer questions | • I have the highest test marks |
| • I don't have to try hard | • I don't have anything hard to do |
| • I don't have anything hard to do | • I'm the only one who can answer questions |
| • I get good marks/results | • I don't have to try hard |

## *English/most enjoyed subject/least enjoyed subject is a class where …*

We have a choice between forming separate scales for each of the classes, and also for attitudes to the class and attitudes to the teacher, or forming overall scales: attitude to class across the three classes; to the teacher across the three teachers; to English class and teacher, most enjoyed class and teacher, and least enjoyed class and teacher; or even a single overall scale for attitude to all three classes and all three teachers.

For each of the three classes and the combined classes, the class and teacher scales are strongly correlated ($0.8 < r < 0.9$), which means that, while they do measure slightly different aspects of the student–class interaction (at

least in theory), only one could be used in a linear model at a time (using both would mean that the model would have problems with collinearity). The strength of the correlations is indicative of the extent to which, at age 16, students' attitudes to their teacher and class are not separated. They tend to like a class in which they have an effective teacher whom they like, and to dislike a class as much on the basis of the characteristics of the teacher as the subject being taught.

The most enjoyed subject and least enjoyed subject measures are weakly correlated, which is indicative of the diversity of opinion on the students' most enjoyed and least enjoyed classes and teachers.

In the analyses, the composite class and teacher (across all three classes) measures were used, as well as the subscale measures, depending on which was more appropriate.

All the other scales are formed across all three subjects.

Scale 6 Positive learning environment in English/most enjoyed subject/least enjoyed subject

| Age 16 (***n*** = 420) | Age 14 (***n*** = 446) |
|---|---|
| Teacher only | |
| • My teacher treats me fairly<br>• I can count on the teacher for help when I need it<br>• The teacher really understands how I feel about things<br>• I like the teacher<br>• I understand my teacher's attitudes and rules | • I like the teacher<br>• My teacher treats me fairly<br>• The teacher really understands how I feel about things<br>• I understand my teacher's attitudes and rules |
| Class only | |
| • My teacher is interested in my ideas<br>• The teacher gives us clear expectations of what we are to do<br>• My teacher gives clear instructions<br>• My teacher knows about what interests us<br>• My teacher keeps teaching till we understand<br>• I gain knowledge that will be useful for my future<br>• The teacher spends most of their time helping us to learn<br>• We discuss different ways of looking at things/interpretations<br>• The teacher gives useful feedback on my work that helps me see what I need to do next and how to do it<br>• The teacher uses examples that are relevant to my experience<br>• The teacher is happy to explain things more than once<br>• I get to think about ideas and problems in new ways<br>• I can make mistakes and learn from them without getting into trouble<br>• I can try out new ideas/ways of doing things | • My teacher gives clear instructions<br>• The teacher helps me do my best<br>• I can count on the teacher for help when I need it<br>• The teacher gives us clear expectations of what we are to do<br>• My teacher knows about what interests us<br>• My teacher is interested in my ideas<br>• My teacher keeps teaching till we understand<br>• The teacher gives useful feedback on my work<br>• The teacher is happy to explain things more than once<br>• The teacher uses examples that are relevant to my experience<br>• I enjoy doing the homework I get |

The next table gives a summary of the statistical properties of the scales.

| Details | Cronbach's alpha | Range of correlations with scale |
|---|---|---|
| English | | |
| Class | 0.91 | 0.39–0.77 |
| Teacher | 0.88 | 0.60–0.78 |
| Most enjoyed subject | | |
| Class | 0.88 | 0.42–0.64 |
| Teacher | 0.84 | 0.61–0.69 |
| Least enjoyed subject | | |
| Class | 0.90 | 0.33–0.76 |
| Teacher | 0.86 | 0.31–0.72 |
| All subjects combined | | |
| Class | 0.89 | 0.21–0.54 |
| Teacher | 0.79 | 0.29–0.54 |

### Scale 7 Absorbed in learning, combined from all three subjects

A high score corresponds to being absorbed in learning.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.87) Item–scale correlations between 0.27 and 0.57; n = 420 | ($\alpha$ = 0.86) n = 447 |
| • When I'm doing something, I think about whether I understand what I'm doing<br>• I organise my time so that I get things done<br>• When I finish my work, I check and make changes if needed before handing it in<br>• I meet any goals that I set myself<br>• I like to reflect on how I've learnt something (the method I used)<br>• I enjoy doing the homework I get | • I get totally absorbed in my work<br>• Things I do outside school help my learning<br>• When I finish my work, I check to make sure it is correct<br>• Students work out problems together<br>• When I'm writing something, I think about whether I understand what I'm doing<br>• I can do the hardest work if I try<br>• I can get help at home if I need to |

### Scale 8 Disengaged in learning, combined from all three subjects

A high score on this scale corresponds with the behaviours or activities taking place in class.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.80) Item–scale correlations between 0.30 and 0.60; n = 420 | ($\alpha$ = 0.85) n = 447 |
| • I muck around<br>• I can get away with not doing much work<br>• I behave in a way which annoys the teacher<br>• We keep doing the same things without learning anything new | • I behave in a way which annoys the teacher<br>• I muck around<br>• I can get away with not doing much work<br>• We keep doing the same things without learning anything new<br>• I don't like asking my teacher questions<br>• We get too much homework |

### Scale 9 Disrupted learning environment, combined from all three subjects

A high score on this scale corresponds to the behaviours or activities taking place in class.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.76) Item–scale correlations between 0.21 and 0.50; n = 420 | ($\alpha$ = 0.84) n = 447 |
| • The class gets interrupted (e.g. by external events, messages)<br>• Students don't listen to what the teacher says<br>• The teacher spends most of the time telling us what to do<br>• The teacher spends most of the time telling us how to behave<br>• Other students are distracting | • Other students are distracting<br>• The class gets interrupted<br>• Students don't listen to what teacher says |

### Scale 10 Attitude to work, combined from all three subjects

A high score corresponds to a positive attitude to work.

| ($\alpha$ = 0.81) Item–scale correlations between 0.20 and 0.56 |
|---|
| • I don't know how to do the work (r)<br>• I plan to drop the subject as soon as I can (r)<br>• I do well<br>• I'm confident I can master the skills being taught<br>• The NCEA credits are easy to get<br>• I will get a lot of NCEA credits in this class |

### Scale 11 Relevant learning opportunities, combined from all three subjects

A high score corresponds to the connections being made in class.

| ($\alpha$ = 0.73) Item–scale correlations between 0.16 and 0.43 |
|---|
| • We learn things outside the classroom, e.g. on field-trips<br>• I see connections with other things outside of school<br>• We do projects about real issues<br>• We have a lot of hands-on/practical activities<br>• We can choose the topics we want to do<br>• I can choose which assessments I want to do for NCEA |

### Scale 12 Comparative learning environment, combined from all three subjects

A high score corresponds to the comparisons being made in class. Although there are only two items used for this score, we effectively had up to six items, two from each of the three teachers.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.77) Item–scale correlations between 0.44 and 0.57; n = 419 | ($\alpha$ = 0.79)<br>n = 447 |
| • The teacher tells us how we compare with other students<br>• The teacher tells us who has the highest and lowest marks for their work | • The teacher tells us how we compare with other students<br>• The teacher tells the whole class who has the highest and lowest marks for their work |

## *When I'm at home …*

### Scale 13 Family communicates well

A high score corresponds to a family with good communication.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.73) Item–scale correlations between 0.32 and 0.54; n = 447 | ($\alpha$ = 0.80)<br>n = 447 |
| • My Mum can tell when I'm upset about something<br>• I tell my family my problems and troubles<br>• My family checks that I've done my homework/what I need to do<br>• My Dad can tell when I'm upset about something<br>• I talk about what I'm reading<br>• I can talk about my hopes and plans for the future<br>• I do interesting things with my parents | • My Mum can tell when I'm upset about something<br>• I tell my family my problems and troubles<br>• My family checks that I've done my homework<br>• My Dad can tell when I'm upset about something<br>• I talk about what I'm reading<br>• I can talk about my hopes and plans for the future<br>• My family asks me about school<br>• I do interesting things with my parents |

### Scale 14 Family pressure

A high score corresponds to a family where individuals feel pressure.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.85) Item–scale correlations between 0.41 and 0.73; n = 447 | ($\alpha$ = 0.80) n = 447 |
| • My Mum is always trying to change me<br>• My Dad is always trying to change me<br>• Home is more friendly if I just do what my parents want<br>• My parents want to control whatever I do<br>• My parents expect too much from me<br>• My family worry too much about what I do with my friends<br>• My parents have their own problems so I don't bother them with mine<br>• I need more privacy | • My Mum is always trying to change me<br>• My Dad is always trying to change me<br>• Home is more friendly if I just do what my parents want<br>• My parents want to control whatever I do<br>• My parents expect too much from me<br>• My family worry too much about what I do with my friends<br>• My parents have their own problems so I don't bother them with mine<br>• I need more privacy |

### Scale 15 Inclusive family

A high score corresponds to a family that is inclusive.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.85) Item–scale correlations between 0.50 and 0.67; *n* = 447 | ($\alpha$ = 0.80) *n* = 447 |
| • I get treated fairly<br>• I am comfortable<br>• My family respects my feelings<br>• I get help if I need help<br>• The expectations are fair<br>• My family asks me about school/what I do<br>• Everyone is too busy to bother about me (r) | • I get treated fairly<br>• I am comfortable<br>• My family respects my feelings<br>• I get help if I need help<br>• The expectations are fair<br>• Everyone is too busy to bother about me (r) |

### Scale 16 Supportive family

A high score corresponds to a family that is supportive.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.85) Item–scale correlations between 0.59 and 0.68; *n* = 447 | ($\alpha$ = 0.87) *n* = 447 |
| • I trust my Dad<br>• My Dad is warm and loving towards me<br>• I trust my Mum<br>• My Mum is warm and loving towards me<br>• I feel close to my family<br>• My family really help and support each other | • I trust my Dad<br>• My Dad is warm and loving towards me<br>• I trust my Mum<br>• My Mum is warm and loving towards me<br>• I feel close to my family<br>• My family really help and support each other |

## *In the past year I've had happen to me …*

### Scale 17 Risky behaviour

A high score corresponds to having shown risky behaviour.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.79) Item–scale correlations between 0.29 and 0.63; n = 444 | ($\alpha$ = 0.80) n = 447 |
| • Doing something you regretted when drunk<br>• Drinking alcohol<br>• Getting in trouble with the police<br>• Having sex<br>• Getting into a physical fight<br>• Breaking up with a boyfriend/girlfriend<br>• Getting in trouble at school<br>• Having to lie about something someone else did<br>• Getting behind with school work | • Doing something you regretted when drunk<br>• Drinking alcohol<br>• Getting in trouble with the police<br>• Having sex<br>• Getting into a physical fight<br>• Breaking up with a boyfriend/girlfriend<br>• Getting in trouble at school<br>• Having to lie about something someone else did<br>• Falling behind with school work |

### Scale 18 Rejection

A high score corresponds to having been hassled or rejected.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0. 74) Item–scale correlations between 0.33 and 0.54; *n* = 444 | ($\alpha$ = 0.75); *n* = 447 |
| • Feeling left out<br>• Being pressured to do something you did not want to<br>• Being hassled about your body size/shape<br>• Being bullied/hassled at school<br>• Hassling/bullying someone at school<br>• Being hassled about your sexuality<br>• Being hassled about your culture<br>• Coping with body changes | • Feeling left out<br>• Not having enough freedom<br>• Losing control of your temper<br>• Having nothing to do/being bored<br>• Being pressured to do something you did not want to<br>• Not having enough money<br>• Losing a friend<br>• Trying to fit everything into your time<br>• Being hassled about your body size/shape<br>• Fighting with others at home<br>• Being bullied/hassled at school<br>• Coping with body changes |

## Scale 19 Achievement and praise

A high score corresponds to having an achievement or being praised.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0. 68) Item–scale correlations between 0.31 and 0.51; n = 444 | ($\alpha$ = 0.71); n = 447 |
| • Being praised for achievement<br>• Getting selected for a team or event<br>• Making a new friend<br>• Being included in a group you really wanted to be in<br>• Supporting a friend in trouble<br>• Taking action about a situation that concerns you<br>• Trying to fit everything into your time | • Being praised for your achievements in sport or cultural activity<br>• Getting selected for a team or event<br>• Being praised for achievements<br>• Making a new friend<br>• Being included in a group you really wanted to be in<br>• Supporting a friend in trouble<br>• Taking action about a situation that concerns you<br>• Being praised for your achievements in a paid work situation |

## Scale 20 Adverse events

A high score corresponds to having had one or more adverse events in the year.

| ($\alpha$ = 0.58) Item–scale correlations between 0.24 and 0.47 |
|---|
| • Having sex when you didn't want to<br>• Death of a friend<br>• Had an accident/been injured<br>• Shifting to live with a different parent or family member/changing where you live<br>• Family break-up<br>• Health problem |

### *My friends are …*

The students still at school were asked questions about their school friends, or friends at school, and the young people who had left school were asked more general questions about friendships. However, the items asked were sufficiently similar that the responses to the slightly different items could be combined into a single scale score.

#### Scale 21 Friends with risky behaviour

A high score corresponds to having friends with risky behaviour.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.81) Item–scale correlations between 0.48 and 0.72; *n* = 447 | ($\alpha$ = 0.84)<br>*n* = 446 |
| • My friends smoke cigarettes<br>• My friends think it is okay to have unsafe sex<br>• When my friends and I party we like to drink alcohol<br>• My friends smoke marijuana<br>• My friends do other drugs<br>• My friends get into trouble [at school] | • My friends smoke cigarettes<br>• My friends think it is okay to have sex before you are 16<br>• My friends like to party and drink alcohol<br>• My friends wag school<br>• My friends smoke marijuana<br>• My friends get into trouble at school |

#### Scale 22 Solid friendships

A high score corresponds to having solid friendships.

| Age 16 | Age 14 |
|---|---|
| ($\alpha$ = 0.77) Item–scale correlations between 0.47 and 0.60; n = 447 | ($\alpha$ = 0.79)<br>n = 446 |
| • My friends respect my feelings<br>• I trust my friends<br>• My [school] friends are good friends<br>• I wish I had different friends [at school] (r)<br>• I feel alone or apart when I am with my friends (r) | • My friends listen to what I have to say<br>• My friends respect my feelings<br>• I trust my friends<br>• My school friends are good friends<br>• My friends are people my parents like<br>• I like to get my friends' point of view on things I am concerned about<br>• My friends push me to do stupid things (r)<br>• I wish I had different friends at school (r)<br>• I feel alone or apart when I am with my friends (r) |

### Scale 23 Extending friendships

A high score corresponds to the existence of friendships with these attributes.

($\alpha$ = 0.74) Item–scale correlations between 0.38 and 0.55

- My friends push me to do well
- I like to get my friends' point of view on things I am concerned about
- My friends talk about hopes and plans for the future
- My friends have introduced me to interesting activities that I would not have known about otherwise
- My friends listen to what I have to say
- My friends enjoy learning new things [at school]
- My parents like my friends

## *Student's way of doing things (at home)*

High scores on these scales correspond to the young person having the attributes.

### Scale 24 Parental view of student self-confidence

($\alpha$ = 0.79) Item–scale correlations between 0.36 and 0.57

- Enjoys new experiences or challenges
- Is confident in his/her interactions with adults
- Expresses his/her views and needs appropriately
- Clearly explains things s/he has seen or done, so that you get a very good idea of what happened
- Asks a lot of questions
- Takes active interest in the outside world beyond him/herself
- Asks for help or support if s/he needs it
- Is good at negotiating with friends
- Presents his/her point of view to an adult in an appropriate manner even when there's a disagreement

### Scale 25 Parental view of student self-efficacy

($\alpha$ = 0.82) Item–scale correlations between 0.40 and 0.61

- Takes responsibility for his/her actions
- Meets any goals s/he sets her/himself
- Shows respect for adults
- Is a good listener
- Takes optimistic view of life
- Is willing to learn from his/her mistakes
- Learns from feedback
- Sees others' points of view
- Is influenced by peer pressure to do something out of character (r)
- Acts without thinking of the consequences (r)

### Scale 26 Parental view of student responsibility

($\alpha$ = 0.80) Item–scale correlations between 0.37 and 0.60

- Is able to remember and carry out instructions after hearing them only once
- Takes responsibility for getting organised
- Passes on messages accurately
- Finishes all his/her chores
- Follows what is being talked about in a conversation and stays on the same topic
- Asks for something to be repeated or explained again if s/he does not get it the first time
- Persists with solving a problem, even when things go wrong for a while
- Has a good concentration span when working on things that interest him/her

### Scale 27 Parent–child friction at age 14

($\alpha$ = 0.73)

- Home would be friendlier place if the student would do as s/he was told
- I worry that their friends have too much freedom
- There are things about the student I am really trying hard to change
- Privacy is source of friction between the student and other family members
- There is a lot of friction in our home
- I trust the student to behave appropriately when in the company of his/her friends (r)
- I generally like their friends (r)
- I see the student's friends as a positive influence on him/her (r)

## Listings of other scale variables

### *Teacher perception of class and student*

Responses to several of the items were used to make the attitudinal competencies, as in previous years. Other questions asked at age 16 were used to make some descriptors of the class environment. The items are in response to an overall descriptor "In this class:" and in general the three classes need to be treated separately, with the situation in the English classes being used to represent the students' most "typical" experiences.

### Scale 28 Students involved and active

($\alpha$ = 0.81, 0.80, 0.78 for English, most enjoyed, and least enjoyed subjects, respectively) Item–scale correlations between 0.33 and 0.66

- Students do a lot of group activities and discussions
- We have a lot of fun
- Students have the opportunity to act on issues that concern them
- Students interact with people outside school as part of school work (e.g. on fieldtrips)
- Students work out problems together
- Students are encouraged to assess each other's work and give feedback
- Students are encouraged to lead group projects or class activities
- When students work in groups, they solve their own conflicts

### Scale 29 Feedback and support

($\alpha$ = 0.80, 0.78, 0.77 for English, most enjoyed, and least enjoyed subjects, respectively) Item–scale correlations between 0.24 and 0.68

- I model the skills and attitudes I would like the students to develop
- Students make mistakes and learn from them without getting into trouble
- Most of my time in class is spent helping students learn
- I encourage students to ask for assistance or support
- I encourage students to discuss things with me
- I use different approaches for different students
- The feedback I give students shows them their weaknesses
- The feedback I give students shows them their strengths
- The feedback I give students shows them their next steps

### Scale 30 Reflective learning

($\alpha$ = 0.68, 0.68, 0.69 for English, most enjoyed, and least enjoyed subjects, respectively) Item–scale correlations between 0.36 and 0.55

- I encourage students to think and talk about how they are learning (the methods they are using)
- Students are given input into the context and direction of learning activities
- Students have the opportunity to set their own learning goals
- Students are given time to reflect on their learning

### Scale 31 Students working alone

($\alpha$ = 0.45, 0.69, 0.64 for English, most enjoyed, and least enjoyed subjects, respectively) Item–scale correlations between 0.15 and 0.58

- Students do a lot of practical activities (r)
- Students do a lot of written activities by themselves
- Students take a lot of notes

The next four scales are the four attitudinal competencies, and were formed from responses to items about the student and how they behaved in class.

### Scale 32 Thinking and learning

($\alpha$ = 0.96)

- Carries out any leadership role s/he is given
- Can reflect on how s/he has learnt about something (the methods used)
- Asks questions so s/he understands
- Enjoys new experiences or challenges
- Learns from my feedback
- Thinks "outside the square"; thinks of new ways to do things or solve problems
- Asks me for advice or help when s/he needs it
- Aware that there are different ways of interpreting knowledge
- Takes full part in a group that is working to complete a learning task together
- Takes on new ideas
- Clearly explains things so that you get a very good idea of what is happening and what s/he is thinking
- Expresses her/his views and needs appropriately

### Scale 33 Focused and responsible

($\alpha$ = 0. 97)

- Persists with solving a problem even when things go wrong for a while
- Has a good concentration span when working
- Assesses her/his work and makes improvements before completing it or handing it in
- When there is a choice of work, chooses work that allows him/her to gain further knowledge or skills
- Finishes all class work
- Finishes all homework
- Follows all class routines and rules without needing to be reminded
- Turns up to class on time
- Brings all the equipment s/he needs to class
- Takes responsibility for his/her actions
- Acts without thinking of the consequences
- Meets any goals that s/he sets her/himself
- Learns from mistakes/experience
- Remembers and carries out instructions after hearing them once
- Follows what is being talked about in a conversation and stays on the same topic
- Good listener: e.g. lets others finish before speaking; concentrates on what they're saying

### Scale 34 Social skills

($\alpha$ = 0.79)

- Good at resolving disputes or keeping things smooth with peers
- Helps/supports other students in the class
- Presents her/his point of view in an appropriate manner even when there's a disagreement
- Respects other points of view or different ways of doing things

### Scale 35 Social difficulties

($\alpha$ = 0.79)

- Gets hassled/bullied by other students
- Hassles/bullies other students
- Influenced by peer pressure to do something out of character
- Mixes with students who are antisocial or get into trouble

The next two scales are in response to items about the student and NCEA assessment.

### Scale 36 Teacher view of student and NCEA assessment

($\alpha$ = 0. 92, 0.92, 0.93 for English, most enjoyed, and least enjoyed subjects, respectively) Item–scale correlations between 0.19 and 0.85

- S/he does the bare minimum to get the credits (r)
- S/he is not interested in the work if there are no credits to be gained (r)
- S/he works hard regardless of whether a topic is assessed or not
- S/he is organised and well prepared for assessments
- S/he can cope with pressure of internal assessments
- S/he uses time well in assessment tasks
- S/he always strives for excellence
- S/he always tries to learn from my feedback on trial assessments
- S/he typically questions judgements and grades awarded
- S/he is realistic about likely achievement in assessment tasks
- S/he makes impulsive decisions to not do assessments (r)
- S/he makes strategic decisions to not do assessments (r)
- S/he is able to cope with pressure of external assessments

The three NCEA measures from the three teachers were moderately correlated (0.50 between most and least enjoyed subject teachers and 0.56 between the least enjoyed subject and English teachers, and 0.51 between most enjoyed subject teachers and English teachers). The pattern of moderate levels of agreement between teachers was noticeable for the other scales, too. The most strongly correlated were the *focused and responsible* subscales (correlations between 0.53 and 0.56), followed by *thinking and learning* (between 0.39 and 0.45), *NCEA assessment*, then *social difficulties* (between 0.29 and 0.42), and *social skills* (between 0.29 and 0.33).

### *Dean (or equivalent) description of hindrances and support for students in the participant's year*

These two variables apply at the school and year level, not at the individual level, as they are measures of the environment in which the participants at the same year level at each school found themselves in during the relevant year of data collection.

Possible hindrances were measured as the mean of the Likert-scale student and teacher hindrance items, scaled to a 1–10 scale.

Scale 37 Hindrances to learning, student causes

($\alpha$ = 0.72) Item–scale correlations between 0.24 and 0.55

- Student absenteeism
- Students disrupting classes
- Students skipping class
- Student transience
- Students lacking respect for teachers
- Students' use of alcohol/illegal drugs
- Students intimidating/bullying others

Scale 38 Hindrances to learning, teacher causes

($\alpha$ = 0.83) Item–scale correlations between 0.45 and 0.63

- Teacher absenteeism
- Teacher turnover
- Teachers being too strict
- Poor student–teacher relationships
- Range of subjects available
- Teachers not meeting individual student needs
- Teachers having low expectations of students
- Students not being encouraged to achieve full potential

# Cluster variables

These variables were constructed from a range of multiple response questions (and occasionally other variables, sometimes dichotomised or converted into a series of binary variables):

- Leisure interests listed by parents when the students were 14
- Leisure interests mentioned by students at age 14
- Family income, and the proportion of income spent on housing, the family's ability to pay bills each month, and how much money is left after paying the bills each month at age 14
- The things that are most important to the student, both now (at 16) and when they are an adult
- Student subject choices (for those still at school)

## Method

Most of our clusters were formed using binary data, as this seemed the best way to make use of the information coded this way. Where nonbinary variables were used in the same cluster analysis along with binary variables, the nonbinary variables were usually dichotomised or else turned into a number of binary variables (one for each point on the scale), because the distance measure we used was appropriate for binary variables.

We used SAS/STAT ® (SAS Institute Inc, 2002-2003) to do the analysis. We calculated the distance matrix using the distance macro, provided by SAS to calculate the distance matrix. If the responses were binary, we calculated Jaccard distances. The Jaccard similarity for two students would be the ratio of the number of times they both had the value of 1 to the number of times where either one or both had the value 1. The Jaccard distance is one minus the similarity. If the responses were not binary (for example, the parental interests), we calculated squared Euclidean distances.

We tried a variety of clustering methods and found that the Lance-Williams flexible-beta method of clustering (Lance & Williams, 1966)d the Ward method gave reasonably even-sized clusters. We checked the number of clusters to retain and the effectiveness of the clustering in defining groups with differing characteristics by comparing cluster means for the competencies and sometimes some of the scale variables. We found that often the cluster means for the former method were more extreme than those for the Ward method. We used the method that gave the greatest separation between clusters on a case-by-case basis.

Descriptions of the cluster groups were based on a comparison of item frequencies across the clusters. The description of a group was formed from the items for which the group had higher frequencies than any of the other groups (the item was overrepresented in that group).

## Listings of the cluster variables

The clusters described here are those that proved to define groups with clear mean differences in competency scores and/or scale scores.

Cluster membership cannot be entirely clear, nor unambiguous. However, it seems that the clusters have allowed us to define subgroups within the sample who respond differently on a variety of measurements.

### *Student values at age 16*

The students were asked to indicate the three things that are most important to them at age 16, and the thing(s) that they think will be most important to them as adults. A cluster analysis yielded three clusters:

- Having a satisfying life (wanting to be helpful or kind, have a good sense of humour, enjoy the things they do, have a happy family life, have an interesting job, being creative)

- Standing out (wanting to look good/cool, have money and friends, have an important job, and do well at sport)
- Aspirational (wanting to be with family/whänau/fanau, do well at school and sport, get a good education, have an important job, influence other people, and have good health)

Scale 39 Student values at age 16

- Current values:
    - wearing the right clothes/looking cool
    - being good looking
    - having money to spend
    - being helpful or kind
    - having the latest things
    - being with family/whänau/fanau
    - having a good sense of humour
    - doing well at school
    - doing well at sport
    - doing well at an interest outside school
    - going to church
    - having lots of friends
    - enjoying the things I do
- Future adult values:
    - good looks
    - happy family life
    - lots of money
    - lots of friends
    - an interesting job
    - a good education
    - an important job
    - influencing other people
    - being creative/making something new
    - taking part in church/spiritual activities
    - good health

### *Student values at age 14*

The students were asked to indicate the three things that are most important to them at age 14, and the thing(s) that they think will be most important to them as adults. A cluster analysis yielded three clusters:

- Anchored/achieving
- Anchored
- Standing out

Scale 40 Student values at age 14

- Current values:
  - wearing the right clothes/looking cool
  - being good looking
  - having money to spend
  - being helpful or kind
  - having the latest things
  - being with family/whänau/fanau
  - having a good sense of humour
  - doing well at school
  - doing well at sport
  - doing well at an interest outside school
  - going to church
  - having lots of friends
  - enjoying the things I do
- Future adult values:
  - good looks
  - happy family life
  - lots of money
  - lots of friends
  - an interesting job
  - a good education
  - an important job
  - influencing other people
  - being creative/making something new
  - taking part in church/spiritual activities
  - good health

### *Motivation at age 14*

In these reports, "motivation" refers to the perceived value of education, and long-term ambition of the student and for the student by their parent. This is clear from the items used to construct the clusters. The clusters formed at age 14 were used again at age 16, as they were useful indicators of the value placed on education early in secondary education.

The three clusters used were named:

- University/professional orientation; high faith in gains from school
- Less positive of gains from school and less sure of future goals
- Aiming for skilled/unskilled jobs; low conviction about gains from school

The items listed below were all either binary responses or responses on a Likert-type scale that were converted to binary variables.

Scale 41 Motivation

- Some of the things the students enjoy about the school are:
    - good teachers
    - independence/treated as an individual/adult
    - facilities
    - extracurricular activities
- The student thinks that they will have a career that is:
    - professional
    - skilled
    - unskilled/unknown
- As an adult the student thinks that the most important things will be:
    - happy family life
    - lots of money
    - lots of friends
    - an interesting job
    - a good education
    - an important job
    - doing well at sports
    - influencing other people
    - being creative/making something new
    - taking part in church/spiritual activities
    - good health
- The student thinks that when they leave school they:
    - will study further
    - will travel
    - will get a job
    - have no idea what they will do

- The parent's hopes for the student's future education are:
  - as far as they want to/are able to go
  - university
  - other tertiary
  - end of secondary
- The parent thinks that the student will have a career that is:
  - professional
  - skilled
  - unskilled/unknown as yet
- The student aims to leave school:
  - at the end of Year 12
  - at the end of Year 13
  - unsure
- The parent perceives that an expectation that the student would do well at school is:
  - like us [their family]
  - not like us
- The student gains knowledge useful for their future in English/mathematics/science (entered as separate variables):
  - agree
  - neutral/ disagree

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### *Student interests*

The students were asked to rate how often they were involved in various leisure activities on a scale of often/most days, once or twice a week, less than once a week, and never. A comparison between the age-14 and age-16 clusters indicated that the age-14 clusters showed greater association with the age-16 competencies, so we have used these clusters at age 16, too. The four clusters were:

- Sports player
- Computer games player/no strong interests
- Reading, arts, and sport
- Creative interests

Scale 42 Student interests

- watch television
- read
- use a computer
- play computer/video games etc.
- hang out with friends
- do homework
- play sport for fun
- go to art/music/dance classes
- do exercise/physical training
- play competitive sport
- make things—a hobby or craft
- practise singing or playing a musical instrument
- cultural activities, e.g. kapa haka

### *Student subject choices*

Separate cluster analyses were run on student subject choices for the Year 11 and Year 12 students. In both instances, four similar clusters were found to be most appropriate.

Scale 43 Subject clusters

- Traditional academic: arts orientation. These students were more likely to take achievement standards (AS) in maths, visual art, music, economics, accountancy, graphics, one or more languages, geography, history, design or fabric technology, the English unit standards (US) that require reading a range of texts, and at Level 2 more creative options among the English AS, photography
- Traditional academic: science orientation. These students were more likely to take AS in maths (including standards in geometry), physical education, economics, science subjects (science in Year 11, and biology, chemistry, physics, etc. in Year 12), geography
- Contextually-focused options. These students were more likely to take food technology, outdoor/sport options, physical education, visual art, fabric or other soft technology options, geography, computer-oriented options, text information management, a mix of US and AS in maths, life skills, hospitality, or tourism
- Vocational orientation. These students were more likely to take food technology, physical education, dance and/or drama, music, one or more of the hard technology options, text information management, life skills US, hospitality or tourism, US in maths and English, science (US at Level 2), business studies, other technology options

# History variables

In the last several rounds of analysis[1] we have developed history variables, based on responses to similar questions asked at ages 5 to 14. Some of these history variables cover only a subset of the years. For this report we re-used the age-14 history variables, as the changes (or stability) reflected in these variables is unlikely to be modified much by the addition of an extra round of data and the variables are not affected by nonresponse (particularly of parents, or of those no longer at school on questions about school).

## Method

Developing history variables was a very empirical process. We concatenated the numerical codes for the responses at each data collection round to form a string of digits as long as the number of data rounds, and then grouped the resultant strings into categories. Usually there were categories of all/almost all "good", and all/almost all "bad" (the two extreme categories), one or two clearly categorised mixtures (mainly all good/bad), and a "mixture" category (often difficult to categorise any other way).

The divisions between the categories were checked and finetuned by looking at boxplots and category means for the competencies and scale variables (described above).

## Listings of the history variables

Scale 44 History of watching age-8–14 categories

- Mainly low (up to 2 hours a day in at least three of the rounds)
- Mixed (everything else)
- Mainly high (over 2 hours a day in at least three of the rounds)

Scale 45 History of school decile age-8–14 categories

- Mainly low-decile (decile 1 or 2 school in at least three of the rounds)
- Mainly mid-decile (decile 3–8 school in at least three of the rounds)
- Mixed (everything else)
- Mainly high-decile (decile 9 or 10 school in at least 3 of the rounds)

Scale 46 History of family income age-8–14 categories

- Mainly low (under $30K in at least three of the rounds)
- Mostly moderate ($30–100K in at least three of the rounds)
- Mixed (everything else)
- High at least once (over $100K in at least one of the rounds)

[1] See, for example, Wylie, Thompson et al. (2004).

### Scale 47 History of involvement in bullying age-10–14 categories

- Never involved in bullying
- Has been involved once (as either bully or victim)
- Has been involved at least twice (as either bully or victim)

### Scale 48 History of enjoyment of reading age-8–14 categories

This variable is based on parental reports of the students' enjoyment of reading at ages 8 and 10, and the students' reports at ages 12 and 14.

- Always enjoyed reading
- Everything else—mainly said yes or qualified yes
- Said they did not enjoy reading at least twice

### Scale 49 History of feelings about school age-6 or 8–12 categories

For this history variable, where we had age 6 data, we used it, and for the other students we used age-8–12 data.

- Always enthusiastic
- Fairly enthusiastic (in two or three of the rounds)
- Mixed (everything else)
- Unhappy at least once

### Scale 50 History of parents and teachers working on concerns age-8–14 categories

- Never done so
- Reported a single occurrence
- Reported doing so twice in the four rounds
- Reported doing so in three of the four rounds
- Reported doing so in each of the rounds

# Other derived variables

In this section we report on other derived variables that do not fit into any other category. These are attendance, current bullying, and adverse events.

## Method

Different methods were used for each of these variables, and the methodology is described for each of the described variables below.

### *Family financial situation*

Ordinal-scaled variables used to form three clusters:

- Comfortable family financial situation
- Moderate family financial situation
- Difficult family financial situation

Scale 51 Family financial situation

- Family income (if known)
- The approximate proportion of income that was spent on housing
- The ability to pay all the family's bills each month (4-point scale from no difficulty to a great deal of difficulty)
- The amount of money left each month after paying bills (5-point scale from plenty to in debt).

### *Attendance*

In the previous round of data collection we asked for attendance records from the schools, which presented considerable challenges as the schools (or the software systems they used) reported different data. Some counted presences, some absences, some provided information on the maximum number of days (or half days), and others did not. At age 16 we asked the schools to rate the students' attendance on a 5-point scale (from excellent to multiple absences, seldom attends) with two other possible values to cover many absences due to illness, and other absences (the most common reason offered for these was to do with sport).

In the analyses we used two versions of this variable: the full 7-point scale described above, and a dichotomised version where the only distinction was between those with poor attendance, and the others (no matter how well they attended, or what the reason for being absent). Typically, if attendance was associated with another variable, one of the two versions showed a stronger association, and that version was used in that particular analysis.

### *Other teacher-based variables*

The next two variables are derived from the mean across the three teachers of a single item. Overall ability was measured on a 5-point scale, rating the achievement of the student against that of their peers (and predictably, the students typically received a lower rating from the teacher of their least enjoyed subject than from their English teacher, and the discrepancy with the rating from their most enjoyed subject's teacher was more marked). Highest level of post-school qualification was measured on a 5-point scale, and as with ability, the teachers of the least enjoyed subjects tended to be less optimistic than those of the most enjoyed subjects.

### Scale 52 Overall ability/achievement

Mean of up to three teacher evaluations on a 5-point scale (from minimal/very low to very good/excellent). The ratings of the three teachers were only moderately correlated (0.53 between the English teacher and least enjoyed subject, 0.44 between the English teacher and the most enjoyed subject, and 0.41 between the teachers of the most and least enjoyed subjects).

### Scale 53 Post-school qualifications

Mean of up to three teacher evaluations on a 5-point scale with levels: none, trades qualification, tertiary diploma, undergraduate university degree, postgraduate university degree.

## NCEA variables

Apart from the teacher judgement of the approach and attitude of the student to their work for the NCEA (0), we used the students' responses to questions about whether they skipped any NCEA credits, and if so why, to create some binary variables.

### Scale 54 Missed internal credits

### Scale 55 Missed external credits

### Scale 56 Missed two or more credits

From the students' NCEA results we determined several totals of different categories of credits, and also some percentages:

- The total number of Level 1 and Level 2 credits achieved
- The total number of credits in achievement and unit standards achieved
- The percentage of credits achieved that were achievement and unit standards The number of credits for unit standards achieved, achievement standards achieved (A), achievement standards that were merit (M) or excellence (E) or not achieved (N)
- The number of credits from achievement standards attempted
- The number of credits for achievement standards attempted plus number of credits for unit standards—the number of unit standards attempted and not achieved is not known
- The percentage of credits for achievement standards that were achieved at the levels achieved, merit, or excellence calculated as a percentage of all credits known to have been attempted, and as a percentage of all credits for achievement standards attempted

# 3. Statistical methodology

In this chapter I describe the methods, statistics, and models used and reported. The same methodology is used across the whole technical report, unless otherwise stated.

## Correlation measures

### Correlations between two variables

The Pearson's product-moment correlation coefficient is used to measure the correlation between pairs of variables. This measure, or its square, can be used to measure the size of the effect.

When using the correlation coefficient alone, values close to –1 or 1 are taken to indicate a strong relationship; those about –0.5 or 0.5 to indicate a moderate relationship, those about –0.3 or 0.3 to indicate a weak relationship, and those between –0.2 and 0.2 to indicate very little or no relationship.

The square of the correlation coefficient gives the proportion of the variability in the outcome variable that is explained by the variability in the explanatory variable (or of the one variable that is explained by the other if neither can be considered to be an "outcome" variable). This means that a correlation of 0.2 explains 4 percent of the variability, one of 0.5 explains 25 percent of the variability, and one of 0.7 explains 49 percent.

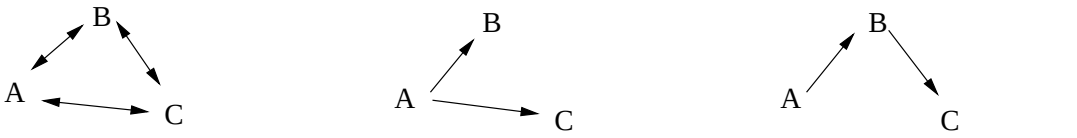
### Correlations between more than two variables

Where we are interested in "clumps" of interrelated variables, simple correlations tell only part of the story. If we know, for example, that engagement, being absorbed in learning, not being disengaged, and being focused and responsible are all correlated, what pattern do we have as a basis for the correlatedness? Maybe all four variables *do* affect the values of the others. Or maybe, some only appear to do so.

A classical example of this is the apparent correlation between the number of books published in a year and the number of traffic accidents in the same year. In actual fact, there is no direct relationship between them, but both are reflecting economic and demographic changes that result in both the number of cars on the road (and so accidents) and the number of books bought (and so published) increasing over time. This could be illustrated by the middle diagram in 0, where the year is A, and B and C are the number of accidents and books, respectively.

A third possibility is that there is a mediating variable. A mediating variable is one where variable A is correlated with variable B which is in turn correlated with variable C. This means that A is apparently correlated with C, but in fact is so only through the mediating variable B.

Figure 1: Possible correlation mechanisms




Correlated | Both B and C affected by A | A affects C only by mediator B

In the first diagram on the left, if the model was causal, and C was the outcome variable, then the arrows from A and B to C would have a single arrow, at the C-end. Depending on the relationship between A and B that, too, could be a single-headed arrow (if one of A or B "caused" changes in the other), or it could be double-headed (if no causal relationship exists, they are correlated).

In this first diagram, as all three variables are correlated, the correlation between any two of them will be less strong once the effect of the third variable is taken into account. In particular, in a linear model in which the explanatory variables are intercorrelated, the simple correlation between any one of the explanatory variables and the outcome variable is stronger than the *partial correlation*[2] which is corrected for or accounting for the other explanatory variables. In a sense, this is the "left-over" correlation between one explanatory variable and the outcome variable, after accounting for the other explanatory variables in the model. The more strongly the explanatory variables are correlated, the greater the reduction in size between the simple correlation and the partial correlation. In this report, where the models contain many approximately continuous variables, we report the partial correlations.

## Models fitted

In all cases where we model an outcome variable on several dependent variables, we used R (R Development Core Team, 2007) to fit a linear model (using the `lm` function).

Because there were so many possible variables to include in the model, we report each time the minimum model, containing only the variables that were statistically significant. An added reason for reporting the minimum model is that where there were two or more strongly correlated variables that could have been included in the model, fitting reduced models allowed us to select the variable that accounted for more variability in the model. Two strongly correlated variables cannot be included in the same model because of multicollinearity. This term reflects that if two or more variables are measuring almost the same thing, at least one is redundant; a model containing both is very difficult to estimate accurately, and the model estimates obtained can vary widely if small changes are made to the model, or be of the opposite sign to that expected. The variance inflation factor (the extent to which the variance of a regression estimate is inflated by multicollinearity) gives a measure of the extent to which multicollinearity is present in a model. If the

[2] The partial correlation between *X* and *Y* holding a set of variables fixed (list) will have the same sign as the multiple regression coefficient of *X* when *Y* is regressed on *X* and the set of variables being held fixed. The partial regression can be calculated from the *t*-statistic for the coefficient of *X* in the multiple regression of *Y* on *X* and the variables in the list, and the residual number of degrees of freedom:

$$r_{XY.\text{list}} = \frac{t}{\sqrt{t^2 + \text{Resid.df}}}$$

explanatory variables are independent, the variance inflation factors (VIFs) are all 1. VIFs of 4 or more (certainly of 10 or more) can indicate possible problems.

All our models were checked for multicollinearity, and where there was an indication of a problem, at least one of the collinear variables was dropped from the model.

In models that were not collinear, variable selection was done by a combination of examining the *F*-test (Type III sums of squares) for the variable, or whether the variable added significantly to the model if it were fitted last, change in the AIC (Akaike's Information Criterion) if the variable were excluded from the model, and the LMG estimates of the percentage of the variability accounted for by the model (see below).

## Effect sizes

In all the linear models fitted, the size of the effect (coefficient) is given. In addition, several measures of "effect size", indices that measure the strength of association between one variable and another (or "signal to noise ratio"), are given.

The most commonly used effect size measure, Cohen's *d*, is seldom used here, as it is most appropriately used to compare two groups, or an experimental and control group. The measures that are used are those appropriate for measures of correlation, or for linear models where several explanatory (independent) variables are used to explain the variability in a single outcome (dependent) variable.

### Correlation measures

Both the simple (Pearson's product-moment) correlation coefficients and partial correlation coefficients can be considered measures of effect size. The coefficients measure the strength of the relationship, and the squared coefficients measure the proportion of variability explained.

In the linear models fitted, the partial correlation coefficients are given as one of the measures of effect size.

### Percentage of variability accounted for

In more complex models there are several ways in which to measure this.

#### *Multiple $R^2$*

$R^2$ is the percentage of variability in the outcome variable that is accounted for or explained by all the explanatory variables.

$$R^2 = \frac{SSM}{SST},$$

Where *SSM* is the model sum of squares and *SST* is the total sum of squares. $R^2$ is the proportion of the variability in the outcome variable (as measured by the total sum of squares) that is accounted for by the model (as measured by the model sum of squares). This value tends to slightly overpredict the true value (it is biased). In models including only continuous variables (one parameter per variable) we quote $R^2$.

A less biased estimate is given by the adjusted $R^2$, which uses mean squares rather than sums of squares, and so is in a sense adjusted for the number of parameters in the models (related to the number of explanatory variables). The difference between the two versions is slight if there is a single explanatory variable, and is more marked in larger models, particularly those with discrete variables (ANOVA or ANCOVA) fitted using dummy variables. In models including several discrete variables (often more than one parameter per variable) we quote adjusted $R^2$.

The overall (adjusted) $R^2$ gives an indication of how well the model as a whole fits the data. However, interest is usually greater in how useful each explanatory variable is in explaining the variation in the outcome variable. There are two approaches here, the one calculating the change in the (adjusted) $R^2$ when one of the explanatory variables is included in the model, and the other, the "eta squareds", gives an estimate of the proportion of the variability in the outcome variable that is accounted for by one of the explanatory variables. $\eta^2$ or $\eta_p^2$ are similar measures, but use a different estimate of variability in the denominator.

### *$R^2$ change*

To calculate these quantities, a series of models needs to be fitted: one including all explanatory variables, and then a number of models leaving out each explanatory variable in turn. These changes in $R^2$ can be calculated whether the explanatory variables are categorical or approximately continuous. The traditional version of these measures has the disadvantage that the percentages calculated for each explanatory variable will typically not add up to exactly the value of the total $R^2$ for the whole model, as in social science research the data are usually not balanced (the numbers of observations in each category of an explanatory variable are not equal). But the relative sizes of the changes in $R^2$ will give an idea of the relative importance of each of the explanatory variables.

Recently, alternative measures that do add to $R^2$ have been proposed. These measures are more computing intensive, as they involve fitting the model in all possible orders (so for three explanatory variables, A, B, and C, fitting the models in the orders ABC ACB BAC BCA CAB CBA) and taking the average amount of variability explained for each variable if it was fitted last (Grömping, 2006, 2007).

When all the variables in a model are continuous or binary (taking only two values, like gender), we present the LMG (Lindeman, Merenda, & Gold, 1980) measure of relative importance, calculated using the relaimpo package (Grömping, 2006) in R (R Development Core Team, 2007) which is the unweighted relative importance across all possible specification orderings of the model. At present, no equivalent measure using the same software is available for discrete variables with more than two levels. Bootstrapped (see below) confidence intervals for the LMG estimates are available (although they may be somewhat liberal, or too wide).

### *The eta squareds*

There are three of these effect size measures: the first two are estimates of the degree of association in the sample, and the third is a measure of the degree of association in the population. All give, in a sense, the proportion of variability in the outcome variable that is explained by an explanatory variable.

$\eta^2 = SS_{effect}/SS_{total}$ gives the proportion of the total variability (in the outcome variable) that is explained by the particular effect (explanatory variable). This measure is not that commonly used, as it tends to be positively biased (it gives estimates that are too high), and is sensitive to the number of observations and other explanatory variables in the model.

If there is only one explanatory variable, then $\eta^2 = R^2$.

A preferred measure (this is the one produced by, for example, SPSS), is partial $\eta^2$ or

$$\eta_p^2 = \frac{SS_{\text{effect}}}{SS_{\text{effect}} + SS_{\text{error}}}.$$

$\eta_p^2$ gives the proportion of the variability explained by a variable relative to the total amount of variability explained by that variable plus unexplained variability (or error variability). Each $\eta_p^2$ calculated for a model takes account of the effect of all the other variables, as the error SS used in the calculations is the residual error left over after all the explanatory variables have been added to the model. This does, however, mean that the $\eta_p^2$s are not additive, and in fact they can sum to a number greater than 1 (or 100 percent).

When the model includes one or more discrete variables with more than two levels, we give $\eta_p^2$.

## Bootstrapping

Bootstrapping is a computer-intensive method of estimating sampling error. Using the existing data as a "population", repeated samples with replacement (i.e., an observation can be selected more than once in any one sample) are selected from the data, and the variability between these samples is used to obtain estimates of confidence intervals (or other parameters) that would otherwise be difficult or impossible to estimate, or where the assumptions required for theoretical estimates are unlikely to be met.

# 4. Overview of the relationships between factor and cluster variables and school and social characteristics

Before attempting to investigate the interrelationship between the variables derived from student, parent, and teacher responses, we look at how each of these variables relates to the social characteristics (gender, ethnicity, family income, maternal qualifications, family financial situation at age 14, and history of family income age 5–14) and school characteristics (decile, history of school decile age 5–14, and gender mix). It is worth looking at the school and family characteristics together, as there appear to be some gender effects that are actually more attributable to the type of school the young person attends (for example, a comparative learning environment is more likely in a single-sex boys' school than in a co-educational or girls-only school). It is difficult to separate gender mix, decile, and family income effects out, as half the students attending co-educational schools are attending low- or mid-decile schools, and correspondingly, most of those attending single-sex schools are attending high-decile or private schools (82 percent of those at girls' schools and 70 percent of those at boys' schools). All the low-decile schools are co-educational. Students attending low- or mid-decile schools are more likely to come from low- or middle-income families, while students from high-income families were more likely to attend high-decile or private schools.

By including the history of school decile and family income variables, we are able to trace the extent to which some of the associations are due to the situation at a particular time-point, or whether they are linked to particular changes over time.

The relationship between the demographic variables and the discrete engagement variables (typically, those derived as a result of a cluster analysis) was investigated using a simple cross-tabulation and the associated chi-square test statistic; associations with continuous variables (typically, those derived as a result of a factor analysis) were investigated using 1-way analysis of variance (ANOVA or regression using dummy variables).

The results are reported by type of analysis and within that derivation (whether from teacher comments, parent comments, or young person's comments), so that similar analyses can be discussed together.

## Discrete variables

The variables considered here are a combination of age-16 variables and some that were used at age 14. The age-16 variables are:

- subject cluster
- number of Level 1 NCEA credits (using Level 1 credits only means that Year 11 and Year 12 students can be meaningfully compared), split into quartile groups
- attendance (rating of attendance/absence at school)
- student values.

The age-14 variables that were used are:

- motivation
- parental interests
- student interests
- history of TV watching (age 8–14)

- history of enjoyment of reading (age 8–14)
- history of involvement in bullying (age 10–14)
- history of feelings about school (age 8–12)
- history of parents and teachers working on concerns (age 8–14).

The age-14 versions of the history and other variables have been used as:

- they are the same categorical variables that were used at age 14
- they capture events or influences during the more formative years of the lives of the young people
- any changes in what they measure between ages 14 and 16 are less likely to affect age-16 outcomes than would be the case for changes at earlier ages.

Ignoring all other variables, we first look at apparent associations with each of the social characteristics in turn. Results in this section are reported only for the variables where there were statistically significant assocations.

## Gender and gender mix of school

These two characteristics are discussed together as some of the associations are more likely to be associated with the school (subject cluster, for example), and others are more likely to be associated with the characteristics of the individual.

Of the students still at school, 215 were male and 204 female, and 14 males and 13 females had left school by age 16. Most of those still at school were at co-educational schools (232 students), while 78 were at girls-only schools and 83 were at boys-only schools.

There are strong associations between gender and:

- Student values at 16; girls were more likely to value a satisfying life (48 percent) than boys (34 percent), whereas boys were more likely to have "standing out" values (45 percent) than girls (28 percent). A similar pattern was found at age 14, when more students valued the "standing out" values highly (48 percent of boys and 33 percent of girls).
- Number of Level 1 NCEA credits; the difference between the number of credits achieved by males and females was not statistically significant, but there was a significant different based on the gender mix of the school (which has a stronger association with decile, maternal qualifications, and family income): fewer than 80 credits were achieved by 28 percent of the young people at co-educational schools, 6 percent at single sex girls' schools, and 13 percent at single sex boys' schools, while corresponding percentages achieving 120 or more credits were 34, 60, and 54, respectively.
- Motivation at 14; this showed an association with gender mix of school, as the proportions rating education highly in co-educational, all-girls, and all-boys schools were 27, 40, and 29 percent respectively, with correspondingly reversed ratings for those rating education as being of low importance: 38, 17, 24.
- Out-of-school interests at 14; the proportions having creative interests and only having computer games as an interest were broadly similar among the males and females, but more girls had wide interests including reading, arts, and sports (36 percent) than boys (23 percent), but more boys had playing sport as their main interest (44 percent) than girls (24 percent). Differences were even more marked in terms of the gender mix of the school, although these differences may be to do with the socioeconomic status of the students attending the single-sex or co-educational schools: 46 percent of girls at all-girls schools had wide interests, compared with 28 percent of boys at all-boys schools and 25 percent of young people at co-educational schools; 27

percent of the young people at co-educational schools had computer games as their main interest if they had one, compared with 8 percent of those at all-girls schools and 17 percent of those at a boys' school.

- Historical pattern of enjoyment of reading; more girls had consistently reported enjoying reading (48 percent) than boys (29 percent), and correspondingly more boys (12 percent) had said on two or more occasions they did not enjoy reading than girls (1 percent).
- Historical pattern of attitude to school; not only did girls more often report enjoying reading, they also were more often reported by their parents to be enthusiastic about school (47 percent) than boys (34 percent), and boys were more often reported to have mixed feelings about school (27 percent) or to have been unhappy at least once (14 percent) than girls (18 and 7 percent, respectively).

There are indicative associations between gender and:

- Subject cluster; males are more likely to be taking vocational (21 percent compared with 15 percent) or contextual (16 compared with 11 percent) orientation subjects, and girls are more likely to be taking traditional academic courses with a science orientation (55 percent compared with 40 percent). There was a stronger association with gender mix: Vocational and contextual orientation courses are more likely to be taken by people at co-educational schools (22 and 17 percent, respectively) than those at all-male (15 and 11 percent) or all-female schools (10 and 5 percent); traditional academic, arts orientation courses were more likely at single-sex schools (32 and 29 percent for all-female and all-male schools, respectively) than at co-educational schools (13 percent); and traditional academic, science orientation courses were more likely at girls' schools (54 percent) than at boys' schools (45 percent) or co-educational schools (47 percent).

## Ethnicity

Effects of ethnicity are difficult to separate out from income, maternal qualifications, school decile, and school gender mix.

At age 16, 56 of the students identified as Mäori or Pacific by their parents at age 5 were still at school and seven had left school, and 351 identified as Päkehä/Asian were still at school, while 20 had left school.

At age 5, about half of the Mäori or Pacific children who are still in the study at age 16 were from low-income homes, compared with about a quarter of Päkehä/Asian children. At age 16 these proportions are much the same, although there was a certain amount of movement between groups: of those in the lowest income group at age 5, 59 percent were in the corresponding group at age 16, and 10 percent were in the highest income group; of those in the highest income group at age 5, 70 percent were in the same group at age 16, and 8 percent were in the lowest income group.

The relationship discussed above between income, school decile, and gender mix can be extended to include ethnicity, given the association between ethnicity and income.

Three percent of the age-5 Mäori/Pacific students' mothers had university qualifications, and 30 percent had no formal qualifications, compared with 21 percent of the Päkehä/Asian students' mothers, who had university qualifications, and 11 percent who had no formal qualifications.

Many, if not most, of the apparent associations between ethnicity and the engagement/motivation variables are no longer significant in larger models that include other variables. In other words, few of the ethnic differences described below are likely to be attributable to nothing other than ethnicity.

There were associations between ethnicity and:

- Subject cluster; Mäori/Pacific students were more likely than Päkehä/Asian students to be taking subjects with a vocational orientation (28 percent compared with 16 percent) or a contextual orientation (33

compared with 10 percent), and were less likely to be taking traditional academic subjects (9 compared with 23 percent for arts, and 31 compared with 50 percent for science).

- Number of Level 1 NCEA credits; a third of Mäori/Pacific students achieved up to 80 credits and 15 percent achieved over 120 credits, compared to just under a fifth and just under half of Päkehä/Asian students.
- Student values at age 16; Mäori/Pacific students were less likely to place value on having a satisfying life than to have aspirational values (30 percent compared with 37 percent), but the order and magnitude of the differences was greater for the Päkehä/Asian students (43 and 19 percent, for satisfying life and aspirational, respectively).
- History of family income; given the association between ethnicity and family income described above, it is not surprising to find that Mäori/Pacific students are more likely than Päkehä/Asian students to come from families that have mostly had a low income (19 compared with 8 percent), and less likely to come from families that have reported a high income in at least one round of data collection (11 compared with 28 percent).

## Family income and financial situation

Many of the students' families had relatively constant incomes: between ages 5 (or 8 if that is when they joined the study) and 16 their income tended to fall consistently into one of the low, middle, or high groups. Some varied over time, and some increased or decreased steadily. The numbers of young people with families in the various categories are shown in Table 1.

Table 1: Family income variables

| Family income at age 5 | Number at school | Number left school | Family income at age 14 | Number at school | Number left school |
|---|---|---|---|---|---|
| Unknown | 11 | 2 | Unknown | 16 | 3 |
| Under $30K | 93 | 19 | Under $30K | 44 | 12 |
| $30–60K | 193 | 5 | $30–60K | 103 | 10 |
| $60–80K | 60 | 1 | $60–100K | 141 | 0 |
| $80K or more | 64 | 0 | $100K or more | 117 | 2 |
| Total | 421 | 27 | Total | 421 | 27 |
| Financial situation | | | | | |
| Comfortable | 245 | 3 | | | |
| Moderate | 112 | 9 | | | |
| Difficult | 64 | 15 | | | |
| Total | 421 | 27 | | | |

When we use income in analyses we have a choice of which income to use: that at age 5, which captures some of the advantages or lack thereof that the child had when he or she started school and which may have had a long-term effect on his or her progress through school; that at age 14, which captures some of the advantages that the child had when starting secondary school; or the latest measure at age 16. The biggest disadvantage of using age-16 family income is that we have information about this variable for at most 440 students, as 440 parent interviews were completed, and not all were willing or able to give information about income. For this reason, the analyses carried out are similar to those run at age 14: both age-5 and age-14 family income was included in

turn in models, and where there was an effect, this was reported for the stronger of the two effects. This time, as we found at age 14, there is a tendency for the age-5 income to have a stronger effect on cognitive competencies, and some attitudinal competencies (like *thinking and learning* and *focused and responsible*), and for the age-14 family income to have a stronger effect on the social competencies, and some of the engagement measures.

At age 14 we obtained a measure which we called family financial situation which is a slightly broader look at socioeconomic status that includes income, ability to pay bills, and money remaining after bills have been paid. Like family income, to which it is closely related, this variable shows fewer Mäori/Pacific than Päkehä/Asian students coming from families with "comfortable" circumstances (30 percent compared with 59 percent), and more coming from homes with "difficult" circumstances (29 percent compared with 15 percent). Students whose mothers had no formal qualifications were more likely to be living in difficult circumstances than those whose mothers had university qualifications (33 percent and 5 percent, respectively). Given the link between income and school decile, it is not surprising that students attending a high-decile school were more likely to have a comfortable family financial situation (67 percent) than a difficult one (9 percent), and the converse was true for students at low-decile schools (26 and 37 percent, respectively).

There were associations with family income and:

- Subject cluster; students from lower-income homes were more likely to take subjects with a vocational or contextual orientation, and those from high-income homes were more likely to take traditional academic subjects. The differences are most marked using the age-5 family income: a third of those from homes with an income of under $30,000 (described as "low-income" below) were taking subjects with a vocational orientation, compared with 8 percent of those from homes with an income of over $60,000 ("high-income"); for contextual orientation the percentages are 25 and 6 for low- and high-income homes; traditional academic with an arts orientation subjects were taken by 15 and 34 percent, respectively, and traditional academic with a science orientation subjects were taken by 25 and 51 percent, respectively. There were similar associations with the history of family income, and family financial circumstances at age 14.
- Number of Level 1 NCEA credits; 36 percent of students from families with an age-5 income of under $30,000 achieved under 80 Level 1 credits, compared with 11 percent of those from families with incomes of over $60,000; 45 percent of those from low-income families achieved between 80 and 120 credits, compared with 28 percent from higher-income families; and none of the students from low-income families achieved over 160 credits, while 10 percent of those from higher-income families did. There was a similar picture for history of family income and family financial circumstances at age 14.
- Motivation at 14; 25 percent of the young people from low-income families at age 5 saw education as something valuable, compared with 36 percent of those from high-income families, and 47 of those from low-income families placed a low value on education, compared with 22 percent of those from high-income families. The differences were more extreme using the family circumstances at 14 variable: 15 percent of those in difficult circumstances saw education as valuable, compared with 33 percent of those in a comfortable situation, and the corresponding percentages for placing a low value on education were 51 and 24.
- History of bullying; differences in experience of bullying are most marked for age-14 family income (they are indicative; they are not significant for income at other ages), perhaps because this is associated with the schools attended in the middle school years, and the culture in the schools. Seventeen percent of the young people from low-income (under $30,000) homes had never reported involvement in bullying, compared with 32 percent of those from high-income (over $60,000) homes. Similarly, a third of those categorised as having a comfortable family financial situation had never been involved in bullying, compared to about a fifth of those from moderate or difficult circumstances.

- History of TV watching; 54 percent of those from low-income families (age-5 income of under $30,000) had a low rate of TV watching between ages 8 and 14, as did 74 percent of those from high-income families (age-5 income of over $60,000), while 25 percent of those from low-income families had high rates, compared with 13 percent of those from high-income families.

## Maternal qualifications

Maternal qualifications are used to capture a wide range of genetic and environmental influences. Mothers with higher levels of qualifications are more likely to belong to families with higher income levels (52 percent of students with mothers with university-level qualifications had a family income over $100,000 at least once by age 14, compared with 7 percent of those whose mothers had no formal qualifications) and, in our sample, to have Päkehä or Asian children (and so to belong to a similar ethnic group). Mothers with higher levels of qualifications are also more likely to have children who would like to have and be able to have similar qualifications, they are more likely to value learning (in the broadest sense), and to engage in activities that support and encourage learning in their children.

Table 2: Maternal qualifications

| Maternal qualifications | Number at school | Number left school |
|---|---|---|
| Unknown | 5 | 1 |
| No formal qualifications | 49 | 9 |
| Mid-school/Trade | 207 | 13 |
| Senior secondary/Tertiary | 78 | 2 |
| University | 82 | 2 |
| Total | 421 | 27 |

In the descriptions below, the responses of those whose mothers had no formal qualifications are contrasted with those whose mothers had university-level qualifications. The responses of those with mid-secondary/trade or senior secondary/tertiary qualifications tended to form a gradient between the two extremes.

There were associations between maternal qualifications and:

- Subject cluster; eighty-nine percent of the students with mothers with university-level qualifications were taking traditional academic subjects in either arts (41 percent) or science (48 percent), compared with 42 percent of the students with mothers with no formal qualifications (6 percent arts, 36 percent science). Students with mothers with no formal qualifications were much more likely to be taking the vocational orientation subjects (34 percent) or contextual orientation (22 percent) compared with those whose mothers had a university qualification (4 and 5 percent, respectively). Possible reasons for this include that individuals in both generations had difficulty with the academic subjects, that the young person was following a similar career path to their parents, and that parents who had completed a formal academic education themselves encouraged their children to take the more traditional subjects in preparation for post-secondary study.
- Number of Level 1 NCEA credits; 35 percent of students whose mothers had no formal qualifications achieved fewer than 80 Level 1 credits, 60 percent achieved between 80 and 120, 4 percent achieved between 120 and 160 credits, and none achieved over 160 credits. The students whose mothers had university qualifications had somewhat different outcomes: 5, 30, 56, and 10 percent, respectively.

- Motivation at age 14; almost half (48 percent) of students whose mothers had no formal qualifications placed a low value on education, and only 22 percent placed a high value, whereas for young people whose mothers had university-level qualifications the percentages were 24 and 37 percent, respectively.
- History of enjoyment of reading; just under a quarter (24 percent) of students whose mothers had no formal qualifications had always enjoyed reading, whereas a half of those whose mothers had university-level qualifications had.
- History of TV watching; not only is there an association between parental interests, where TV watching features as one of the main interests for some mothers, and maternal qualifications, but there is a matching pattern in the amount of TV the young people were allowed to watch between ages 8 and 14: 71 percent of those whose mothers had university qualifications had low rates of TV watching, compared with 40 percent of those whose mothers had no formal qualifications, and the corresponding percentages with high rates of watching were 11 and 33.

## School decile

School decile is associated with family income (present and past), maternal qualifications, and ethnic group. In addition to information about the decile rating of their current school, we have a variable that captures the history of the decile rating of the schools attended between ages 8 and 14. The numbers of young people falling into each group are shown in Table 3.

Table 3: School decile variables

| Decile groups of age-16 school | Number at school | Main decile groups of age 8–14 schools | Number at school | Number left school |
|---|---|---|---|---|
| Unknown/not applicable | 28 | Unknown/not applicable | 34 | 1 |
| 1–2 | 18 | 1–2 | 28 | 3 |
| 3–8 | 129 | 3–8 | 132 | 10 |
| 9–10/Private | 246 | 9–10/Private | 162 | 5 |
| | | Mixed | 65 | 8 |
| Total | 421 | Total | 421 | 27 |

Just as age-16 Mäori/Pacific students are more likely than Päkehä/Asian students to be in low-decile schools, so, too they are more likely to have spent most of their careers up to age 14 in such schools (27 percent compared with 3 percent) and correspondingly less likely to have been in mainly high-decile schools (21 percent compared with 40 percent).

Using age-14 income, 15 percent of students from low-income (under $30,000) homes attended mainly decile 1 or 2 schools, but none of the students from high-income (over $100,000) homes did; 19 percent of the students from low-income homes attended mainly decile 9 or 10 schools, while 55 percent of those from high-income homes did; and 19 percent of students from low-income homes attended a range of schools with low-, mid-, and high-decile classification, compared with 13 percent of students from high-decile homes.

There are associations, too, with maternal qualifications: none of the students whose mothers had university-level qualifications attended mainly decile 1 or 2 schools between the ages of 8 and 14, and 51 percent attended mainly decile 9 or 10 schools; students of mothers with no formal qualifications were almost equally likely to attend mainly low- or mainly high-decile schools (19 and 22 percent, respectively).

And, given the association between gender mix and decile, the 71 percent of students who are attending a co-educational school have mainly attended decile 1 or 2 schools.

School decile, or history of school decile, showed associations with:

- Subject cluster; students in low-decile schools are more likely to do vocational or contextual orientation subjects (42 and 32 percent, respectively) than students in high-decile schools (14 and 9 percent, respectively), and those in low-decile schools are less likely to do traditional academic subjects with emphasis in either arts or science (none did arts, 26 percent did science subjects), while these subjects are more likely to be taken by students in high-decile schools (26 and 50 percent, respectively).
- Number of Level 1 NCEA credits; students at low-decile schools were more likely to achieve under 80 credits (56 percent) than were students at high-decile schools (13 percent), and those at high-decile schools were more likely to achieve over 120 credits (52 percent) than those at low-decile schools (11 percent, but none achieved more than 160 credits).
- Motivation at 14; there was not a statistically significant association between the decile of the age-16 school, but there was an association with history of decile, where 58 percent of students who had mostly been in low-decile schools placed a low value on education, compared with 20 percent of those who had mostly been in high-decile schools, with the corresponding percentages for those placing a high value on education being 16 and 34.
- Attendance at 16; none of the students attending low-decile schools were rated as having excellent attendance, but 28 percent of those at high-decile schools were, and the corresponding percentages with multiple absences and seldom attending were 29 and 9, respectively.
- History of bullying; there was an indicative association between history of bullying and history of school decile: 16 percent of those mainly attending decile 1 or 2 schools had never been involved in bullying, compared with 32 percent of those mainly in mid-decile schools and 26 percent of those mainly in high-decile schools. The highest rate of longer-term involvement in bullying (two or more years) was among those who had attended schools in a range of decile groups (45 percent—by contrast only 32 percent of those mainly in mid-decile schools reported as much involvement), which may suggest that this was one of the motivators for changing school, for at least some of the 73 young people in this mixed-decile category, or that students changing schools are more likely to be subject to bullying when they are new to a school.
- History of TV watching; mainly low rates of TV watching were more common among those who had mainly attended high-decile schools aged 8–14 (63 percent) than those who mainly attended low-decile schools (42 percent), while the corresponding percentages for mainly high rates of TV watching were 18 and 29, respectively.

## Continuous variables

We turn now to scale variables derived from a series of factor analyses of parent, teacher, and student responses, all of which measure some aspect of the young person's attitude to or engagement with life in general or school in particular, or measure the extent to which their attitude or engagement may have been affected by the environment in which they live or some events in their lives. These scale variables, and the items used to construct them, are discussed in detail in the chapter "Scale variables, cluster variables, and history variables". In particular, we are looking at subsets of scale variables that describe the young person's home life:

- the student's view that:
    - the *family communicates well*

    - there is *family pressure*
    - the *family is inclusive*, or *supportive*;
- the student's information about the extent to which they:
    - were involved in *risky behaviour*
    - expressed *rejection*
    - had experienced *adverse events*
    - had *friends involved in risky behaviour*
    - had *solid friendships*
    - had *extending friendships*
    - had *praise and achievement* in any sphere of their life;
- the parent's view that the young person was:
    - *self-confident*
    - showed *self-efficacy*
    - or *responsibility*.

Variables that describe their school life:

- teacher views on:
    - the student and *NCEA assessment*
    - *overall ability*
    - and the attitudinal competencies of *thinking and learning*, *focused and responsible*, *social skills*, and *social difficulties*;
- student views of the extent to which they are:
    - *engaged in school*
    - *affirmed at school*
    - *satisfied with their subject mix*
    - use *internal markers* of achievement
    - in a *positive learning environment*
    - *absorbed in learning*
    - *disengaged in learning*
    - in a *disrupted learning environment*
    - experiencing *relevant learning opportunities*
    - in a *comparative learning environment*, and their
    - *attitude to all work*.

We have used 1-way ANOVAs in which the demographic home and school variables (current and historical, in the case of income and school decile) are used as explanatory variables.

The results are reported for all 31 outcome variables, whether the differences were statistically significant or not. Variables where there were differences that were significant at the 1 percent level, or were almost significant at that level and the demographic variable accounted for over 2 percent of the variability, are in **bold face**.

## Gender

There are gender differences for several variables, most of them measuring a social or attitudinal attribute. Where there were differences, they were usually in females' favour.

Table 4: Associations between engagement, attitude, and experience variables and gender

| Scale variable | Males | Females | *p*-value | $R^2$ (%) |
|---|---|---|---|---|
| Cognitive competency | 5.96 | 6.19 | 0.079 | 0.7 |
| Student view of family life | | | | |
| Family communicates well | 6.57 | 6.62 | 0.703 | 0 |
| Family pressure | 4.59 | 4.32 | 0.090 | 0.7 |
| Family is inclusive | 7.81 | 7.83 | 0.848 | 0 |
| Family is supportive | 8.11 | 7.80 | 0.043 | 0.9 |
| Student views of friends and experiences | | | | |
| Adverse events | 1.86 | 2.00 | 0.123 | 0.5 |
| Rejection | 2.19 | 2.11 | 0.872 | 0 |
| Praise and achievement | 5.63 | 5.99 | 0.010 | 1.5 |
| Risky behaviour | 3.62 | 3.58 | 0.766 | 0 |
| Friends with risky behaviour | 4.10 | 4.18 | 0.649 | 0 |
| Extending friendships | 7.06 | 7.44 | 0.0007 | 2.6 |
| Solid friendships | 8.26 | 8.53 | 0.018 | 1.2 |
| Parent view of student | | | | |
| Self-confidence | 6.97 | 7.09 | 0.298 | 0.2 |
| Self-efficacy | 7.01 | 7.28 | 0.019 | 1.3 |
| Responsibility | 7.08 | 7.57 | < 0.0001 | 3.7 |
| Teachers' view of student | | | | |
| Focused and responsible | 6.55 | 7.15 | 0.0001 | 3.5 |
| NCEA assessment | 3.27 | 3.47 | 0.010 | 1.6 |
| Overall ability | 6.19 | 6.64 | 0.022 | 1.3 |
| Social difficulties | 2.60 | 2.06 | < 0.0001 | 6.1 |
| Social skills | 5.98 | 6.59 | < 0.0001 | 4.9 |
| Thinking and learning | 6.08 | 6.56 | 0.001 | 2.6 |
| Student views on school and classes | | | | |
| Absorbed in learning | 5.83 | 5.98 | 0.182 | 0.4 |
| Affirmed at school | 5.05 | 5.26 | 0.029 | 1.2 |
| Attitude to all work | 6.65 | 6.44 | 0.041 | 1.0 |
| Comparative learning environment | 4.23 | 3.38 | < 0.0001 | 7.0 |
| Engaged in school | 5.55 | 5.61 | 0.602 | 0.1 |

| Scale variable | Males | Females | *p*-value | $R^2$ (%) |
|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | |
| Internal markers of achievement | 7.42 | 7.79 | 0.007 | 1.7 |
| Disengaged in learning | 4.68 | 4.17 | < 0.0001 | 4.2 |
| Disrupted learning environment | 5.41 | 5.02 | 0.0003 | 3.1 |
| Positive learning environment | 6.83 | 6.75 | 0.361 | 0.2 |
| Satisfied with subject mix | 7.71 | 7.62 | 0.493 | 0.1 |
| Relevant learning opportunities | 4.98 | 4.80 | 0.061 | 0.8 |

**Bold face** indicates that the differences were significant at the 1 percent level.

Very few of the apparent gender differences remain significant once other variables are included in the model.

## Ethnicity

There are few apparent differences between the two broadly categorised ethnic groups, and few of these remain significant once other variables are added to the model. Where there are differences, they are to do with risky behaviour, the teachers' perceptions of the young person's attitude or teacher expectations (the attitudinal competencies and overall ability), and the young person's engagement in school and satisfaction with their current subject mix.

Table 5: Associations between engagement, attitude, and experience variables and ethnicity

| Scale variable | Mäori/Pacific | Päkehä/Asian | *p*-value | $R^2$ (%) |
|---|---|---|---|---|
| Cognitive competency | 5.43 | 6.17 | < 0.0001 | 8.7 |
| Student view of family life | | | | |
| Family communicates well | 6.39 | 6.64 | 0.374 | 0.4 |
| Family pressure | 4.52 | 4.45 | 0.920 | 0 |
| Family is inclusive | 7.84 | 7.81 | 0.753 | 0.1 |
| Family is supportive | 8.19 | 7.91 | 0.353 | 0.5 |
| Student views of friends and experiences | | | | |
| Adverse events | 2.01 | 1.91 | 0.744 | 0.1 |
| Rejection | 2.19 | 2.18 | 0.192 | 0.7 |
| Praise and achievement | 5.95 | 5.80 | 0.426 | 0.4 |
| Risky behaviour | 4.03 | 3.53 | 0.035 | 1.5 |
| Friends with risky behaviour | 4.94 | 4.02 | 0.001 | 3.1 |
| Extending friendships | 7.48 | 7.20 | 0.190 | 0.7 |
| Solid friendships | 8.50 | 8.37 | 0.738 | 0.1 |
| Parent view of student | | | | |
| Self-confidence | 6.98 | 7.03 | 0.832 | 0 |
| Self-efficacy | 7.01 | 7.15 | 0.611 | 0.2 |
| Responsibility | 6.95 | 7.37 | 0.072 | 1.2 |
| Teachers' view of student | | | | |
| Focused and responsible | 5.93 | 6.70 | < 0.0001 | 5.4 |
| NCEA assessment | 3.01 | 3.43 | 0.0004 | 3.8 |
| Overall ability | 5.26 | 6.63 | < 0.0001 | 5.9 |
| Social difficulties | 2.65 | 2.29 | 0.069 | 1.3 |
| Social skills | 5.97 | 6.33 | 0.182 | 0.8 |
| Thinking and learning | 5.53 | 6.44 | < 0.0001 | 4.5 |
| Student views on school and classes | | | | |
| Absorbed in learning | 5.78 | 5.94 | 0.156 | 0.9 |
| Affirmed at school | 5.05 | 5.18 | 0.508 | 0.3 |

| Scale variable | Mäori/Pacific | Päkehä/Asian | *p*-value | $R^2$ (%) |
|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | |
| Attitude to all work | 6.26 | 6.61 | 0.027 | 1.8 |
| Comparative learning environment | 3.70 | 3.87 | 0.097 | 1.1 |
| **Engaged in school** | **5.13** | **5.67** | **0.001** | **3.2** |
| Internal markers of achievement | 7.46 | 7.63 | 0.595 | 0.3 |
| Disengaged in learning | 4.78 | 4.39 | 0.074 | 1.2 |
| Disrupted learning environment | 5.47 | 5.19 | 0.171 | 0.8 |
| Positive learning environment | 6.63 | 6.82 | 0.333 | 0.5 |
| **Satisfied with subject mix** | **7.13** | **7.75** | **0.009** | **2.3** |
| Relevant learning opportunities | 4.84 | 4.90 | 0.843 | 0.1 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Family income and financial situation

There are some apparent differences by family income, and family financial situation. Some of these differences are statistically significant only for age-5 family income, some only for age-14 family income, and some only for family financial situation; others are significant for two or more of the income measures. The differences significant only for age-5 family income relate to parental views of self-confidence and responsibility, and to social difficulties, all likely to be long-term characteristics of the young people; the differences significant only for age-14 family income were social skills and engagement in school; the differences significant only for financial situation were inclusive family and extending friendships. Many of the variables significant for differences in both age-14 income and family financial situation were those that related to the world the young person experienced at age 16 or what was happening to them: how the family relates, school engagement, adverse events, and risky behaviour.

Table 6: Associations between engagement, attitude, and experience variables and age-5 family income

| Scale variable | < $30K | $30–$60K | $60–$80K | > $80K | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 5.47 | 6.06 | 6.52 | 6.75 | < 0.0001 | 9.5 |
| Student view of family life | | | | | | |
| Family communicates well | 6.39 | 6.55 | 6.60 | 7.12 | 0.030 | 2.4 |
| Family pressure | 4.57 | 4.87 | 4.35 | 4.29 | 0.816 | 0.4 |
| Family is inclusive | 7.76 | 7.76 | 7.82 | 8.15 | 0.311 | 1.1 |
| Family is supportive | 7.73 | 7.92 | 7.81 | 8.58 | 0.015 | 2.7 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 2.10 | 1.88 | 1.92 | 1.81 | 0.240 | 1.2 |
| Rejection | 2.19 | 2.22 | 2.06 | 2.27 | 0.855 | 0.3 |
| Praise and achievement | 5.76 | 5.69 | 6.00 | 6.16 | 0.132 | 1.6 |
| Risky behaviour | 3.94 | 3.46 | 3.59 | 3.59 | 0.015 | 2.8 |
| Friends with risky behaviour | 4.69 | 3.98 | 4.15 | 3.82 | 0.006 | 3.2 |
| Extending friendships | 7.21 | 7.19 | 7.37 | 7.44 | 0.319 | 1.1 |
| Solid friendships | 8.35 | 8.34 | 8.55 | 8.60 | 0.149 | 1.5 |
| Parent view of student | | | | | | |
| Self-confidence | 6.83 | 6.94 | 7.43 | 7.31 | 0.008 | 3.1 |
| Self-efficacy | 6.91 | 7.04 | 7.59 | 7.45 | 0.001 | 4.1 |
| Responsibility | 7.02 | 7.24 | 7.79 | 7.67 | 0.0004 | 4.6 |
| Teachers' view of student | | | | | | |
| Focused and responsible | 6.34 | 6.87 | 7.27 | 7.09 | 0.004 | 3.7 |
| NCEA assessment | 3.13 | 3.36 | 3.54 | 3.56 | 0.005 | 3.6 |
| Overall ability | 5.76 | 6.37 | 7.15 | 6.81 | 0.0003 | 4.9 |
| Social difficulties | 2.65 | 2.34 | 2.14 | 2.06 | 0.007 | 3.4 |

| Scale variable | < $30K | $30–$60K | $60–$80K | > $80K | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Teachers' view of student - *continued* | | | | | | |
| Social skills | 6.05 | 6.20 | 6.75 | 6.45 | 0.014 | 3.0 |
| Thinking and learning | 5.96 | 6.27 | 6.84 | 6.55 | 0.001 | 4.3 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 5.81 | 5.91 | 6.07 | 5.87 | 0.735 | 0.5 |
| Affirmed at school | 4.93 | 5.14 | 5.40 | 5.30 | 0.038 | 2.4 |
| Attitude to all work | 6.34 | 6.49 | 6.63 | 6.89 | 0.023 | 2.7 |
| Comparative learning environment | 3.93 | 3.90 | 3.70 | 3.51 | 0.480 | 0.8 |
| Engaged in school | 5.37 | 5.58 | 5.76 | 5.68 | 0.200 | 1.5 |
| Internal markers of achievement | 7.29 | 7.60 | 8.10 | 7.61 | 0.014 | 3.0 |
| Disengaged in learning | 4.68 | 4.42 | 4.22 | 4.40 | 0.194 | 1.5 |
| Disrupted learning environment | 5.42 | 5.23 | 5.26 | 4.71 | 0.084 | 2.0 |
| Positive learning environment | 6.77 | 6.80 | 6.87 | 6.78 | 0.881 | 0.3 |
| Satisfied with subject mix | 7.44 | 7.73 | 7.58 | 7.86 | 0.383 | 1.0 |
| Relevant learning opportunities | 5.03 | 4.96 | 4.70 | 4.66 | 0.087 | 1.9 |

**Bold face** indicates that the differences were significant at the 1 percent level.

Table 7: Associations between engagement, attitude, and experience variables and age-14 family income

| Scale variable | < $30K | $30–$60K | $60–$100K | > $100K | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 5.61 | 5.58 | 6.31 | 5.53 | < 0.0001 | 8.7 |
| Student view of family life | | | | | | |
| Family communicates well | 6.23 | 6.36 | 6.80 | 6.82 | 0.009 | 3.0 |
| Family pressure | 4.67 | 4.41 | 4.44 | 4.35 | 0.372 | 1.0 |
| Family is inclusive | 7.51 | 7.72 | 8.02 | 7.91 | 0.034 | 2.3 |
| Family is supportive | 7.40 | 7.78 | 8.15 | 8.24 | 0.003 | 3.5 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 2.39 | 1.85 | 1.86 | 1.80 | 0.0003 | 4.8 |
| Rejection | 2.39 | 2.11 | 2.17 | 2.26 | 0.510 | 0.7 |
| Praise and achievement | 5.56 | 5.51 | 5.94 | 6.03 | 0.039 | 2.3 |
| Risky behaviour | 4.18 | 3.60 | 3.36 | 3.54 | 0.005 | 3.3 |
| Friends with risky behaviour | 4.89 | 4.12 | 3.88 | 4.01 | 0.003 | 3.6 |
| Extending friendships | 6.84 | 7.39 | 7.32 | 7.25 | 0.042 | 2.2 |
| Solid friendships | 8.27 | 8.45 | 8.39 | 8.40 | 0.942 | 0.2 |
| Parent view of student | | | | | | |
| Self-confidence | 6.72 | 6.87 | 7.07 | 7.26 | 0.057 | 2.1 |
| Self-efficacy | 6.86 | 6.94 | 7.19 | 7.40 | 0.019 | 2.7 |
| Responsibility | 6.98 | 7.22 | 7.41 | 7.48 | 0.119 | 1.7 |
| Teachers' view of student | | | | | | |
| Focused and responsible | 6.52 | 6.45 | 7.04 | 7.14 | 0.001 | 4.4 |
| NCEA assessment | 3.19 | 3.22 | 3.47 | 3.50 | 0.0008 | 4.6 |
| Overall ability | 6.00 | 5.82 | 6.64 | 6.92 | < 0.0001 | 5.6 |
| Social difficulties | 2.47 | 2.55 | 2.31 | 2.15 | 0.094 | 1.9 |
| Social skills | 6.03 | 5.97 | 6.44 | 6.51 | 0.002 | 4.0 |
| Thinking and learning | 5.88 | 5.87 | 6.56 | 6.63 | < 0.0001 | 6.2 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 5.89 | 5.96 | 5.88 | 5.98 | 0.178 | 1.5 |
| Affirmed at school | 4.97 | 5.08 | 5.17 | 5.34 | 0.026 | 2.7 |
| Attitude to all work | 6.36 | 6.37 | 6.67 | 6.68 | 0.029 | 2.6 |
| Comparative learning environment | 3.73 | 4.00 | 5.70 | 3.81 | 0.666 | 0.6 |
| Engaged in school | 5.40 | 5.40 | 5.72 | 5.74 | 0.003 | 3.8 |
| Internal markers of achievement | 7.37 | 7.54 | 7.70 | 7.66 | 0.626 | 0.6 |

| Scale variable | < $30K | $30–$60K | $60–$100K | > $100K | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | | |
| Disengaged in learning | 4.60 | 4.56 | 4.27 | 4.45 | 0.349 | 1.1 |
| Disrupted learning environment | 5.30 | 5.34 | 5.16 | 5.14 | 0.567 | 0.7 |
| Positive learning environment | 6.76 | 6.81 | 6.75 | 6.91 | 0.198 | 1.4 |
| Satisfied with subject mix | 7.55 | 7.66 | 7.76 | 7.72 | 0.007 | 1.7 |
| Relevant learning opportunities | 5.11 | 5.02 | 4.84 | 4.80 | 0.227 | 1.4 |

**Bold face** indicates that the differences were significant at the 1 percent level.

Table 8: Associations between engagement, attitude, and experience variables and family financial situation

| Scale variable | Difficult | Moderate | Comfortable | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Cognitive competency | 5.73 | 5.62 | 6.41 | < 0.0001 | 7.2 |
| Student view of family life | | | | | |
| Family communicates well | 5.99 | 6.61 | 6.80 | < 0.0001 | 4.1 |
| Family pressure | 4.84 | 4.47 | 4.31 | 0.050 | 1.3 |
| Family is inclusive | 7.33 | 7.94 | 7.94 | 0.0009 | 3.1 |
| Family is supportive | 7.27 | 7.99 | 8.17 | < 0.0001 | 4.2 |
| Student views of friends and experiences | | | | | |
| Adverse events | 2.26 | 1.98 | 1.80 | 0.0008 | 3.2 |
| Rejection | 2.23 | 2.25 | 2.13 | 0.372 | 0.4 |
| Praise and achievement | 5.58 | 5.81 | 5.90 | 0.257 | 0.6 |
| Risky behaviour | 3.92 | 3.66 | 3.47 | 0.047 | 1.4 |
| Friends with risky behaviour | 4.65 | 4.22 | 3.91 | 0.011 | 2.0 |
| Extending friendships | 6.84 | 7.33 | 7.34 | 0.003 | 2.6 |
| Solid friendships | 8.20 | 8.41 | 8.45 | 0.296 | 0.5 |
| Parent view of student | | | | | |
| Self-confidence | 6.61 | 7.12 | 7.12 | 0.006 | 2.3 |
| Self-efficacy | 6.67 | 7.16 | 7.28 | 0.0006 | 3.4 |
| Responsibility | 6.93 | 7.30 | 7.45 | 0.010 | 2.1 |
| Teachers' view of student | | | | | |
| Focused and responsible | 6.48 | 6.61 | 7.04 | 0.008 | 2.3 |
| NCEA assessment | 3.45 | 3.34 | 3.17 | 0.012 | 2.2 |
| Overall ability | 5.80 | 6.14 | 6.69 | 0.002 | 3.0 |
| Social difficulties | 2.32 | 2.49 | 2.28 | 0.239 | 0.7 |
| Social skills | 5.81 | 6.27 | 6.41 | 0.008 | 2.3 |
| Thinking and learning | 5.76 | 6.21 | 6.51 | 0.001 | 3.3 |
| Student views on school and classes | | | | | |
| Absorbed in learning | 5.86 | 5.90 | 5.93 | 0.914 | 0 |
| Affirmed at school | 4.84 | 5.19 | 5.22 | 0.025 | 1.8 |
| Attitude to all work | 6.28 | 6.47 | 6.66 | 0.028 | 1.7 |
| Comparative learning environment | 3.74 | 3.92 | 3.88 | 0.597 | 0.2 |
| Engaged in school | 5.32 | 5.59 | 5.65 | 0.094 | 1.1 |
| Internal markers of achievement | 7.33 | 7.55 | 7.70 | 0.152 | 0.9 |
| Disengaged in learning | 4.50 | 4.46 | 4.40 | 0.820 | 0.1 |

| Scale variable | Difficult | Moderate | Comfortable | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | |
| Disrupted learning environment | 5.33 | 5.31 | 5.15 | 0.344 | 0.5 |
| Positive learning environment | 6.56 | 6.80 | 6.86 | 0.080 | 1.2 |
| Satisfied with subject mix | 7.43 | 7.72 | 7.70 | 0.366 | 0.5 |
| Relevant learning opportunities | 4.89 | 4.87 | 4.97 | 0.813 | 0 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Maternal qualifications

The variables with apparent differences associated with maternal qualifications are to do with risky behaviour (on the whole, less likely for the young people with mothers with higher levels of education), levels of self-efficacy and responsibility as judged by a parent and the teachers, and the engagement variables (on the whole these variables are all higher for the young people with mothers with higher levels of education).

Table 9: Associations between engagement, attitude, and experience variables and maternal qualifications

| Scale variable | None | Mid-secondary/ Trade | Senior-secondary/ Tertiary | University | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 5.13 | 5.90 | 6.40 | 6.97 | < 0.0001 | 18.1 |
| Student view of family life | | | | | | |
| Family communicates well | 6.54 | 6.47 | 6.82 | 6.76 | 0.335 | 1.0 |
| Family pressure | 4.46 | 4.64 | 4.23 | 4.31 | 0.041 | 2.2 |
| Family is inclusive | 7.90 | 7.69 | 8.06 | 7.88 | 0.271 | 1.2 |
| Family is supportive | 8.21 | 7.82 | 8.09 | 7.96 | 0.185 | 1.4 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 2.03 | 2.00 | 1.75 | 1.80 | 0.112 | 1.7 |
| Rejection | 2.13 | 2.14 | 2.19 | 2.45 | 0.240 | 1.2 |
| Praise and achievement | 5.55 | 5.88 | 5.65 | 5.97 | 0.187 | 1.4 |
| Risky behaviour | 3.70 | 3.85 | 3.20 | 3.27 | 0.001 | 4.0 |
| Friends with risky behaviour | 4.56 | 4.43 | 3.72 | 3.53 | 0.0002 | 4.9 |
| Extending friendships | 7.20 | 7.24 | 7.14 | 7.38 | 0.700 | 0.5 |
| Solid friendships | 8.36 | 8.35 | 8.48 | 8.40 | 0.869 | 0.3 |
| Parent view of student | | | | | | |
| Self-confidence | 6.65 | 7.09 | 7.02 | 7.16 | 0.071 | 2.0 |
| Self-efficacy | 6.81 | 7.13 | 7.36 | 7.25 | 0.003 | 3.6 |
| Responsibility | 6.64 | 7.31 | 7.51 | 7.63 | 0.0002 | 5.4 |
| Teachers' view of student | | | | | | |
| Focused and responsible | 6.14 | 6.54 | 7.23 | 7.69 | < 0.0001 | 11.2 |
| NCEA assessment | 3.06 | 3.27 | 3.43 | 3.74 | < 0.0001 | 7.7 |
| Overall ability | 5.47 | 6.14 | 6.66 | 7.50 | < 0.0001 | 10.8 |
| Social difficulties | 2.71 | 2.50 | 2.08 | 1.93 | < 0.0001 | 6.6 |
| Social skills | 6.03 | 6.04 | 6.60 | 6.80 | < 0.0001 | 7.3 |
| Thinking and learning | 5.74 | 6.08 | 6.59 | 7.04 | < 0.0001 | 9.6 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 5.71 | 5.90 | 5.83 | 6.05 | 0.095 | 1.9 |
| Affirmed at school | 5.07 | 5.02 | 5.18 | 5.51 | 0.005 | 3.6 |

| Scale variable | None | Mid-secondary/ Trade | Senior-secondary/ Tertiary | University | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | | |
| Attitude to all work | 6.18 | 6.51 | 6.52 | 6.90 | 0.004 | 3.7 |
| Comparative learning environment | 3.69 | 3.98 | 3.59 | 3.57 | 0.001 | 4.2 |
| Engaged in school | 5.47 | 5.37 | 5.76 | 6.05 | < 0.0001 | 6.3 |
| Internal markers of achievement | 7.07 | 7.62 | 7.51 | 7.98 | 0.006 | 3.4 |
| Disengaged in learning | 4.53 | 4.59 | 4.22 | 4.18 | 0.041 | 2.4 |
| Disrupted learning environment | 5.05 | 5.31 | 5.19 | 5.09 | 0.356 | 1.1 |
| Positive learning environment | 6.75 | 6.71 | 6.88 | 6.94 | 0.228 | 1.4 |
| Satisfied with subject mix | 7.66 | 7.59 | 7.58 | 7.94 | 0.396 | 0.1 |
| Relevant learning opportunities | 5.02 | 4.86 | 4.92 | 4.84 | 0.478 | 0.8 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## School decile

The only factor to be indicative with respect to current decile group is *disrupted learning environment*, which is slightly more likely in low-decile schools (Table 10)

More variables show significant differences across the historical pattern of school decile (Table 11):: the parent perception of the young person's *self-confidence* and *responsibility*, and all of the teacher perception variables. In each case, the students who have mainly been in high-decile schools tend to have higher scores than those in low-decile schools (with the exception of *social difficulties*, for which students in high-decile schools have lower scores, indicating fewer difficulties). Young people who have mainly attended high-decile schools also on average had higher scores for *engaged in school* and *attitude to work*, and lower scores for *disengaged in learning* and *disrupted learning environment*.

Table 10: Associations between engagement, attitude, and experience variables and age-16 school decile

| Scale variable | Decile 1–2 | Decile 3–8 | Decile 9–10/ Private | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Cognitive competency | 5.94 | 6.00 | 6.12 | 0.837 | 0.2 |
| Student view of family life | | | | | |
| Family communicates well | 6.60 | 6.60 | 6.63 | 0.884 | 0.2 |
| Family pressure | 4.90 | 4.43 | 4.42 | 0.419 | 0.7 |
| Family is inclusive | 7.75 | 7.83 | 7.84 | 0.969 | 0.1 |
| Family is supportive | 7.57 | 7.96 | 7.99 | 0.696 | 0.3 |
| Student views of friends and experiences | | | | | |
| Adverse events | 1.99 | 1.90 | 1.94 | 0.840 | 0.2 |
| Rejection | 2.64 | 2.15 | 2.21 | 0.360 | 0.8 |
| Praise and achievement | 5.96 | 5.71 | 5.90 | 0.493 | 0.6 |
| Risky behaviour | 4.17 | 3.60 | 3.60 | 0.368 | 0.7 |
| Friends with risky behaviour | 4.39 | 4.11 | 4.14 | 0.902 | 0.1 |
| Extending friendships | 7.29 | 7.17 | 7.27 | 0.803 | 0.2 |
| Solid friendships | 8.28 | 8.26 | 8.47 | 0.417 | 0.7 |
| Parent view of student | | | | | |
| Self-confidence | 6.84 | 6.95 | 7.11 | 0.570 | 0.5 |
| Self-efficacy | 7.37 | 6.95 | 7.26 | 0.081 | 1.6 |
| Responsibility | 7.45 | 7.19 | 7.40 | 0.396 | 0.7 |
| Teachers' view of student | | | | | |
| Focused and responsible | 6.72 | 6.97 | 6.83 | 0.694 | 0.4 |
| NCEA assessment | 3.04 | 3.47 | 3.34 | 0.100 | 1.6 |
| Overall ability | 6.04 | 6.35 | 6.51 | 0.698 | 0.4 |
| Social difficulties | 2.22 | 2.23 | 2.39 | 0.495 | 0.6 |

| Scale variable | Decile 1–2 | Decile 3–8 | Decile 9–10/ Private | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Teachers' view of student - *continued* | | | | | |
| Social skills | 6.51 | 6.35 | 6.24 | 0.483 | 0.6 |
| Thinking and learning | 6.11 | 6.40 | 6.33 | 0.438 | 0.7 |
| Student views on school and classes | | | | | |
| Absorbed in learning | 5.99 | 6.00 | 5.86 | 0.717 | 0.3 |
| Affirmed at school | 5.08 | 5.18 | 5.70 | 0.674 | 0.4 |
| Attitude to all work | 6.13 | 6.56 | 6.57 | 0.416 | 0.7 |
| Comparative learning environment | 4.00 | 3.70 | 3.81 | 0.409 | 0.7 |
| Engaged in school | 5.44 | 5.67 | 5.53 | 0.519 | 0.6 |
| Internal markers of achievement | 7.69 | 7.58 | 7.59 | 0.951 | 0.1 |
| Disengaged in learning | 4.12 | 4.31 | 4.50 | 0.546 | 0.5 |
| Disrupted learning environment | 5.54 | 5.06 | 5.25 | 0.020 | 2.4 |
| Positive learning environment | 7.04 | 6.84 | 6.75 | 0.562 | 0.5 |
| Satisfied with subject mix | 7.92 | 7.80 | 7.58 | 0.460 | 0.6 |
| Relevant learning opportunities | 5.11 | 4.92 | 4.83 | 0.307 | 0.9 |

Table 11: Associations between engagement, attitude, and experience variables and history of age-8–14 school decile

| Scale variable | Mainly decile 1–2 | Mainly decile 3–8 | Mainly decile 9–10 | Mixed over time | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 4.57 | 5.90 | 6.44 | 5.99 | < 0.0001 | 12.3 |
| Student view of family life | | | | | | |
| Family communicates well | 6.83 | 6.38 | 6.74 | 6.65 | 0.237 | 1.2 |
| Family pressure | 4.52 | 4.54 | 4.33 | 4.47 | 0.834 | 0.3 |
| Family is inclusive | 8.09 | 7.75 | 7.84 | 7.83 | 0.738 | 0.4 |
| Family is supportive | 8.41 | 7.69 | 8.12 | 7.95 | 0.090 | 1.8 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 2.35 | 1.89 | 1.84 | 1.97 | 0.083 | 1.9 |
| Rejection | 2.53 | 2.15 | 2.24 | 2.17 | 0.343 | 1.0 |
| Praise and achievement | 5.60 | 5.79 | 5.91 | 5.59 | 0.279 | 1.1 |
| Risky behaviour | 3.83 | 3.63 | 3.52 | 3.62 | 0.848 | 0.3 |
| Friends with risky behaviour | 4.44 | 4.21 | 4.04 | 4.21 | 0.736 | 0.5 |
| Extending friendships | 7.38 | 7.25 | 7.31 | 6.96 | 0.146 | 1.5 |
| Solid friendships | 8.57 | 8.40 | 8.36 | 8.26 | 0.550 | 0.7 |
| Parent view of student | | | | | | |
| Self-confidence | 6.98 | 6.70 | 7.25 | 7.06 | 0.002 | 3.8 |
| Self-efficacy | 7.08 | 6.96 | 7.30 | 7.08 | 0.132 | 1.6 |
| Responsibility | 6.90 | 7.12 | 7.54 | 7.21 | 0.007 | 3.2 |
| Teachers' view of student | | | | | | |
| Focused and responsible | 5.45 | 6.67 | 7.21 | 6.68 | < 0.0001 | 7.7 |
| NCEA assessment | 2.71 | 3.27 | 3.56 | 3.27 | < 0.0001 | 8.1 |
| Overall ability | 4.78 | 6.24 | 6.80 | 6.13 | < 0.0001 | 7.2 |
| Social difficulties | 3.11 | 2.47 | 2.13 | 2.41 | 0.0001 | 5.5 |
| Social skills | 5.48 | 6.08 | 6.53 | 6.26 | 0.0008 | 4.6 |
| Thinking and learning | 5.16 | 6.13 | 6.64 | 6.17 | < 0.0001 | 7.0 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 6.03 | 5.83 | 5.98 | 5.82 | 0.743 | 0.5 |
| Affirmed at school | 4.96 | 5.18 | 5.21 | 4.96 | 0.199 | 1.4 |
| Attitude to all work | 6.21 | 6.44 | 6.77 | 6.32 | 0.006 | 3.4 |
| Comparative learning environment | 4.08 | 3.81 | 3.80 | 3.90 | 0.665 | 0.6 |
| Engaged in school | 5.10 | 5.47 | 5.74 | 5.52 | 0.015 | 3.0 |

| Scale variable | Mainly decile 1–2 | Mainly decile 3–8 | Mainly decile 9–10 | Mixed over time | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | | |
| Internal markers of achievement | 7.15 | 7.55 | 7.68 | 7.43 | 0.034 | 2.5 |
| **Disengaged in learning** | **4.76** | **4.58** | **4.44** | **4.26** | **0.012** | **3.0** |
| **Disrupted learning environment** | **5.54** | **5.27** | **5.34** | **5.06** | **0.006** | **4.6** |
| Positive learning environment | 6.67 | 6.84 | 6.78 | 6.68 | 0.313 | 1.1 |
| Satisfied with subject mix | 7.21 | 7.68 | 7.68 | 7.67 | 0.447 | 0.9 |
| Relevant learning opportunities | 5.22 | 5.00 | 4.86 | 4.85 | 0.052 | 2.2 |

**Bold face** indicates that the differences were significant at the 1 percent level.

This section gives us clues of patterns of associations between variables. There are many apparent associations between the demographic variables and engagement variables, just as there are between the engagement variables themselves. The next section explores the relationships between these same engagement, family, and friends variables and the discrete engagement variables. The chapter after that is about starting to tease apart these associations, and to identify which variables are most strongly associated with each other, starting with the variables to do with family and friends.

# 5. Overview of the relationships between factor and cluster variables

This chapter gives an overview as to how the factor variables differ across the subgroups defined by the cluster and other discrete variables, and how the discrete variables are interrelated. These differences are explored more comprehensively in the next chapters as the larger models start to be built.

Some of the differences found in this chapter, like those in the previous chapter, may be due to real differences by subgroup, and some may actually be attributable to some other variable, with which both the factor variable and discrete variable are associated.

The relationship between the demographic variables and the discrete engagement variables (typically, those derived as a result of a cluster analysis) was investigated using a simple cross-tabulation and the associated chi-square test statistic; associations with continuous variables (typically, those derived as a result of a factor analysis) were investigated using 1-way analysis of variance (ANOVA).

The results are reported by type of analysis and within that derivation (whether from teacher comments, parent comments, or young person's comments), so that similar analyses can be discussed together.

## Discrete variables

The variables considered here are the same as those in the previous chapter; a combination of age-16 variables and some that were used at age 14. The age-16 variables are:

- subject cluster
- number of Level 1 NCEA credits (using Level 1 credits only means that Year 11 and Year 12 students can be meaningfully compared), split into quartile groups
- attendance (rating of attendance/absence at school)
- stud ent values.

The age-14 variables that were used are:

- motivation
- student interests
- history of TV watching (age 8–14)
- history of enjoyment of reading (age 8–14)
- history of involvement in bullying (age 10–14)
- history of feelings about school (age 8–12)
- history of parents and teachers working on concerns (age 8–14).

### Interrelationships

There are 12 discrete variables, which means that there are 66 pairs of them, taken two at a time. The relationships were explored using a cross-tabulation and chi-square test of independence, and the results are presented only for those where the test had a *p*-value of under 0.05. The results are presented in increasingly short tables, so that each pair of variables appears once, in a single table. To give an idea of the strength and direction of the relationship, some representative percentages are given. These are "conditional percentages" in that they are within the categories of the "main" variable in the table.

For instance, in Table 12, the "main" variable is *subject cluster*, and the percentages are the percent in each of the clusters. The first two rows of the table are showing the relationship with the *number of Level 1 credits* obtained by students in each subject cluster: 59 percent of those in the vocational cluster achieved under 80 L1 credits, and only 8 percent achieved between 120 (exclusive) and 160 (inclusive) credits. This can be contrasted with the traditional arts cluster, in which the corresponding percentages were 5 and 56. There is a single *p*-value for the two lines in the table, as that value applied to the whole cross-tabulation, from which the two lines were extracted.

The differences in *attendance* across the groups can be well captured by looking only at the percentage with poor attendance, so this cross-tabulation is covered by a single line in the table (but the *p*-value again applies to the whole table).

*Number of L1 credits* and *attendance* each have their own tables (Table 13 and Table 14, respectively), that do not have an entry for *subject cluster*, as that relationship is covered inTable 12. However, the percentages in their own tables cannot be directly compared with those in Table 12 as they have a different conditioning variable: the respective "main" variables of the tables (but meaningful comparisons are possible within each of the tables). However, the story told, of a varying pattern of behaviour across the groups defined by the cross-tabulation, is similar.

### *Subject cluster*

There were statistically significant associations for all the variables, except TV watching age 8–14. An indication of the strength of the relationships, and the magnitude of the differences is given in Table 12.

Table 12: Relationships between subject cluster and other discrete variables

| Other variable | Subject cluster | | | | |
|---|---|---|---|---|---|
| | Vocational % (*n* = 79) | Contextual % (*n* = 56) | Traditional academic: Arts % (*n* = 87) | Traditional academic: Science % (*n* = 200) | *p*-value |
| Number of L1 credits — under 80 | 59 | 44 | 5 | 9 | < 0.0001 |
| —120–160 | 8 | 13 | 56 | 47 | |
| Attendance—poor | 30 | 20 | 1 | 7 | < 0.0001 |
| Student values 16—standing out | 38 | 43 | 20 | 37 | 0.003 |
| Involvement in bullying 8–14—involved at least twice | 52 | 41 | 36 | 28 | 0.0004 |
| Student interests 14—computer games/ none | 25 | 39 | 13 | 18 | 0.014 |
| Enjoyment of reading 8–14—always enjoyed | 30 | 23 | 48 | 46 | 0.0006 |
| — mainly did not enjoy | 13 | 14 | 2 | 3 | |
| Feelings about school 8–14—always enthusiastic | 29 | 41 | 45 | 43 | 0.003 |
| Motivation 14—low | 49 | 46 | 14 | 26 | < 0.0001 |
| Parents & teachers working on problems 8–14—never | 11 | 14 | 23 | 50 | 0.044 |

### *Number of level 1 credits*

There were statistically significant associations for all variables except feelings about school 8–14, and parents and teachers working together on problems 8–14.

Table 13: Relationships between number of L1 credits and other discrete variables

| Other variable | Number of L1 credits | | | | |
|---|---|---|---|---|---|
| | < 80 % (*n* = 71) | 80–120 % (*n* = 137) | 120–160 % (*n* = 149) | > 160 % (*n* = 20) | *p*-value |
| Attendance—poor | 30 | 13 | 1 | 5 | < 0.0001 |
| Student values 16—standing out | 51 | 36 | 26 | 10 | < 0.0001 |
| Involvement in bullying 8–14—involved at least twice | 60 | 37 | 24 | 15 | < 0.0001 |
| Student interests 14—computer games/none | 35 | 20 | 13 | 20 | 0.034 |
| Enjoyment of reading 8–14—always enjoyed | 23 | 35 | 51 | 80 | < 0.0001 |
| —mainly did not enjoy | 18 | 3 | 2 | 0 | |
| TV watching 8–14—mainly low | 49 | 50 | 73 | 80 | 0.0001 |
| —mainly high | 21 | 27 | 11 | 5 | |
| Motivation 14—low | 56 | 31 | 17 | 10 | < 0.0001 |

### *Attendance*

There were statistically significant associations for all variables except enjoyment of reading 8–14, feelings about school 9–14, and TV watching 8–14.

Table 14: Relationships between attendance and other discrete variables

| Other variable | Attendance | | | | |
|---|---|---|---|---|---|
| | Good–excellent % (*n* = 276) | Fair % (*n* = 58) | Poor % (*n* = 44) | Poor health % (*n* = 11) | *p*-value |
| Student values 16—standing out | 33 | 29 | 36 | 46 | 0.029 |
| Involvement in bullying 8–14—involved at least twice | 32 | 48 | 46 | – | 0.037 |
| Student interests 14—computer games/none | 18 | 21 | 34 | 0 | 0.017 |
| Motivation 14—low | 26 | 33 | 55 | 36 | 0.005 |
| Parents and teachers working on problems—once or never | 35 | 29 | 30 | – | 0.0008 |

### *Student values at 16*

There were statistically significant associations for all variables except student interests, feelings about school 9–14, and parents and teachers working on problems 8–14.

Table 15: Relationships between student values at 16 and other discrete variables

| Other variable | Student values | | | |
|---|---|---|---|---|
| | Satisfying life % (*n* = 183) | Standing out % (*n* = 163) | Aspirational % (*n* = 101) | *p*-value |
| Involvement in bullying 8–14—involved at least twice | 26 | 42 | 44 | < 0.0001 |
| Enjoyment of reading 8–14—always enjoyed | 50 | 23 | 43 | < 0.0001 |
| —mainly did not enjoy | 4 | 13 | 3 | |
| TV watching 8–14—mainly low | 69 | 53 | 53 | 0.020 |
| —mainly high | 12 | 23 | 24 | |
| Motivation 14—low | 26 | 39 | 33 | 0.043 |

### *Involvement in bullying 8–14*

There were statistically significant associations for all variables except student interests, feelings about school 8–14, and motivation at age 14.

Table 16: Relationships between student values at 16 and other discrete variables

| Other variable | Student values | | | |
|---|---|---|---|---|
| | No involvement % (*n* = 123) | Involved once % (*n* = 163) | Involved at least twice % (*n* = 161) | *p*-value |
| Enjoyment of reading 8–14—always enjoyed | 55 | 35 | 30 | 0.004 |
| —mainly did not enjoy | 5 | 6 | 10 | |
| TV watching 8–14—mainly low | 69 | 56 | 55 | < 0.0001 |
| —mainly high | 13 | 20 | 22 | |
| Parents and teachers working on problems —once or never | 35 | 42 | 23 | 0.002 |

### *Student interests at 14*

There were statistically significant associations for all variables except feelings about school 8–14, and parents and teachers working on problems 8–14.

Table 17: Relationships between student interests at 14 and other discrete variables

| Other variable | Student interests | | | | |
|---|---|---|---|---|---|
| | Sports player % (***n*** = 154) | Computer games/none % (***n*** = 100) | Reading, arts, sports % (***n*** = 131) | Creative interests % (***n*** = 63) | ***p***-value |
| Enjoyment of reading 8–14—always enjoyed | 31 | 28 | 47 | 54 | 0.001 |
| —mainly did not enjoy | 7 | 11 | 2 | 19 | |
| TV watching 8–14—mainly low | 58 | 44 | 65 | 73 | 0.012 |
| —mainly high | 21 | 27 | 15 | 8 | |
| Motivation 14—low | 34 | 48 | 21 | 30 | < 0.0001 |

### *Enjoyment of reading 8–14*

Apart from associations mentioned above, there was an association between enjoyment of reading and feelings about school ($p$ = 0.004), with 47 percent of those who always enjoyed reading also being enthusiastic about school, while 9 percent were unhappy at school at least once, and, conversely, 16 percent of those who tended to report not enjoying reading were enthusiastic about school and 26 were unhappy at school at least once.

There was also an association between enjoyment of reading and watching TV ($p$ < 0.0001): 73 percent of those who enjoyed reading had mainly low rates of TV watching, compared with 29 percent of those who did not enjoy reading. Enjoying reading was also associated with motivation ($p$ < 0.0001): 42 percent of those who always enjoyed reading placed a high value on education, compared with 13 percent of those who did not enjoy reading.

### *Feelings about school 8–14*

Apart from the associations above, feelings about school was associated with parents and teachers working on problems at the same age ($p$ = 0.0001): the parents of 52 percent of those who were enthusiastic about school had never worked with teachers about problems, compared with 2 percent of those who had been unhappy at school at least once.

## Continuous variables

The scale variables, also the same as were used in the previous chapter, were derived from a series of factor analyses of parent, teacher, and student responses, all of which measure some aspect of the young person's attitude to or engagement with life in general or school in particular, or measures the extent to which their attitude or engagement may have been affected by the environment in which they live or some events in their lives. These scale variables, and the items used to construct them, are discussed in detail in the chapter "Scale variables, cluster variables, and history variables". In particular, we are looking at subsets of scale variables that describe the young person's home life:

- the student's view that:
  - the *family communicates well*
  - there is *family pressure*
  - the *family is inclusive*, or *supportive*;
- the student's information about the extent to which they:
  - were involved in *risky behaviour*
  - expressed *rejection*
  - had experienced *adverse events*
  - had *friends involved in risky behaviour*
  - had *solid friendships*
  - had *extending friendships*
  - had *praise and achievement* in any sphere of their life;
- the parent's view that the young person was:
  - *self-confident*
  - showed *self-efficacy*
  - or *responsibility*;

Variables that describe their school life:

- teacher views on:
  - the student and *NCEA assessment*
  - *overall ability*
  - and the attitudinal competencies of *thinking and learning*, *focused and responsible*, *social skills*, and *social difficulties*;
- the student views of the extent to which they are:
  - *engaged in school*
  - *affirmed at school*
  - *satisfied with their subject mix*
  - using *internal markers* of achievement
  - in a *positive learning environment*
  - *absorbed in learning*
  - *not disengaged in learning*
  - *not in a disrupted learning environment*
  - showing a positive *attitude to all work*
  - able to make *relevant learning opportunities*
  - in a *comparative learning environment*.

We have used 1-way ANOVAs where the discrete variables (cluster or other) are used as explanatory variables.

The results are reported for all 31 outcome variables, whether the differences were statistically significant or not. Variables where there were differences that were significant at the 1 percent level, or were almost significant at that level and the demographic variable accounted for over 2 percent of the variability, are in **bold** face.

## Subject cluster

There are marked differences between subject cluster groupings, mainly across a divide between the vocational/contextual clusters and the traditional academic clusters. More young people from families with pressure have ended up in the vocational and contextual clusters, and more people from families that are less inclusive have ended in the vocational cluster. Young people in the traditional academic clusters are less likely to experience adverse events, to show risky behaviour, or to have friends that do. Their parents and teachers were likely to rate their attitudinal competencies more highly, and their teachers were more likely to rate their overall ability more highly—which was matched by higher cognitive competency scores. The young people themselves reported higher levels of engagement in all the measures used, except for *relevant learning opportunities*, where the scores were higher for those in the vocational and contextual clusters.

Table 18: Associations between engagement, attitude, and experience variables and subject cluster (***n*** = 425)

| Scale variable | Vocational | Contextual | Traditional academic: Arts | Traditional academic: Science | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 5.20 | 5.37 | 7.07 | 6.38 | < 0.0001 | 25.2 |
| Student view of family life | | | | | | |
| Family communicates well | 6.26 | 6.48 | 6.69 | 6.76 | 0.115 | 1.8 |
| Family pressure | 4.93 | 4.87 | 4.42 | 4.19 | 0.004 | 3.7 |
| Family is inclusive | 7.47 | 7.74 | 7.70 | 8.07 | 0.006 | 3.3 |
| Family is supportive | 7.76 | 7.79 | 8.05 | 8.08 | 0.365 | 1.0 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 2.20 | 2.05 | 1.69 | 1.78 | 0.001 | 4.2 |
| Rejection | 2.29 | 2.41 | 2.17 | 2.08 | 0.099 | 1.9 |
| Praise and achievement | 5.60 | 5.53 | 5.45 | 5.62 | 0.878 | 0.3 |
| Risky behaviour | 3.83 | 4.16 | 3.00 | 3.45 | < 0.0001 | 6.6 |
| Friends with risky behaviour | 4.72 | 4.88 | 3.37 | 3.84 | < 0.0001 | 9.1 |
| Extending friendships | 7.23 | 6.93 | 7.32 | 7.36 | 0.046 | 2.3 |
| Solid friendships | 8.37 | 8.12 | 8.39 | 8.55 | 0.173 | 1.5 |
| Parent view of student | | | | | | |
| Self-confidence | 6.71 | 6.84 | 7.43 | 7.10 | 0.003 | 3.8 |
| Self-efficacy | 6.79 | 6.82 | 7.64 | 7.30 | < 0.0001 | 7.2 |
| Responsibility | 6.82 | 6.94 | 7.89 | 7.51 | < 0.0001 | 9.0 |
| Teachers' view of student | | | | | | |
| Focused and responsible | 5.84 | 5.88 | 7.86 | 7.04 | < 0.0001 | 21.1 |
| NCEA assessment | 5.38 | 5.59 | 7.48 | 6.64 | < 0.0001 | 24.8 |
| Overall ability | 4.93 | 5.14 | 7.73 | 6.79 | < 0.0001 | 25.7 |
| Social difficulties | 5.58 | 5.70 | 3.85 | 4.64 | < 0.0001 | 9.7 |
| Social skills | 5.72 | 5.71 | 6.91 | 6.38 | < 0.0001 | 10.1 |
| Thinking and learning | 5.35 | 5.57 | 7.16 | 6.53 | < 0.0001 | 19.4 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 5.93 | 5.84 | 6.04 | 5.87 | 0.752 | 0.5 |
| Affirmed at school | 4.89 | 4.75 | 5.49 | 5.24 | < 0.0001 | 6.9 |
| Attitude to all work | 6.29 | 6.31 | 7.04 | 6.51 | < 0.0001 | 6.3 |
| Comparative learning environment | 4.14 | 4.35 | 3.79 | 3.57 | 0.0006 | 4.6 |

| Scale variable | Vocational | Contextual | Traditional academic: Arts | Traditional academic: Science | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | | |
| Engaged in school | 5.18 | 5.05 | 6.22 | 5.62 | < 0.0001 | 12.8 |
| Internal markers of achievement | 7.11 | 7.20 | 7.93 | 7.79 | < 0.0001 | 6.4 |
| Disengaged in learning | 4.81 | 4.85 | 4.28 | 4.24 | 0.0008 | 4.5 |
| Disrupted learning environment | 5.39 | 5.70 | 5.19 | 5.05 | 0.002 | 4.0 |
| Positive about class | 6.58 | 6.52 | 6.73 | 6.71 | 0.037 | 2.4 |
| Positive about teachers | 6.77 | 6.72 | 7.07 | 6.93 | 0.002 | 3.9 |
| Satisfied with subject mix | 7.37 | 7.41 | 8.03 | 7.70 | 0.018 | 2.8 |
| Relevant learning opportunities | 5.32 | 5.06 | 4.63 | 4.80 | 0.0001 | 5.3 |

Bold face indicates that the differences were significant at the 1 percent level.

## Number of Level 1 NCEA credits

Students from inclusive and supportive families tended to achieve more credits, as did those who were positively engaged at school, by any of the measures. Those who tended to achieve fewer credits included those who experienced adverse events (which could include poor health), and those who, along with their friends, showed risky behaviour. The teacher perceptions were strongly associated with the number of credits achieved.

Table 19: Associations between engagement, attitude, and experience variables and number of Level 1 NCEA credits (***n*** = 425)

| Scale variable | Up to 80 | 80–120 | 120–160 | Over 160 | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 5.07 | 5.99 | 6.78 | 7.87 | < 0.0001 | 31.6 |
| Student view of family life | | | | | | |
| Family communicates well | 6.24 | 6.57 | 6.81 | 7.46 | 0.002 | 3.7 |
| Family pressure | 4.83 | 4.58 | 4.27 | 3.74 | 0.013 | 2.7 |
| Family is inclusive | 7.61 | 7.75 | 7.97 | 8.60 | 0.009 | 2.8 |
| Family is supportive | 7.72 | 7.81 | 8.19 | 8.76 | 0.008 | 2.9 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 2.09 | 2.06 | 1.60 | 1.81 | < 0.0001 | 6.0 |
| Rejection | 2.29 | 2.24 | 2.11 | 1.96 | 0.444 | 0.7 |
| Praise and achievement | 5.53 | 5.89 | 5.93 | 6.19 | 0.133 | 1.4 |
| Risky behaviour | 4.19 | 3.76 | 3.10 | 2.54 | < 0.0001 | 11.7 |
| Friends with risky behaviour | 4.93 | 4.21 | 3.59 | 2.91 | < 0.0001 | 9.6 |
| Extending friendships | 6.94 | 7.35 | 7.34 | 7.30 | 0.037 | 2.1 |
| Solid friendships | 8.29 | 8.52 | 8.49 | 8.18 | 0.377 | 0.8 |
| Parent view of student | | | | | | |
| Self-confidence | 6.62 | 7.16 | 7.15 | 7.48 | 0.002 | 3.6 |
| Self-efficacy | 6.65 | 7.29 | 7.36 | 7.93 | < 0.0001 | 7.7 |
| Responsibility | 6.64 | 7.41 | 7.62 | 8.38 | < 0.0001 | 11.7 |
| Teachers' view of student | | | | | | |
| Focused and responsible | 5.42 | 6.49 | 7.73 | 8.72 | < 0.0001 | 36.3 |
| NCEA assessment | 5.20 | 6.15 | 7.24 | 8.36 | < 0.0001 | 36.0 |
| Overall ability | 4.45 | 6.17 | 7.46 | 8.95 | < 0.0001 | 37.5 |
| Social difficulties | 6.17 | 5.12 | 3.91 | 2.98 | < 0.0001 | 19.4 |
| Social skills | 5.25 | 6.25 | 6.73 | 7.42 | < 0.0001 | 18.7 |
| Thinking and learning | 4.98 | 6.17 | 7.01 | 7.81 | < 0.0001 | 31.0 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 5.79 | 5.77 | 6.04 | 6.33 | 0.052 | 1.9 |
| Affirmed at school | 4.65 | 5.03 | 5.48 | 5.64 | < 0.0001 | 11.2 |
| Attitude to all work | 6.18 | 6.38 | 6.77 | 7.37 | < 0.0001 | 7.7 |
| Comparative learning environment | 4.23 | 3.89 | 6.62 | 3.25 | 0.013 | 2.7 |
| Engaged in school | 4.99 | 5.39 | 5.99 | 6.42 | < 0.0001 | 15.2 |
| Internal markers of achievement | 7.01 | 7.59 | 7.84 | 8.64 | < 0.0001 | 7.7 |
| Disengaged in learning | 4.91 | 4.67 | 4.04 | 3.89 | < 0.0001 | 9.0 |
| Disrupted learning environment | 5.70 | 5.24 | 5.01 | 5.29 | 0.0001 | 5.1 |
| Positive about class | 6.57 | 6.53 | 6.80 | 6.91 | 0.032 | 2.2 |

| Scale variable | Up to 80 | 80–120 | 120–160 | Over 160 | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | | |
| Positive about teachers | 6.63 | 6.76 | 7.08 | 7.52 | 0.0003 | 4.7 |
| Satisfied with subject mix | 7.32 | 7.50 | 7.96 | 8.01 | 0.002 | 3.8 |
| Relevant learning opportunities | 5.12 | 4.85 | 4.81 | 4.45 | 0.031 | 2.2 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Attendance

Experiencing *adverse events* and *attendance* were associated, with those with general poor attendance and poor attendance because of poor health reporting a greater incidence of adverse events. *Risky behaviour* and *friends with risky behaviour* were reported at higher levels among those whose attendance was poor, and the same students had lower average scores for parent perceptions of responsibility. Teacher perceptions were strongly linked with attendance, as students with poor attendance were rated low on all scales other than *social difficulty*, where they were rated high. The students who were rated as attending poorly themselves reported low levels of engagement, affirmation, and a poor attitude to work (and correspondingly a high rate of disengagement) and also a low level of satisfaction with their subject mix.

Typically, the measures for excellent, very good, and good attendance are similar (and may or may not show an increasing or decreasing gradient between excellent and good); those for fair attendance are slightly lower for a positive attribute such as engagement, or slightly higher for a negative attribute such as risky behaviour, and those for poor attendance drop (or rise) more markedly. The measures for the students with poor health and other reasons for absence vary, forming different patterns for different measures.

Table 20: Associations between engagement, attitude, and experience variables and attendance at school (***n*** = 393)

| Scale variable | Excell-ent | Very good | Good | Fair | Poor | Unwell | Other | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|---|---|---|---|
| Cognitive competency | 6.27 | 6.26 | 6.40 | 6.05 | 5.39 | 6.39 | 6.60 | 0.004 | 4.8 |
| Student view of family life | | | | | | | | | |
| Family communicates well | 6.79 | 6.16 | 6.66 | 6.40 | 6.67 | 6.46 | 6.87 | 0.812 | 0 |
| Family pressure | 4.35 | 4.35 | 4.50 | 4.56 | 4.44 | 4.36 | 5.88 | 0.683 | 1.0 |
| Family is inclusive | 7.94 | 7.82 | 7.94 | 7.73 | 7.96 | 7.63 | 7.51 | 0.92 | 0.6 |
| Family is supportive | 8.14 | 7.90 | 8.19 | 7.91 | 7.93 | 8.26 | 8.03 | 0.845 | 0.7 |
| Student views of friends and experiences | | | | | | | | | |
| Adverse events | 1.56 | 1.72 | 1.82 | 1.88 | 2.52 | 2.53 | 1.75 | < 0.0001 | 11.4 |
| Rejection | 3.70 | 3.65 | 3.61 | 3.81 | 3.78 | 4.02 | 3.81 | 0.910 | 0.5 |
| Praise and achievement | 5.78 | 5.91 | 5.86 | 5.89 | 5.78 | 5.53 | 7.59 | 0.377 | 1.7 |
| Risky behaviour | 3.11 | 3.35 | 3.39 | 3.74 | 4.37 | 3.66 | 3.69 | < 0.0001 | 7.2 |
| Friends with risky behaviour | 3.22 | 3.21 | 3.24 | 4.02 | 4.32 | 4.07 | 3.53 | 0.0002 | 6.5 |
| Extending friendships | 7.48 | 7.35 | 7.18 | 6.90 | 7.48 | 7.11 | 7.99 | 0.085 | 2.8 |
| Solid friendships | 8.43 | 8.54 | 8.45 | 8.20 | 8.53 | 8.67 | 8.99 | 0.565 | 1.2 |
| Parent view of student | | | | | | | | | |
| Self-confidence | 7.14 | 6.91 | 6.97 | 7.11 | 7.10 | 7.63 | 7.25 | 0.641 | 1.1 |
| Self-efficacy | 7.47 | 7.24 | 7.12 | 7.09 | 7.01 | 7.75 | 7.54 | 0.122 | 2.6 |
| Responsibility | 7.77 | 7.40 | 7.26 | 7.23 | 6.83 | 7.78 | 7.33 | 0.002 | 5.3 |
| Teachers' view of student | | | | | | | | | |
| Focused and responsible | 7.43 | 7.28 | 7.15 | 6.30 | 5.31 | 6.08 | 7.45 | < 0.0001 | 18.8 |
| NCEA assessment | 7.00 | 6.88 | 6.79 | 6.00 | 5.01 | 5.61 | 6.50 | < 0.0001 | 19.6 |
| Overall ability | 6.91 | 6.98 | 6.84 | 5.84 | 4.75 | 5.64 | 7.19 | < 0.0001 | 13.4 |
| Social difficulties | 4.42 | 4.45 | 4.18 | 5.56 | 8.82 | 4.83 | 4.82 | < 0.0001 | 7.7 |
| Social skills | 6.53 | 6.53 | 6.48 | 5.90 | 5.48 | 6.59 | 6.85 | < 0.0001 | 7.4 |

| Scale variable | Excell-ent | Very good | Good | Fair | Poor | Unwell | Other | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|---|---|---|
| Teachers' view of student - *continued* | | | | | | | | | |
| Thinking and learning | 6.75 | 6.60 | 6.57 | 5.89 | 5.19 | 5.81 | 7.25 | < 0.0001 | 12.3 |
| Student views on school and classes | | | | | | | | | |
| Absorbed in learning | 6.07 | 5.94 | 5.98 | 5.79 | 5.58 | 5.65 | 5.96 | 0.310 | 1.8 |
| Affirmed at school | 5.37 | 5.33 | 5.28 | 4.89 | 4.71 | 4.33 | 5.49 | < 0.0001 | 7.5 |
| Attitude to all work | 6.57 | 6.71 | 6.78 | 6.42 | 6.02 | 6.31 | 6.63 | 0.007 | 4.5 |
| Comparative learning environment | 3.57 | 3.79 | 3.94 | 3.97 | 4.07 | 4.13 | 2.88 | 0.411 | 1.6 |
| Engaged in school | 5.87 | 5.84 | 5.70 | 5.32 | 4.83 | 4.86 | 5.99 | < 0.0001 | 10.9 |
| Internal markers of achievement | 7.74 | 7.65 | 7.76 | 7.68 | 7.31 | 7.39 | 7.68 | 0.439 | 1.5 |
| Disengaged in learning | 4.05 | 4.41 | 4.47 | 4.53 | 4.95 | 4.61 | 4.94 | 0.006 | 4.6 |
| Disrupted learning environment | 5.14 | 5.25 | 5.19 | 5.23 | 5.44 | 4.84 | 4.34 | 0.407 | 1.6 |
| Positive about class | 6.84 | 6.59 | 6.72 | 6.52 | 6.52 | 6.51 | 7.21 | 0.175 | 2.3 |
| Positive about teacher | 7.18 | 6.85 | 6.85 | 6.59 | 6.65 | 6.87 | 7.86 | 0.017 | 3.9 |
| Satisfied with subject mix | 7.89 | 7.93 | 7.72 | 7.39 | 6.95 | 7.75 | 7.75 | 0.003 | 4.9 |
| Relevant learning opportunities | 4.81 | 5.01 | 4.72 | 4.71 | 5.19 | 4.69 | 5.66 | 0.053 | 3.2 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Student values at 16

*Student values at 16* showed stronger associations with the engagement and family variables than with the equivalent age-14 grouping.

There is a strong or indicative association between all the parent and family variables, with the group with standing out values having less positive experiences in their family, and having parents that rated them lower in terms of *self-confidence*, *self-efficacy*, and *responsibility*. Their teacher ratings were also all lower (apart from *social difficulties*), as were their own ratings of general engagement (with *disengaged* having a higher rating). The satisfying life group had lower rates of *adverse events*, *rejection*, *risky behaviour*, and *friends with risky behaviour*. The aspirational group had the highest scores for *extending friendships*.

Table 21: Associations between engagement, attitude, and experience variables and student values at 16 (***n*** up to 420 for school data, 447 for family and friend data)

| Scale variable | Standing out | Satisfying life | Aspirational | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Cognitive competency 16 | 5.64 | 6.56 | 5.94 | < 0.0001 | 8.7 |
| Student view of family life | | | | | |
| Family communicates well | 6.26 | 6.79 | 6.84 | 0.0006 | 3.3 |
| Family pressure | 4.73 | 4.27 | 4.33 | 0.024 | 1.7 |
| Family is inclusive | 7.55 | 8.00 | 7.96 | 0.003 | 2.5 |
| Family is supportive | 7.69 | 8.10 | 8.19 | 0.018 | 1.8 |
| Student views of friends and experiences | | | | | |
| Adverse events | 2.03 | 1.76 | 2.08 | 0.006 | 2.3 |
| Rejection | 2.17 | 2.06 | 2.51 | 0.006 | 2.3 |
| Praise and achievement | 5.71 | 5.79 | 5.06 | 0.163 | 0.8 |
| Risky behaviour | 4.05 | 3.24 | 3.51 | < 0.0001 | 6.2 |
| Friends with risky behaviour | 4.55 | 3.83 | 4.03 | 0.001 | 3.0 |
| Extending friendships | 7.03 | 7.35 | 7.42 | 0.009 | 2.1 |
| Solid friendships | 8.22 | 8.50 | 8.50 | 0.073 | 1.2 |
| Parent view of student | | | | | |
| Self-confidence | 6.72 | 7.21 | 7.21 | 0.0004 | 3.5 |
| Self-efficacy | 6.84 | 7.33 | 7.28 | 0.0005 | 3.4 |
| Responsibility | 6.93 | 7.67 | 7.30 | < 0.0001 | 6.2 |
| Teachers' view of student | | | | | |
| Focused and responsible | 6.21 | 7.35 | 6.85 | < 0.0001 | 9.5 |
| NCEA assessment | 5.87 | 6.87 | 6.51 | < 0.0001 | 8.6 |
| Overall ability | 5.77 | 7.00 | 6.28 | < 0.0001 | 7.0 |
| Social difficulties | 2.66 | 2.14 | 2.23 | < 0.0001 | 4.6 |
| Social skills | 5.81 | 6.52 | 6.54 | < 0.0001 | 6.2 |
| Thinking and learning | 5.80 | 6.69 | 6.41 | < 0.0001 | 6.9 |
| Student views on school and classes | | | | | |
| Absorbed in learning | 5.56 | 6.05 | 6.17 | < 0.0001 | 5.0 |
| Affirmed at school | 4.86 | 5.32 | 5.30 | < 0.0001 | 4.8 |
| Attitude to all work | 6.38 | 6.70 | 6.53 | 0.028 | 1.7 |

| Scale variable | Standing out | Satisfying life | Aspirational | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | |
| Comparative learning environment | 4.09 | 3.71 | 3.57 | 0.024 | 1.8 |
| **Engaged in school** | **5.30** | **5.74** | **5.72** | **0.0005** | **3.6** |
| **Internal markers of achievement** | **7.27** | **7.75** | **7.85** | **0.001** | **3.1** |
| **Disengaged in learning** | **4.76** | **4.25** | **4.26** | **0.0004** | **3.7** |
| Disrupted learning environment | 5.31 | 5.08 | 5.33 | 0.101 | 1.1 |
| Positive about classes | 6.54 | 6.70 | 6.75 | 0.164 | 0.9 |
| Positive about teachers | 6.78 | 6.93 | 6.97 | 0.338 | 0.5 |
| Satisfied with subject mix | 7.51 | 7.76 | 7.70 | 0.264 | 0.6 |
| Relevant learning opportunities | 4.96 | 4.85 | 4.88 | 0.632 | 0.2 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Motivation

The value students placed on education when aged 14 showed associations with *adverse events*, *risky behaviour*, and having *friends with risky behaviour*: young people who placed a high value on education had a lower risk profile for all these variables, and those who placed a low value had a higher risk profile. There was a matching association between the parent perceptions of the young people, the teachers, and the young people's own rating of their engagement and the value placed on education.

Table 22: Associations between engagement, attitude, and experience variables and motivation (***n*** up to 420 for school data, 447 for family and friend data)

| Scale variable | High | Unsure | Low | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Cognitive competency | 6.63 | 6.26 | 5.37 | < 0.0001 | 13.7 |
| Student view of family life | | | | | |
| Family communicates well | 6.86 | 6.68 | 6.31 | 0.006 | 2.3 |
| Family pressure | 4.49 | 4.36 | 4.50 | 0.703 | 0.2 |
| Family is inclusive | 7.93 | 7.92 | 7.64 | 0.108 | 1.0 |
| Family is supportive | 8.11 | 8.02 | 7.76 | 0.161 | 0.8 |
| Student views of friends and experiences | | | | | |
| Adverse events | 1.78 | 1.88 | 2.12 | 0.007 | 2.2 |
| Rejection | 2.13 | 2.22 | 2.23 | 0.694 | 0.2 |
| Praise and achievement | 5.94 | 5.91 | 5.60 | 0.098 | 1.0 |
| Risky behaviour | 3.18 | 3.61 | 3.95 | < 0.0001 | 4.4 |
| Friends with risky behaviour | 3.53 | 4.34 | 4.45 | < 0.0001 | 4.5 |
| Extending friendships | 7.49 | 7.21 | 7.09 | 0.015 | 1.9 |
| Solid friendships | 8.53 | 8.43 | 8.24 | 0.0009 | 3.1 |
| Parent view of student | | | | | |
| Self-confidence | 7.27 | 7.07 | 6.78 | 0.005 | 2.4 |
| Self-efficacy | 7.39 | 7.27 | 6.78 | < 0.0001 | 4.5 |
| Responsibility | 7.61 | 7.41 | 6.97 | 0.0001 | 4.0 |
| Teachers' view of student | | | | | |
| Focused and responsible | 7.67 | 6.96 | 6.16 | < 0.0001 | 9.0 |
| NCEA assessment | 7.03 | 6.46 | 5.84 | < 0.0001 | 9.9 |
| Overall ability | 7.10 | 6.53 | 5.56 | < 0.0001 | 8.8 |
| Social difficulties | 4.46 | 4.49 | 5.48 | < 0.0001 | 4.5 |
| Social skills | 6.70 | 6.40 | 5.71 | < 0.0001 | 8.4 |
| Thinking and learning | 6.88 | 6.40 | 5.65 | < 0.0001 | 10.7 |
| Student views on school and classes | | | | | |
| Absorbed in learning | 6.23 | 5.72 | 5.83 | 0.0006 | 3.5 |
| Affirmed at school | 5.39 | 5.24 | 4.81 | < 0.0001 | 11.2 |
| Attitude to all work | 6.76 | 6.53 | 6.36 | 0.011 | 2.1 |
| Comparative learning environment | 3.65 | 3.84 | 3.93 | 0.370 | 0.5 |
| Engaged in school | 5.96 | 5.58 | 5.22 | < 0.0001 | 7.0 |
| Internal markers of achievement | 8.02 | 7.56 | 7.26 | < 0.0001 | 4.6 |
| Disengaged in learning | 4.20 | 4.47 | 4.61 | 0.026 | 1.7 |

| Scale variable | High | Unsure | Low | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | |
| Disrupted learning environment | 5.18 | 5.15 | 5.35 | 0.260 | 0.6 |
| Positive learning environment | 6.93 | 6.79 | 6.68 | 0.110 | 1.1 |
| Satisfied with subject mix | 7.83 | 7.60 | 7.57 | 0.259 | 0.6 |
| Relevant learning opportunities | 4.90 | 4.83 | 4.98 | 0.456 | 0.4 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Student interests at age 14

The age-14 clusters formed from the interests expressed proved to distinguish more clearly between cognitive and attitudinal competencies than equivalent age-16 clusters.

Young people who reported few interests beyond computer games at age 14 were likely to have lower than average scores on both *family communicates well* and *family is supportive*. The group with the highest scores in both is the one with the widest interest. For most of the discrete variables discussed in this section there is one group that almost always had the most positive scores, and another that almost always had the most negative scores. The young people with computer games or no real interests scored the lowest on *praise and achievement*, *extending friendships*, parent perceptions of their *self-confidence*, *self-efficacy*, and *responsibility*, in all the teacher perceptions, and themselves reported the lowest levels of being *absorbed in learning* and *attitude to all work*, and other positive engagement variables. There were, however, no statistically significant differences for *disengagement in learning* or *disrupted learning environment*. The sports players, whether they had wider interests or not, tended to have higher scores on *supportive family* and *praise and achievement*. However, the sports players without wider interests also reported higher rates of *risky behaviour* and *friends with risky behaviour*. The young people with the widest interests (reading, arts, and sports) were the most likely to report *extending friendships*, and had the highest average scores from their parents for *self-confidence* and *self-efficacy*. It was the group with creative interests that had the highest average scores for all the teacher variables (other than *social difficulties*), for *responsibility* as judged by parents, and by their own report for the various positive engagement variables.

Despite the teachers perceiving differences in ability and likelihood of success in NCEA that were statistically significant, there were no such differences in our measures of cognitive competency.

Table 23: Associations between engagement, attitude, and experience variables and student interests (***n*** = 420 for school variables, 447 for others)

| Scale variable | Sports player | Computer games/ none | Reading, arts, sports | Creative | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 6.02 | 5.94 | 6.15 | 6.30 | 0.348 | 0.7 |
| Student view of family life | | | | | | |
| Family communicates well | 6.55 | 6.15 | 6.94 | 6.81 | 0.0004 | 4.0 |
| Family pressure | 4.54 | 4.49 | 4.34 | 4.38 | 0.763 | 0.3 |
| Family is inclusive | 7.70 | 7.63 | 8.08 | 7.96 | 0.029 | 2.0 |
| Family is supportive | 8.04 | 7.43 | 8.31 | 7.91 | < 0.0001 | 7.8 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 1.88 | 1.95 | 2.08 | 1.70 | 0.054 | 1.7 |
| Rejection | 2.11 | 2.28 | 2.19 | 2.32 | 0.522 | 0.5 |
| Praise and achievement | 5.97 | 5.10 | 6.23 | 5.75 | < 0.0001 | 8.1 |
| Risky behaviour | 3.78 | 3.73 | 3.58 | 2.98 | 0.002 | 3.3 |
| Friends with risky behaviour | 4.44 | 4.29 | 3.98 | 3.50 | 0.004 | 3.0 |
| Extending friendships | 7.16 | 6.97 | 7.55 | 7.30 | 0.001 | 3.5 |
| Solid friendships | 8.33 | 8.28 | 8.58 | 8.37 | 0.246 | 0.9 |
| Parent view of student | | | | | | |
| Self-confidence | 6.90 | 6.74 | 7.39 | 7.08 | 0.0005 | 4.0 |
| Self-efficacy | 7.12 | 6.77 | 7.41 | 7.27 | 0.0009 | 3.7 |
| Responsibility | 7.24 | 6.98 | 7.48 | 7.73 | 0.002 | 3.4 |

| Scale variable | Sports player | Computer games/ none | Reading, arts, sports | Creative | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Teachers' view of student | | | | | | |
| Focused and responsible | 6.63 | 6.63 | 6.98 | 7.39 | 0.006 | 3.0 |
| NCEA assessment | 6.30 | 6.09 | 6.65 | 6.94 | 0.001 | 3.9 |
| Overall ability | 6.11 | 6.11 | 6.65 | 7.09 | 0.004 | 3.2 |
| Social difficulties | 4.96 | 4.88 | 4.80 | 4.25 | 0.183 | 1.2 |
| Social skills | 6.11 | 6.01 | 6.51 | 6.64 | 0.004 | 3.2 |
| Thinking and learning | 6.14 | 5.94 | 6.58 | 6.74 | 0.0008 | 4.0 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 5.76 | 5.67 | 6.08 | 6.29 | 0.001 | 3.7 |
| Affirmed at school | 5.10 | 4.94 | 5.31 | 5.30 | 0.032 | 2.1 |
| Attitude to all work | 6.50 | 6.26 | 6.70 | 6.80 | 0.005 | 3.0 |
| Comparative learning environment | 3.89 | 3.88 | 3.63 | 3.88 | 0.540 | 0.5 |
| Engaged in school | 5.49 | 5.40 | 5.71 | 5.83 | 0.036 | 2.1 |
| Internal markers of achievement | 7.51 | 7.32 | 7.85 | 7.75 | 0.032 | 2.1 |
| Disengaged in learning | 4.49 | 4.61 | 4.33 | 4.23 | 0.209 | 1.1 |
| Disrupted learning environment | 5.27 | 5.25 | 5.09 | 5.34 | 0.209 | 1.1 |
| Positive about class | 6.60 | 6.50 | 6.74 | 6.87 | 0.067 | 1.7 |
| Positive about teachers | 6.89 | 6.69 | 6.94 | 7.09 | 0.149 | 1.3 |
| Satisfied with subject mix | 7.85 | 7.48 | 7.56 | 7.67 | 0.184 | 1.2 |
| Relevant learning opportunities | 4.98 | 4.87 | 4.86 | 4.80 | 0.637 | 0.4 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## TV watching 8–14

Patterns of low TV watching were associated with student reports of lower rates of *adverse events*, and *risky behaviour*, negative engagement in school, and higher rates of positive engagement, parent reports of greater *responsibility*, and positive teacher reports, although the cognitive and attitudinal differences were more marked than those for the social competencies. The teacher perception of greater cognitive and attitudinal strengths was confirmed by the associated higher scores on our cognitive competency.

Table 24: Associations between engagement, attitude, and experience variables and TV watching 8–14 (***n*** up to 420 for school data, 447 for family and friend data)

| Scale variable | Mainly low | Mixed | Mainly high | ***p*-value** | $R^2$ (%) |
|---|---|---|---|---|---|
| Cognitive competency | 6.25 | 6.04 | 5.61 | 0.0008 | 3.7 |
| Student view of family life | | | | | |
| Family communicates well | 6.74 | 6.50 | 6.29 | 0.051 | 1.7 |
| Family pressure | 4.44 | 4.43 | 4.52 | 0.508 | 0.5 |
| Family is inclusive | 7.90 | 7.77 | 7.69 | 0.598 | 0.4 |
| Family is supportive | 8.04 | 7.94 | 7.73 | 0.398 | 0.7 |
| Student views of friends and experiences | | | | | |
| Adverse events | 1.85 | 2.03 | 2.03 | 0.002 | 3.3 |
| Rejection | 2.13 | 2.18 | 2.45 | 0.127 | 1.3 |
| Praise and achievement | 5.91 | 5.73 | 5.62 | 0.282 | 0.6 |
| Risky behaviour | 3.46 | 3.61 | 4.02 | 0.021 | 2.2 |
| Friends with risky behaviour | 3.95 | 4.24 | 4.61 | 0.035 | 1.9 |
| Extending friendships | 7.32 | 7.22 | 7.08 | 0.371 | 0.7 |
| Solid friendships | 8.48 | 8.69 | 8.13 | 0.143 | 1.2 |
| Parent view of student | | | | | |
| Self-confidence | 7.13 | 7.00 | 6.80 | 0.150 | 1.2 |
| Self-efficacy | 7.26 | 7.12 | 6.83 | 0.013 | 2.4 |
| Responsibility | 7.47 | 7.22 | 6.99 | 0.003 | 3.1 |
| Teachers' view of student | | | | | |
| Focused and responsible | 7.14 | 6.55 | 6.23 | < 0.0001 | 5.6 |
| NCEA assessment | 6.69 | 6.23 | 5.92 | < 0.0001 | 4.5 |
| Overall ability | 6.68 | 6.30 | 5.69 | 0.0006 | 3.5 |
| Social difficulties | 4.58 | 4.90 | 5.32 | 0.024 | 1.8 |
| Social skills | 6.45 | 6.09 | 5.99 | 0.012 | 2.1 |
| Thinking and learning | 6.54 | 6.08 | 5.91 | 0.0009 | 3.4 |
| Student views on school and classes | | | | | |
| Absorbed in learning | 6.06 | 5.81 | 5.57 | 0.002 | 2.8 |
| Affirmed at school | 5.27 | 5.08 | 4.90 | 0.011 | 2.2 |
| Attitude to all work | 6.67 | 6.50 | 6.21 | 0.002 | 3.3 |
| Comparative learning environment | 3.69 | 4.02 | 3.94 | 0.187 | 0.8 |
| Engaged in school | 5.74 | 5.43 | 5.28 | 0.002 | 3.0 |
| Internal markers of achievement | 7.77 | 7.52 | 7.21 | 0.007 | 2.4 |
| Disengaged in learning | 4.21 | 4.67 | 4.85 | < 0.0001 | 4.9 |

| Scale variable | Mainly low | Mixed | Mainly high | *p*-value | $R^2$ (%) |
|---|---|---|---|---|---|
| Student views on school and classes - *continued* | | | | | |
| Disrupted learning environment | 5.08 | 5.53 | 5.32 | 0.003 | 2.7 |
| Positive about class | 6.72 | 6.59 | 6.53 | 0.190 | 0.8 |
| Positive about teachers | 7.02 | 6.68 | 6.72 | 0.011 | 2.1 |
| Satisfied with subject mix | 7.80 | 7.43 | 7.49 | 0.043 | 1.5 |
| Relevant learning opportunities | 4.81 | 5.04 | 4.99 | 0.121 | 1.0 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Enjoyment of reading 8–14

The young people who enjoyed reading when they were younger tended to come from families that communicated well, did not have pressure, neither they nor their friends tended to be involved in risktaking, and they enjoyed *extending friendships*. They were rated relatively highly by their parents for *self-efficacy* and *responsibility*, and were given high ratings by their teachers for all the social, attitudinal, and cognitive measures—supported by high scores in the *cognitive composite*. They themselves reported above-average responses on all the positive engagement variables (and below-average responses on the negative ones).

*Enjoyment of reading* accounted for substantial percentages of variability in the attitudinal and cognitive competency variables (10–23 percent).

Table 25: Associations between engagement, attitude, and experience variables and enjoyment of reading 8–14 (***n*** up to 420 for school data, 447 for family and friend data)

| Scale variable | Yes, always | Yes, mainly | Mixed | Often no | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 6.74 | 6.15 | 5.43 | 4.56 | < 0.0001 | 23.0 |
| Student view of family life | | | | | | |
| Family communicates well | 6.85 | 6.46 | 6.67 | 5.63 | 0.0002 | 4.5 |
| Family pressure | 4.26 | 4.72 | 4.24 | 5.02 | 0.003 | 3.1 |
| Family is inclusive | 7.95 | 7.69 | 7.92 | 7.41 | 0.080 | 1.5 |
| Family is supportive | 8.10 | 7.75 | 8.11 | 7.53 | 0.086 | 1.5 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 1.81 | 1.96 | 2.04 | 2.01 | 0.200 | 1.0 |
| Rejection | 2.18 | 2.18 | 2.32 | 2.22 | 0.978 | 0 |
| Praise and achievement | 6.06 | 5.72 | 5.67 | 5.43 | 0.033 | 2.0 |
| Risky behaviour | 3.21 | 3.78 | 3.76 | 4.34 | < 0.0001 | 5.4 |
| Friends with risky behaviour | 3.57 | 4.44 | 4.40 | 5.09 | < 0.0001 | 6.7 |
| Extending friendships | 7.48 | 7.22 | 7.07 | 6.82 | 0.003 | 3.1 |
| Solid friendships | 8.56 | 8.29 | 8.38 | 7.92 | 0.036 | 1.9 |
| Parent view of student | | | | | | |
| Self-confidence | 7.16 | 7.10 | 6.95 | 6.40 | 0.014 | 2.4 |
| Self-efficacy | 7.41 | 7.18 | 6.94 | 6.37 | < 0.0001 | 5.4 |
| Responsibility | 6.66 | 7.50 | 6.88 | 6.46 | < 0.0001 | 9.2 |
| Teachers' view of student | | | | | | |
| Focused and responsible | 7.53 | 6.72 | 6.21 | 5.48 | < 0.0001 | 16.0 |
| NCEA assessment | 7.04 | 6.31 | 5.89 | 5.41 | < 0.0001 | 13.4 |
| Overall ability | 7.28 | 6.31 | 5.56 | 4.72 | < 0.0001 | 16.0 |
| Social difficulties | 4.09 | 4.87 | 5.41 | 6.46 | < 0.0001 | 10.1 |
| Social skills | 6.81 | 6.24 | 5.76 | 5.18 | < 0.0001 | 13.7 |
| Thinking and learning | 6.89 | 6.20 | 5.82 | 5.18 | < 0.0001 | 12.7 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 6.14 | 5.68 | 5.83 | 5.83 | 0.008 | 2.8 |
| Affirmed at school | 5.49 | 4.92 | 4.96 | 4.90 | < 0.0001 | 7.5 |
| Attitude to all work | 6.86 | 6.30 | 6.42 | 6.23 | < 0.0001 | 5.7 |
| Comparative learning environment | 3.54 | 3.95 | 3.88 | 4.61 | 0.006 | 2.9 |
| Engaged in school | 5.95 | 5.30 | 5.48 | 4.96 | < 0.0001 | 8.6 |
| Internal markers of achievement | 7.94 | 7.45 | 7.39 | 7.07 | 0.0004 | 4.3 |
| Disengaged in learning | 4.12 | 4.60 | 4.78 | 5.09 | < 0.0001 | 5.1 |
| Disrupted learning environment | 5.09 | 5.26 | 5.29 | 5.59 | 0.122 | 1.4 |
| Positive about class | 6.81 | 6.45 | 6.64 | 6.62 | 0.012 | 2.6 |
| Positive about teachers | 7.10 | 6.65 | 6.82 | 6.86 | 0.007 | 2.9 |
| Satisfied with subject mix | 7.89 | 7.41 | 7.55 | 7.81 | 0.028 | 2.2 |
| Relevant learning opportunities | 4.81 | 4.83 | 4.99 | 5.32 | 0.072 | 1.7 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Involvement in bullying 8–14

Those who had been involved in bullying in more than two of our rounds of data collection were more likely to come from families with pressure, and less likely to come from families that were supportive. Their parents on average gave them relatively low scores for self-efficacy and responsibility. Their teachers tended to give them lower than average ratings for the cognitive and attitudinal competencies (and they had relatively low scores for the cognitive competency), and high scores for *social difficulties* (which included involvement in bullying at age 16). The students themselves reported more *adverse events* and *rejection* (which included bullying), more involvement in *risky behaviour*, less *extending* or *solid friendships*, and less engagement at school, in particular lower *affirmation* and *engagement*.

Table 26: Associations between engagement, attitude, and experience variables and involvement in bullying 8–14 (***n*** up to 420 for school data, 447 for family and friend data)

| Scale variable | No involvement | Single instance | Involved at least twice | ***p*-value** | $R^2$ (%) |
|---|---|---|---|---|---|
| Cognitive competency | 6.48 | 6.07 | 5.80 | 0.0002 | 4.4 |
| Student view of family life | | | | | |
| Family communicates well | 6.79 | 6.58 | 6.49 | 0.246 | 0.9 |
| **Family pressure** | **3.93** | **4.59** | **4.71** | **0.0002** | **4.3** |
| Family is inclusive | 8.09 | 7.75 | 7.71 | 0.080 | 1.5 |
| **Family is supportive** | **8.36** | **7.93** | **7.69** | **0.006** | **2.8** |
| Student views of friends and experiences | | | | | |
| **Adverse events** | **1.71** | **1.91** | **2.10** | **< 0.0001** | **5.1** |
| **Rejection** | **1.86** | **2.26** | **2.40** | **0.0006** | **3.9** |
| Praise and achievement | 5.92 | 5.66 | 5.90 | 0.370 | 0.7 |
| **Risky behaviour** | **3.15** | **3.69** | **3.84** | **0.0006** | **3.9** |
| **Friends with risky behaviour** | **3.74** | **4.12** | **4.46** | **0.012** | **2.4** |
| **Extending friendships** | **7.50** | **7.29** | **7.03** | **0.007** | **2.7** |
| **Solid friendships** | **8.81** | **8.23** | **8.24** | **0.0002** | **4.3** |
| Parent view of student | | | | | |
| Self-confidence | 7.12 | 7.04 | 6.98 | 0.587 | 0.4 |
| **Self-efficacy** | **7.47** | **7.09** | **6.96** | **0.002** | **3.5** |
| **Responsibility** | **7.58** | **7.32** | **7.15** | **0.008** | **2.7** |
| Teachers' view of student | | | | | |
| **Focused and responsible** | **7.31** | **6.57** | **6.74** | **0.0005** | **3.6** |
| **NCEA assessment** | **6.79** | **6.44** | **6.17** | **0.003** | **2.8** |
| **Overall ability** | **6.88** | **6.43** | **6.02** | **0.002** | **2.9** |
| **Social difficulties** | **4.38** | **4.72** | **5.19** | **0.008** | **2.3** |
| Social skills | 6.49 | 6.27 | 6.12 | 0.089 | 1.2 |
| **Thinking and learning** | **6.57** | **6.26** | **6.18** | **0.079** | **1.2** |
| Student views on school and classes | | | | | |
| Absorbed in learning | 5.90 | 5.79 | 6.03 | 0.194 | 0.8 |
| **Affirmed at school** | **5.39** | **5.14** | **4.98** | **< 0.0001** | **5.6** |
| Attitude to all work | 6.73 | 6.47 | 6.49 | 0.096 | 1.1 |
| Comparative learning environment | 3.64 | 3.96 | 3.80 | 0.257 | 0.7 |
| **Engaged in school** | **5.78** | **5.47** | **5.54** | **0.0003** | **3.6** |
| Internal markers of achievement | 7.90 | 7.45 | 7.53 | 0.023 | 1.8 |
| Disengaged in learning | 4.30 | 4.53 | 4.44 | 0.300 | 0.6 |
| Disrupted learning environment | 5.03 | 5.29 | 5.31 | 0.087 | 1.2 |
| Positive about class | 6.70 | 6.58 | 6.70 | 0.450 | 0.4 |
| Positive about teachers | 7.06 | 6.71 | 6.93 | 0.032 | 1.6 |
| Satisfied with subject mix | 7.67 | 7.69 | 7.63 | 0.935 | 0 |
| Relevant learning opportunities | 4.84 | 4.89 | 4.92 | 0.686 | 0.2 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Feelings about school 8–14

There were few strong associations between how the young people felt at school up to the age of 14 and their family, nonschool, and school lives at age 16. Those who had tended to be enthusiastic about school were more likely to report *extending friendships* and to be given higher ratings for *self-efficacy* and *responsibility* by their parents. There were no real associations with their levels of engagement, but they were more likely to report being *affirmed* at school.

Table 27: Associations between engagement, attitude, and experience variables and feelings about school 8–14 (***n*** up to 420 for school data, 447 for family and friend data)

| Scale variable | Enthusiastic | Fairly enthusiastic | Mixed | Unhappy once or more | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|---|
| Cognitive competency | 6.20 | 6.17 | 5.95 | 5.64 | 0.064 | 1.6 |
| Student view of family life | | | | | | |
| Family communicates well | 6.65 | 6.82 | 6.48 | 6.22 | 0.081 | 1.5 |
| Family pressure | 4.35 | 4.22 | 4.71 | 4.81 | 0.054 | 1.7 |
| Family is inclusive | 7.94 | 7.97 | 7.63 | 7.52 | 0.055 | 1.7 |
| Family is supportive | 8.07 | 8.19 | 7.70 | 7.56 | 0.030 | 2.0 |
| Student views of friends and experiences | | | | | | |
| Adverse events | 1.95 | 1.81 | 1.94 | 2.10 | 0.331 | 0.8 |
| Rejection | 2.16 | 2.06 | 2.36 | 2.34 | 0.190 | 1.1 |
| **Praise and achievement** | **5.99** | **5.48** | **5.96** | **5.69** | **0.019** | **2.2** |
| Risky behaviour | 3.61 | 6.42 | 6.68 | 3.80 | 0.399 | 0.7 |
| Friends with risky behaviour | 4.14 | 3.99 | 4.10 | 4.59 | 0.297 | 0.8 |
| **Extending friendships** | **7.34** | **7.35** | **7.26** | **6.62** | **0.001** | **3.6** |
| Solid friendships | 8.52 | 8.48 | 8.26 | 8.00 | 0.042 | 1.8 |
| Parent view of student | | | | | | |
| Self-confidence | 7.22 | 6.93 | 6.98 | 6.70 | 0.038 | 1.9 |
| **Self-efficacy** | **7.33** | **7.21** | **6.97** | **6.67** | **0.003** | **3.2** |
| **Responsibility** | **7.47** | **7.48** | **7.00** | **7.06** | **0.007** | **2.7** |
| Teachers' view of student | | | | | | |
| Focused and responsible | 6.89 | 7.03 | 6.61 | 6.64 | 0.241 | 1.0 |
| NCEA assessment | 6.49 | 6.60 | 6.26 | 6.21 | 0.278 | 0.9 |
| Overall ability | 6.63 | 6.45 | 6.21 | 5.85 | 0.100 | 1.5 |
| Social difficulties | 4.82 | 4.71 | 4.62 | 5.25 | 0.436 | 0.7 |
| Social skills | 6.49 | 6.20 | 6.10 | 6.06 | 0.078 | 1.6 |
| Thinking and learning | 6.50 | 6.29 | 6.13 | 6.06 | 0.155 | 1.3 |
| Student views on school and classes | | | | | | |
| Absorbed in learning | 5.90 | 6.02 | 5.92 | 5.66 | 0.366 | 0.8 |
| **Affirmed at school** | **5.33** | **5.19** | **5.04** | **4.67** | **0.0008** | **4.0** |
| Attitude to all work | 6.57 | 6.61 | 6.56 | 6.29 | 0.400 | 0.7 |
| Comparative learning environment | 3.69 | 3.87 | 3.71 | 4.33 | 0.104 | 1.5 |
| Engaged in school | 5.64 | 5.69 | 5.49 | 5.27 | 0.117 | 1.4 |
| Internal markers of achievement | 7.70 | 7.65 | 7.42 | 7.53 | 0.469 | 0.6 |
| Disengaged in learning | 4.35 | 4.27 | 4.69 | 4.59 | 0.065 | 1.7 |
| Disrupted learning environment | 5.15 | 5.21 | 5.24 | 5.50 | 0.318 | 0.8 |
| Positive about class | 6.65 | 6.78 | 6.61 | 6.46 | 0.239 | 1.0 |
| Positive about teachers | 6.97 | 6.97 | 6.77 | 6.64 | 0.188 | 1.1 |
| Satisfied with subject mix | 7.71 | 7.56 | 7.73 | 7.63 | 0.806 | 0.2 |
| Relevant learning opportunities | 4.83 | 4.92 | 4.99 | 4.89 | 0.676 | 0.4 |

**Bold face** indicates that the differences were significant at the 1 percent level.

## Parents and teachers working on issues 8–14

There were few strong associations between parents and teachers working on issues up to the age of 14 and their family, nonschool, and school lives at age 16. There were indications that those whose parents had often worked with their teachers were more likely to come from a home with pressure, and to show risky behaviour at 16. Their parents gave them slightly lower ratings on *self-efficacy* and *responsibility*, and their teachers gave them slightly lower ratings on the attitudinal competencies and rated them slightly more highly for *social difficulties*. They gave them lower ratings for their cognitive abilities, which agreed with the findings for our cognitive competency score. The young people themselves did not indicate that they had particularly much lower levels of engagement than their peers.

Table 28: Associations between engagement, attitude, and experience variables and parents and teachers working on issues 8–14 (***n*** up to 420 for school data, 447 for family and friend data)

| Scale variable | Never | Once | Twice | 3 or 4 times | Each time | ***p***-value | $R^2$ (%) |
|---|---|---|---|---|---|---|---|
| Cognitive competency | 6.35 | 6.33 | 6.16 | 5.89 | 5.72 | 0.032 | 2.4 |
| Student view of family life | | | | | | | |
| Family communicates well | 6.54 | 6.61 | 6.67 | 6.51 | 6.63 | 0.953 | 0.2 |
| Family pressure | 4.40 | 4.02 | 4.51 | 4.79 | 4.62 | 0.026 | 2.5 |
| Family is inclusive | 7.81 | 7.98 | 7.79 | 7.69 | 7.89 | 0.655 | 0.6 |
| Family is supportive | 7.94 | 8.09 | 7.96 | 7.76 | 8.05 | 0.743 | 0.4 |
| Student views of friends and experiences | | | | | | | |
| Adverse events | 1.62 | 1.89 | 1.92 | 2.00 | 2.16 | 0.064 | 2.0 |
| Rejection | 2.14 | 2.01 | 2.28 | 2.18 | 2.37 | 0.257 | 1.2 |
| Praise and achievement | 5.53 | 5.89 | 5.83 | 5.80 | 5.92 | 0.678 | 0.5 |
| Risky behaviour | 3.27 | 3.51 | 3.48 | 3.76 | 4.11 | 0.013 | 2.8 |
| Friends with risky behaviour | 3.99 | 4.11 | 4.00 | 4.36 | 4.39 | 0.489 | 0.8 |
| Extending friendships | 7.55 | 7.36 | 7.21 | 6.94 | 7.32 | 0.049 | 2.1 |
| Solid friendships | 8.48 | 8.61 | 8.40 | 8.11 | 8.30 | 0.116 | 1.7 |
| Parent view of student | | | | | | | |
| Self-confidence | 7.09 | 7.15 | 6.97 | 7.08 | 6.92 | 0.756 | 0.4 |
| **Self-efficacy** | **7.33** | **7.25** | **7.23** | **7.03** | **6.77** | **0.012** | **2.1** |
| **Responsibility** | **7.46** | **7.55** | **7.34** | **7.26** | **6.88** | **0.026** | **2.5** |
| Teachers' view of student | | | | | | | |
| **Focused and responsible** | **7.25** | **7.04** | **6.92** | **6.51** | **6.35** | **0.012** | **3.1** |
| **NCEA assessment** | **6.84** | **6.65** | **6.51** | **6.07** | **6.04** | **0.009** | **3.2** |
| **Overall ability** | **6.95** | **6.87** | **6.36** | **6.02** | **5.79** | **0.003** | **3.7** |
| **Social difficulties** | **4.76** | **4.30** | **4.70** | **5.24** | **5.39** | **0.013** | **3.1** |
| Social skills | 6.49 | 6.37 | 6.41 | 5.97 | 6.02 | 0.085 | 2.0 |
| **Thinking and learning** | **6.69** | **6.48** | **6.41** | **5.96** | **5.92** | **0.015** | **3.0** |
| Student views on school and classes | | | | | | | |
| Absorbed in learning | 5.95 | 5.74 | 6.03 | 5.92 | 5.84 | 0.419 | 0.9 |
| Affirmed at school | 5.34 | 5.29 | 5.17 | 4.94 | 5.00 | 0.103 | 1.9 |
| Attitude to all work | 6.75 | 6.60 | 6.53 | 6.47 | 6.44 | 0.633 | 0.6 |
| Comparative learning environment | 3.70 | 3.75 | 3.80 | 3.82 | 4.08 | 0.726 | 0.5 |
| Engaged in school | 5.51 | 5.59 | 5.72 | 5.41 | 5.49 | 0.346 | 1.1 |
| Internal markers of achievement | 7.76 | 7.54 | 7.69 | 7.61 | 7.37 | 0.582 | 0.7 |
| Disengaged in learning | 4.37 | 4.30 | 4.38 | 4.63 | 4.61 | 0.374 | 1.0 |
| Disrupted learning environment | 5.11 | 5.06 | 5.19 | 5.53 | 5.29 | 0.091 | 1.9 |
| Positive about class | 6.66 | 6.66 | 6.72 | 6.47 | 6.69 | 0.456 | 0.9 |
| Positive about teachers | 7.05 | 6.88 | 6.99 | 6.63 | 6.81 | 0.165 | 1.5 |
| Satisfied with subject mix | 7.49 | 7.66 | 7.77 | 7.76 | 7.38 | 0.392 | 1.0 |
| Relevant learning opportunities | 5.058 | 4.81 | 4.83 | 4.90 | 5.10 | 0.280 | 1.2 |

**Bold face** indicates that the differences were significant at the 1 percent level.

# 6. Family and friends

If we are aiming to explore the nature of engagement at school, where do we start? Or rather, if we are to start at the beginning, what is the beginning? Our young people at age 16 have been influenced, in approximately sequential order, by their family, ECE experiences, and school. However, along the way there has been a continuous feedback between what is happening at home, or at least not at school, and at school. When we look at how they feel at school as they near the end of their years of secondary education, these feelings will be based on their out-of-school life (family and friends), and at-school life (teachers and peers).

We have an abundance of measures of aspects of family life, from the student's point of view, as well as of the student's relationship with her friends. When we build models about engagement, only a few of these variables will be included in any one of the models, yet there is a mass of associations between the various family and friends variables. So before doing anything else, it is interesting to explore the relationship between the family and friends variables, and in particular at the relationship between the age-14 versions of these variables (as explanatory variables) and the age-16 versions (as outcome variables).

In this chapter I first list the variables used in the models, then outline the model-fitting process, and finally present the analysis for the family variables and then the friends and life variables.

## Age-16 family and friends variables used

The family variables we are exploring are:

- *inclusive family*
- *supportive family*
- *family communicates well*
- *family pressure.*

The friends variables, which include some life variables, and two of the attitudinal competencies are:

- *rejection*
- *praise and achievement*
- *adverse events*
- *friends with risky behaviour*
- *solid friendships*
- *risky behaviour*
- *extending friendships*
- *social skills*
- *social difficulties.*

# Model-fitting process

The models included three categories of explanatory variables: the age-14 family, friends, and life variables; demographic variables; and a mix of discrete age-14 and age-16 variables likely to be associated with some or all of the outcome variables.

## Explanatory variables used

### *Age-14 family, friends, and life variables*

These variables were included to see to what extent they were, or were not, important to the age-16 variables. It should be noted that while several of the variables were constructed from the same or similar items/questions at both ages 14 and 16, these are all "empirical" scales rather than "theoretical" scales, and the age-14 and age-16 variables of the same name should be seen as broadly similar rather than repetitions of the same measure (see *Scale variables, cluster variables, and history variables* for details). Our items/questions asked of the parents, teachers, and young people were based on our previous research and wider research literature. We developed scale variables from the patterns of responses found in the data, so these scales are indirectly related to the research literature which was used for item selection; we did not form any scales based directly on scales used in other research. However, there are parallels between what we found and what is reported in the literature.

At ages 14 and 16, most of the factor scale variables were left on a "natural" scale, so that if, for example, family pressure was a "bad thing", likely to be associated with low levels of achievement, then a high score on the scale was "bad" and a low score was "good", and family pressure had a negative correlation with the competencies:

- *rejection*
- *praise and achievement*
- *friends with risky behaviour*
- *solid friendships*
- *risky behaviour*
- *social skills with peers*[3]
- *social skills with peers and adults*
- *family communicates well*
- *family pressure*
- *inclusive family*
- *parent–child friction at 14*
- *close parent–child communication*
- *self-management* (attitudinal competency based on teacher report that: student checks work before handing it in, follows class routines without reminders, is on time, brings all the equipment necessary, takes responsibility for their actions and does not act without thinking of the consequences[4])
- *self-efficacy* (attitudinal competency based on teacher report that: student is optimistic, willing to learn from mistakes, will carry out leadership roles, sees the point of view of others[5])
- parent view of *self-confidence*
- parent view of *self-efficacy*

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3 Note that some of the same items were used at age 16 to form *social skills*, and others to form *social difficulties*.

4 At age 16, these items and others were used to form *focused and responsible*.

5 At age 16, some of these items and others were used to form *thinking and learning*.

- *supportive family*
- parent view of *responsibility*.

### *Demographic variables*

These are the "usual suspects" of gender, ethnicity, maternal qualifications, age-14 family income and financial situation, as well as school-level "demographics" of decile and gender mix.

### *Discrete variables*

These are a mix of one age-16 variable, and several age-14 variables that were created either as a result of a cluster analysis (e.g., motivation) or to capture a history of experiences (e.g., history of involvement in bullying, or enjoyment of reading). The age-14 variables are the same ones used in *Overview of the relationships between factor and cluster variables and school and social characteristics*.

*Attendance* is used in both its full form (with seven levels) and its dichotomised form, depending on which accounted for more of the variability in the model (see also the chapter *Scale variables, cluster variables and history variables*).

## Fitting the models

Correlations between explanatory variables, between outcome variables, and between outcome and explanatory variables are presented first. Then the final model for each outcome variable is presented.

The models were fitted in the stages:

- basic model of age-14 family, friends, and life variables: all age-14 variables with correlations greater than 0.2 in absolute value were put into the model, then all variables not statistically significant (at the 5 percent level) were dropped from the model; typically the model includes an age-14 equivalent to the age-16 outcome variable
- demographic variables were tested to see if any added significantly to the model
- discrete variables were tested to see if any added significantly to the model
- a check of all continuous variables was made to ensure that no other variables with correlations greater than 0.15 in absolute value contributed significantly to the model (including those previously dropped)
- examination of variance inflation factors (VIFs)[6], given that several of the explanatory variables are quite strongly correlated, and where necessary variable/s were dropped from the model
- examination of residual plots: several of our young people have atypical lifestyles or experiences, and in several of the models a residual plot showed that between one and five of the observations were exerting too much influence on the model[7], typically it was the same individuals across all models who were excluded from the model on this basis.

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[6] VIFs measure the extent to which the variance of a regression estimate is inflated by multicollinearity. The minimum value is 1 (indicating no inflation) and there is no upper limit. In this study, values over two or three appear to indicate possible problems.

[7] "Influence", measured by leverage, and in the sense that the inclusion of the outlier(s) changed the parameter estimates in the model substantially, or even changed which variables added significantly to the model.

# Family variables

The correlations between the age-16 family variables and the continuous explanatory variables are presented first, and then the results of the model-fitting process.

## Interrelationships between the variables

We have four outcome variables, 15 continuous explanatory variables, and a total of 16 possible discrete explanatory variables. Many of the explanatory variables show associations with each of the outcome variables, but typically only 4–8 explanatory variables are included in any one model.

We look first at the inter-correlations between all the continuous outcome and explanatory variables. This gives a broad picture of the "if a young person has/at age 14 had this attribute, then they are very/quite/unlikely to also have these other attributes" type. This is not an indication of causation, only of association. The explanatory variables included in the model presented are likely to be among those most strongly correlated with the outcome variable, but where there are several explanatory variables strongly correlated with each other ($r > 0.7$) as well as with the outcome variable, it is likely that only one will be included in the model (including more than one would result in a multicollinear model).

Some of the correlations are not due to true relationships, but are because of a mediating variable: A is correlated with B (but not C); B is correlated with C; so A appears to be correlated with C. If A and B were included in a model to predict C, it is likely that B would be significant, but A would not.

Another situation in which a subset of the explanatory variables explains the variation in the outcome variable almost as well as the full set does is when there are several variables all moderately correlated with the outcome variable and with each other. If the correlation with each other is not strong enough to cause multicollinearity, it can still be true that a subset of the explanatory variables explains almost as much of the total variability in the outcome variable as the whole set does. In this case, several competing models, each including a different subset of the explanatory variables, can explain almost equal amounts of the variability in the outcome variable, and which subset is presented will depend at least in part on chance, or perhaps on the order in which the variables were selected.

The correlation coefficients between all the explanatory variables are presented in 0. To save space, family pressure and praise and achievement are omitted from the table, as neither have correlations of over 0.4 (or less than -0.4) with any other variable in the table. Correlations of at least 0.4 in absolute value are shown in **bold face**.

Table 29: Correlation between the age-14 family and life variables

| | Social skills with peers and adults | Family communicates well | Inclusive family | Parent–child friction | Close parent–child communication | Self-management | Self-efficacy | Child self-confident | Child's self-efficacy | Risky behaviour | Rejection | Supportive family |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Family communicates well | 0.18 | | | | | | | | | | | |
| Inclusive family | 0.26 | **0.57** | | | | | | | | | | |
| Parent–child friction | -0.33 | -0.14 | -0.24 | | | | | | | | | |
| Close parent–child communication | 0.19 | 0.32 | 0.24 | -0.31 | | | | | | | | |
| Self-management | **0.80** | 0.12 | 0.20 | -0.33 | 0.14 | | | | | | | |
| Self-efficacy | **0.85** | 0.22 | 0.27 | -0.33 | 0.19 | **0.75** | | | | | | |
| Child self-confident | 0.17 | 0.18 | 0.14 | -0.23 | **0.48** | – | 0.21 | | | | | |
| Child's self-efficacy | **0.41** | 0.16 | 0.18 | **-0.51** | **0.45** | 0.33 | 0.39 | **0.53** | | | | |
| Risky behaviour | -0.34 | -0.21 | -0.32 | 0.28 | -0.12 | **-0.45** | -0.33 | – | -0.19 | | | |
| Rejection | – | -0.23 | **-0.40** | 0.24 | – | – | – | – | -0.10 | **0.45** | | |
| Supportive family | 0.26 | **0.64** | **0.68** | -0.26 | 0.30 | 0.20 | 0.29 | 0.14 | 0.24 | -0.28 | -0.35 | |
| Child responsible | **0.41** | 0.14 | 0.18 | -0.37 | 0.34 | **0.40** | **0.40** | **0.52** | **0.69** | -0.17 | – | 0.19 |

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

The strongest associations are between the three attitudinal competencies of *self-management*, *self-efficacy*, and *social skills with peers and adults* ($r > 0.75$). The next strongest are between the family variables of *supportive*, *inclusive*, and *communicates well* ($0.57 < r < 0.68$), then between the parent perceptions of the child's *self-efficacy*, *self-confidence*, and *responsibility,* and between these and the attitudinal competencies ($0.5 < r < 0.69$). *Rejection* correlates moderately with *risky behaviour*, and *inclusive family* (a negative correlation, as the more inclusive the family is, the less likely rejection is) and *self-management* (also negative).

The correlations between the outcome variables and with the explanatory variables are given in 0. The strongest correlations ($r > 0.4$) are shown in **bold face**. Where there is a strong correlation between an outcome and explanatory variable, it is likely that the explanatory variable will be in the model. The actual variables included in the models are indicated by an asterisk. Because of the strong correlations between the age-14 versions of

*family communicates well*, *inclusive family*, and *supportive family* (all over 0.57), most often only one of these variables is included in each of the four models, in spite of all three being almost equally strongly correlated with the outcome variable.

Table 30: Correlation between the age-16 family variables and with the age-14 family and life variables

| | Family communicates well 16 | Inclusive family 16 | Supportive family 16 | Family pressure 16 |
|---|---|---|---|---|
| Inclusive family 16 | 0.69 | | | |
| Supportive family 16 | 0.70 | 0.73 | | |
| Family pressure 16 | -0.40 | -0.58 | -0.47 | |
| Social skills, peer and adult 14 | 0.17 | 0.11 | – | 0.19 |
| Family communicates well 14 | **0.51*** | 0.39* | **0.40** | 0.15 |
| Family pressure 14 | -0.24* | -0.29* | -0.22 | **0.45*** |
| Inclusive family 14 | **0.40** | **0.49*** | 0.39 | -0.32* |
| Parent–child friction 14 | -0.20 | -0.25* | -0.22 | 0.29* |
| Praise and achievement 14 | 0.21* | 0.19* | 0.21 | – |
| Close parent–child communication 14 | 0.26 | 0.19 | 0.24* | -0.14 |
| Self-management 14 | 0.11 | – | – | -0.16 |
| Self-efficacy 14 | 0.20 | 0.16 | 0.11 | -0.17 |
| Child self-confident 14 | 0.22 | 0.14 | 0.16 | -0.13 |
| Child's self-efficacy 14 | 0.24 | 0.20 | 0.19 | -0.21 |
| Risky behaviour 14 | -0.18 | -0.16 | -0.14 | 0.19 |
| Rejection 14 | -0.19 | -0.23 | -0.20 | 0.24 |
| Supportive family 14 | **0.43** | **0.43** | **0.52*** | -0.23 |
| Child responsible 14 | 0.21* | 0.18 | 0.11 | -0.16 |

* Variable is included in relevant model.

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

## Models fitted

The models are presented in the same order in which they are listed in Table 30, for ease of cross-referencing.

### *Family communicates well at 16*

From the correlations, we can identify that a family that communicates well at age 16 was likely to have also done so at 14, as well as having the attributes of being inclusive and supportive. A child from a close and supportive family was slightly more likely to achieve things, be more confident, have good self-efficacy, be responsible, and was slightly less likely to come from a family with friction, or to be involved in risky behaviour or feel rejected.

The model presented in Table 31 accounted for 32 percent of the variability in family communicates well at 16. Most of the variability was accounted for by family communicates well at 14 (about 20 percent). The model suggests that while family relationships do change over time, it is not by that much.

Table 31: Model to estimate family communicates well at 16 from age-14 variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 3.52 | 0.50 | < 0.0001 | | |
| Family communicates well 14 | 0.37 | 0.04 | < 0.0001 | 20.2 | 0.45 |
| Family pressure 14 | -0.13 | 0.04 | 0.0003 | 2.9 | -0.17 |
| Praise and achievement 14 | 0.10 | 0.04 | 0.016 | 1.3 | 0.11 |
| Child responsible 14 | 0.10 | 0.05 | 0.032 | 1.0 | 0.10 |
| Financial situation at 14–comfortable | 0 | | 0.026 | 1.7 | |
| –moderate | -0.17 | 0.14 | 0.201 | | |
| –difficult | -0.43 | 0.16 | 0.008 | | |
| Reading pattern 8–14–enjoy reading | 0 | | 0.042 | 1.9 | |
| –mainly enjoy reading | 0.06 | 0.15 | 0.705 | | |
| –mixed responses | 0.22 | 0.15 | 0.153 | | |
| –repeated lack of enjoyment | -0.48 | 0.25 | 0.057 | | |

All the partial correlations are less strong than the corresponding simple correlations, implying that there is some overlap in the information provided in the model (the explanatory variables are, as shown above, correlated).

The only discrete variables to have an indicative association were the financial situation at age 14: families in a comfortable situation were more likely to communicate well than those in a difficult situation, possibly a result of having more time and energy and less of a daily struggle to make ends meet; and reading pattern where there were indications that there was an association between a lack of enjoyment of reading and a lack of good communication in the home. The most marked difference was between those who did not enjoy reading and those who gave mixed responses—perhaps as they enjoyed communicating more than reading!

### *Inclusive family at 16*

The correlations show the strongest association between the inclusiveness of the family at 16 and the same variable at age 14 and the family having been supportive.

The model presented in Table 32 accounted for 30 percent of the variability in inclusive family at 16. The variable accounting for the most of this variability was inclusive family at 14 (14 percent).

Table 32: Model to estimate inclusive family at 16 from age-14 variables

| | Parameter estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 4.84 | 0.43 | < 0.0001 | | |
| Inclusive family 14 | 0.29 | 0.05 | < 0.0001 | 13.6 (9, 18) | 0.27 |
| Family communicates well 14 | 0.12 | 0.04 | 0.001 | 7.4 (4, 11) | 0.15 |
| Family pressure 14 | -0.10 | 0.04 | 0.010 | 4.0 (2, 6) | -0.12 |
| Parent–child friction 14 | -0.11 | 0.04 | 0.016 | 2.8 (1, 5) | -0.11 |
| Praise and achievement 14 | 0.08 | 0.04 | 0.028 | 1.9 (1, 4) | 0.10 |

An inclusive family is likely to stay one, and to be inclusive, communicate well, and have less friction and pressure rather than more. There is an association between students coming from inclusive families and getting recognition for achievements.

### *Supportive family at 16*

From the correlations, we can identify that a supportive family at age 16 was likely to have also been so at 14, as well as having the attributes of being inclusive and communicating well.

The model presented in Table 33 accounted for 29 percent of the variability in *supportive family at 16*. Most of the variability was accounted for by *supportive family at 14* (about 28 percent).

Table 33: Model to estimate supportive family at 16 from age-14 variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 3.41 | 0.46 | < 0.0001 | | |
| Supportive family 14 | 0.45 | 0.04 | < 0.0001 | 21.7 | 0.47 |
| Close parent–child communication 14 | 0.11 | 0.05 | 0.031 | 1.1 | 0.10 |
| Financial situation at 14–comfortable | 0 | | 0.006 | 2.3 | |
| –moderate | -0.20 | 0.15 | 0.184 | | |
| –difficult | -0.57 | 0.18 | 0.002 | | |

Mutually supportive families tend to remain so across time, and this characteristic of a family is more difficult for those in difficult financial circumstances.

### *Family pressure at 16*

From the correlations, we can identify that a family with *family pressure at age 16* was likely to have a similar profile at 14, but none of the other variables were as strongly correlated.

The model presented in Table 34 accounted for 27 percent of the variability in *family pressure at 16*. Three of the young people were excluded from this analysis as they appeared as outliers in the analysis of residuals.

Table 34: Model to estimate family pressure at 16 from age-14 variables

| | Parameter estimate | Standard error | ***p*-value** | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 4.13 | 0.54 | < 0.0001 | | |
| Family pressure 14 | 0.38 | 0.05 | < 0.0001 | 12.7 | 0.36 |
| Inclusive family 14 | -0.16 | 0.05 | 0.002 | 2.2 | -0.15 |
| Parent–child friction 14 | 0.16 | 0.06 | 0.006 | 1.7 | 0.13 |
| Reading pattern 8–14–enjoy reading | 0 | | 0.009 | 2.6 | |
| –mainly enjoy reading | 0.09 | 0.17 | 0.548 | | |
| –mixed responses | -0.39 | 0.17 | 0.025 | | |
| –repeated lack of enjoyment | 0.44 | 0.29 | 0.121 | | |

Family pressure was associated with *family pressure* being felt at age 14, as well as a certain amount of friction (*family pressure* at 16 was more likely where there was friction at 14).

Those who had mixed pattern of enjoyment of reading tended to come from families with less pressure than those who always enjoyed reading and those who never enjoyed reading. This may be because the types of pressure differed for those who did and did not enjoy reading.

## Variables about friends

In this section we explore the associations between the way the family members relate to each other (typically, at age 16), the way the young person related to their friends at age 14, and how the young person related to friends at age 16.

### Interrelationships between the variables

We have nine outcome variables, 17 continuous explanatory variables (the 15 used for the family variables above, plus age-14 measures of *solid friendships* and *risky behaviour*; the four age-16 family variables modelled above were used to describe current family relations, rather than at age 14), and a total of 16 possible discrete explanatory variables.

The correlations between the age-16 family variables, and age-14 friends and life variables are presented in two tables, as there are too many variables to fit into a single table. The variables fell naturally into two groups, with the age-14 attitudinal competencies being common to both groups. The first group consists of the age-14 attitudinal competencies plus the age-16 family variables and the age-14 friendship variables (Table 35), and the second consists of the age-14 attitudinal competencies plus the age-14 parent views of the young person's efficacy, responsibility, self-confidence, parent–child friction, and close parent–child communication (Table 36). Correlations within the two groups of variables are mainly moderate to strong, but those between the groups are all weak (under 0.4).

Table 35: Correlation between the age-16 family and age-14 attitudinal competencies and friendship variables

| | Social skills with peers and adults 14 | Self-management 14 | Self-efficacy 14 | Family communicates well 16 | Inclusive family 16 | Supportive family 16 | Family pressure 16 | Risky behaviour 14 | Rejection 14 | Friends with risky behaviour 14 | Solid friendships 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Self-management 14 | **0.80** | | | | | | | | | | |
| Self-efficacy 14 | **0.85** | **0.75** | | | | | | | | | |
| Family communicates well 16 | 0.17 | 0.11 | 0.20 | | | | | | | | |
| Inclusive family 16 | 0.11 | – | 0.16 | **0.69** | | | | | | | |
| Supportive family 16 | – | – | 0.11 | **0.70** | **0.73** | | | | | | |
| Family pressure 16 | -0.19 | -0.16 | -0.17 | **-0.40** | **-0.58** | **-0.47** | | | | | |
| Risky behaviour 14 | -0.34 | **-0.45** | -0.33 | -0.18 | -0.16 | -0.14 | 0.19 | | | | |
| Rejection 14 | – | – | – | -0.19 | -0.23 | -0.20 | 0.24 | **0.45** | | | |
| Friends with risky behaviour 14 | -0.31 | **-0.40** | -0.26 | -0.16 | – | -0.13 | – | **0.62** | 0.32 | | |
| Solid friendships 14 | 0.19 | 0.14 | 0.17 | 0.20 | 0.19 | 0.17 | -0.11 | -0.19 | -0.26 | -0.34 | |
| Praise and achievement 14 | – | – | – | 0.21 | 0.19 | 0.21 | – | 0.28 | 0.17 | – | 0.22 |

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

There are very strong associations between the three attitudinal composite variables, and strong associations between the three "positive" family variables. There is also a cluster of moderate associations between the "risk" variables: *risky behaviour*, *friends with such behaviour*, *rejection*, and poor *self-management*.

There are at best weak associations between the attitudinal competencies (how the teacher perceives the student) and the family characteristics, or between earning praise and recognition of an achievement and the other variables. The only variable with which *rejection* was moderately associated was *risky behaviour*.

Table 36: Correlation between the age-14 attitudinal competencies and parent perception of the young person variables

| | Social skills with peers and adults 14 | Self-management 14 | Self-efficacy 14 | Parent–child friction 14 | Close parent–child communication 14 | Child self-confident 14 | Child's self-efficacy 14 |
|---|---|---|---|---|---|---|---|
| Self-management 14 | **0.80** | | | | | | |
| Self-efficacy 14 | **0.85** | **0.75** | | | | | |
| Parent–child friction 14 | -0.33 | -0.33 | -0.33 | | | | |
| Close parent–child communication 14 | 0.19 | 0.14 | 0.19 | -0.31 | | | |
| Child self-confident 14 | 0.17 | – | 0.21 | -0.23 | **0.48** | | |
| Child's self-efficacy 14 | **0.41** | 0.33 | 0.39 | -0.51 | **0.45** | **0.53** | |
| Child responsible 14 | **0.41** | **0.40** | **0.40** | -0.37 | 0.34 | **0.52** | **0.69** |

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

There are moderate associations between close parent–child communication and the parent perceptions of the young person variables and between the parent perception variables. There are weaker associations between the teacher (attitudinal competencies) and parent perceptions of the young person.

The correlations between the outcome variables about friends and with the explanatory variables are given in Table 37. The strongest correlations ($r > 0.4$) are shown in **bold face**. Where there is a strong correlation between an outcome and explanatory variable, it is likely that the explanatory variable will be in the model. The actual variables included in the models are indicated by an asterisk.

Table 37: Correlation between the age-16 friend variables and with the age-14 friend, family, and life variables

| | Solid friendships 16 | Friends with risky behaviour 16 | Risky behaviour 16 | Extending friendships 16 |
|---|---|---|---|---|
| Friends with risky behaviour 16 | -0.14 | | | |
| Risky behaviour 16 | – | 0.67 | | |
| Extending friendships 16 | 0.48 | -0.18 | – | |
| Self-management 14 | – | -0.41* | -0.45* | 0.10 |
| Self-efficacy 14 | 0.13 | -0.26 | -0.34 | 0.21 |
| Family communicates well 16 | 0.18 | -0.23 | -0.18 | 0.38* |
| Inclusive family 16 | 0.31* | -0.21 | -0.17 | 0.30 |
| Supportive family 16 | 0.28 | -0.19* | -0.16 | 0.29 |
| Family pressure 16 | -0.22 | 0.23* | 0.30* | -0.17 |
| Risky behaviour 14 | -0.11 | 0.50 | 0.58* | – |
| Rejection 14 | -0.14 | 0.18 | 0.22 | – |
| Friends with risky behaviour 14 | -0.12 | 0.52* | 0.46 | – |
| Solid friendships 14 | 0.33* | -0.11 | – | 0.23* |
| Praise and achievement 14 | 0.16 | 0.12 | 0.13 | 0.27* |
| Parent–child friction 14 | -0.10 | 0.21 | 0.21 | -0.14 |
| Close parent–child communication 14 | – | -0.14 | – | 0.13 |
| Child self-confident 14 | 0.10 | – | – | 0.16 |
| Child's self-efficacy 14 | 0.15 | -0.23 | -0.23 | 0.15 |
| Child responsible 14 | 0.13 | -0.19 | -0.21 | 0.11 |

* Variable is included in relevant model.

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

The correlations between the outcome variables about life experiences and with the friendship explanatory variables are given in Table 38. *Rejection* at age 16 showed moderate association with *adverse events*. Age-16 *social skills*, and *social difficulties* (both based on teacher perceptions) were moderately strongly and negatively associated. There was no association between doing something praiseworthy and *social difficulties*, nor between *social skills* and *adverse events*, nor between the young person's indication of *rejection* and the teachers' perceptions of their *social skills* or *difficulties.*

Table 38: Correlation between the age-16 life experiences variables and with the age-14 friend, family, and life variables

| | Rejection 16 | Praise and achieve-ment 16 | Adverse events 16 | Social skills 16 | Social difficulties 16 |
|---|---|---|---|---|---|
| Praise and achievement 16 | -0.14 | | | | |
| Adverse events 16 | 0.38* | -0.19* | | | |
| Social skills 16 | – | 0.15 | – | | |
| Social difficulties 16 | – | – | 0.16 | **-0.53** | |
| Self-management 14 | – | – | -0.23 | **0.47** | **-0.48** |
| Self-efficacy 14 | -0.10 | – | -0.19 | **0.50** | -0.38 |
| Social skills peers and adults 14 | -0.11 | – | -0.14 | **0.50*** | **-0.47** |
| Social skills peers 14 | -0.13 | – | -0.15 | **0.47** | **-0.50*** |
| Family communicates well 16 | – | 0.24* | – | 0.21 | -0.13 |
| Inclusive family 16 | -0.12 | 0.19 | -0.15 | 0.12 | – |
| Supportive family 16 | – | 0.18 | -0.14 | – | – |
| Family pressure 16 | 0.31* | – | 0.18* | -0.17 | 0.17 |
| Solid friendships 16 | -0.31* | 0.24* | – | – | – |
| Risky behaviour 14 | 0.18 | 0.18 | 0.25* | -0.19 | 0.24 |
| Rejection 14 | 0.31* | 0.16* | 0.17 | – | – |
| Friends with risky behaviour 14 | 0.12 | 0.10 | 0.17 | -0.15 | 0.19 |
| Praise and achievement 14 | – | **0.44*** | 0.14* | 0.10 | – |
| Parent–child friction 14 | 0.12 | – | 0.18 | -0.16 | 0.16 |
| Close parent–child communication 14 | – | – | – | – | – |
| Child self-confident 14 | – | 0.13 | – | – | – |
| Child's self-efficacy 14 | – | – | -0.16 | 0.26 | -0.27 |
| Child responsible 14 | – | – | -0.13 | 0.28 | -0.22 |

* Variable is included in relevant model.

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

## Models fitted

The models are presented in the order as listed in the tables above for ease of reference.

### *Solid friendships 16*

From the correlations above we can see that solid friendships are most strongly associated with lack of friends with risky behaviour and having extending friendships.

The model presented in Table 39 accounted for 18 percent of the variability in solid friendships.

Table 39: Model to estimate solid friendships at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | ***p*-value** | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 4.02 | 0.48 | < 0.0001 | | |
| Solid friendships 14 | 0.30 | 0.05 | < 0.0001 | 7.2 | 0.27 |
| Inclusive family 16 | 0.23 | 0.04 | < 0.0001 | 6.6 | 0.26 |
| History of involvement in bullying 8–14 | | | 0.006 | 2.3 | |
| –been involved once | 0 | | | | |
| –involved at least twice | 0.03 | 0.13 | 0.835 | | |
| –no involvement | 0.40 | 0.14 | 0.003 | | |

There was an association with having had solid friendships at age 14, coming from an inclusive family, and having had no involvement in bullying, either as bully or victim (although the association may be that having solid friendships is protective against involvement in bullying).

### *Friends with risky behaviour 16*

From the correlations above we can see that having *friends with risky behaviour* is associated with the young person themselves having risky behaviour (both of these both at age 14 and 16), and relatively poor self-management skills at age 14.

The model presented in Table 40 accounted for 37 percent of the variability in *friends with risky behaviour*. Three of the young people were excluded from the model as their data exerted excessive leverage.

Table 40: Model to estimate friends with risky behaviour at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 3.02 | 0.56 | < 0.0001 | | |
| Friends with risky behaviour 14 | 0.40 | 0.04 | < 0.0001 | 18.5 | 0.43 |
| Family pressure 16 | 0.16 | 0.04 | 0.0004 | 3.3 | 0.18 |
| Self-management 14 | -0.18 | 0.05 | 0.008 | 2.9 | -0.17 |
| Attendance–acceptable | 0 | | 0.011 | 1.7 | 0.13 |
| –poor | 0.60 | 0.24 | 0.011 | | |
| Values 14–anchored/achieving | 0 | | 0.007 | 2.5 | |
| –anchored | 0.05 | 0.19 | 0.810 | | |
| –standing out | 0.49 | 0.17 | 0.004 | | |

Young people with *friends with risky behaviour* at age 14 were largely exhibiting similar behaviour at age 16, although some had changed their friends, or the friends had changed their behaviour.

Not having a family that puts pressure on the young person (or gives the young person something against which to rebel) and developing good self-management skills go some of the way to mitigate the chances of a young person making such choices about who they have as friends as can pose risks to their wellbeing.

### *Risky behaviour 16*

Having *friends with risky behaviour* and taking risks yourself are strongly associated. Other associations with *risky behaviour* are *self-management* (or lack of it) and *family pressure*.

The model presented in Table 41 accounted for 43 percent of the variability in *risky behaviour*.

Table 41: Model to estimate risky behaviour at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.48 | 0.43 | < 0.0001 | | |
| Risky behaviour 14 | 0.50 | 0.05 | < 0.0001 | 20.0 | 0.45 |
| Family pressure 16 | 0.19 | 0.03 | < 0.0001 | 7.6 | 0.28 |
| Self-management 14 | -0.16 | 0.04 | 0.0002 | 3.7 | -0.19 |
| Gender –male | 0 | | 0.009 | 1.8 | 0.13 |
| –female | 0.30 | 0.11 | 0.009 | | |
| Attendance– acceptable | 0 | | 0.002 | 2.6 | 0.16 |
| –poor | 0.57 | 0.18 | 0.002 | | |
| Student interests 14–sports player | 0 | | 0.041 | 2.2 | |
| –computer games/nothing much | -0.17 | 0.15 | 0.259 | | |
| –reading, arts, sport | -0.11 | 0.14 | 0.443 | | |
| –creative interests | -0.49 | 0.17 | 0.005 | | |

Not all students reporting *risky behaviour* at age 14 (or lack of it) gave similar reports at 16, but many who did report *risky behaviour* at 14 were still showing such behaviour two years later.

Young women were more likely to report *risky behaviour* than young men, as were those whose school attendance was categorised as poor by the school they attended (there was no statistically significant gender–attendance interaction). The students who reported having creative interests at age 14 were less likely to show *risky behaviour* at age 16 than sports players ($p$ = 0.005), or those who like reading, arts, and sports ($p$ = 0.021).

### *Extending friendships 16*

Having extending friendships at age 16 is most strongly associated with having a family that communicates well, and the other family variables, and is weakly associated with having solid friendships and praise and achievement at age 14.

The model presented in Table 42 accounted for 25 percent of the variability in *extending friendships*. Three young people were excluded from the analysis as their data exerted excessive leverage.

Table 42: Model to estimate extending friendships at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 3.75 | 0.45 | < 0.0001 | | |
| Family communicates well 16 | 0.22 | 0.04 | < 0.0001 | 9.0 | 0.30 |
| Praise and achievement 14 | 0.15 | 0.04 | < 0.0001 | 4.7 | 0.22 |
| Solid friendships 14 | 0.15 | 0.05 | 0.004 | 2.2 | 0.15 |
| Gender –male | 0 | | 0.0002 | 3.8 | 0.19 |
| –female | 0.39 | 0.10 | 0.0002 | | |
| Attendance– excellent | 0 | | 0.011 | 4.3 | |
| –very good | -0.13 | 0.14 | 0.369 | | |
| –good | -0.30 | 0.14 | 0.038 | | |
| –fair | -0.54 | 0.16 | 0.0009 | | |
| –poor | 0.05 | 0.18 | 0.782 | | |
| –absences for health reasons | -0.50 | 0.31 | 0.112 | | |
| –absences for other reasons | 0.22 | 0.50 | 0.658 | | |

Having *extending friendships* is associated with a family that communicates well, and with gaining recognition for achievements. It is more common in females, and there are indications that some of the young people who have only fair attendance may not have good friends at school. This is confirmed by responses to the item "School is a place where I have good friends": 70 percent of those whose attendance was fair responded always/almost always, compared with 76 and 77 percent of those whose attendance was better or worse (for any reason), respectively (these differences alone are not statistically significant, but are consistent with the pattern in the model).

### *Rejection 16*

*Rejection* is moderately associated with experiencing adverse events at age 16, feeling *family pressure*, not having *solid friendships*, and experiencing *rejection* at age 14.

The model presented in Table 43 accounted for 31 percent of the variability in *rejection* at age 16. Two young people were excluded from the analysis as their data exerted excessive leverage.

Table 43: Model to estimate rejection at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | ***p*-value** | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.26 | 0.36 | < 0.0001 | | |
| Adverse events 16 | 0.30 | 0.05 | < 0.0001 | 8.8 | 0.30 |
| Solid friendships 16 | -0.21 | 0.03 | < 0.0001 | 8.4 | -0.29 |
| Rejection 14 | 0.17 | 0.04 | < 0.0001 | 5.3 | 0.23 |
| Family pressure 16 | 0.11 | 0.03 | < 0.0001 | 3.9 | 0.20 |
| Values 16–satisfying life | 0 | | 0.006 | 2.3 | |
| –aspirational | 0.24 | 0.11 | 0.028 | | |
| –standing out | -0.11 | 0.09 | 0.229 | | |

Students who at age 16 valued a satisfying life or "standing out" had lower *rejection* scores than those with aspirational values. This may be because the aspirations were to things the young people and their families did not currently have, or their peers did not have, leading to rejection of some of these values by their peers.

### *Praise and achievement 16*

Praise and achievement at 16 was most strongly associated with similar success at age 14.

The model presented in Table 44 accounted for 32 percent of the variability in praise and achievement at age 16. One young person was excluded from the analysis as their data exerted excessive leverage.

Table 44: Model to estimate praise and achievement at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 0.13 | 0.56 | 0.82 | | |
| Praise and achievement 14 | 0.34 | 0.04 | < 0.0001 | 13.4 | 0.37 |
| Solid friendships 16 | 0.22 | 0.05 | < 0.0001 | 4.5 | 0.21 |
| Adverse events 16 | -0.27 | 0.06 | < 0.0001 | 4.0 | -0.20 |
| Family communicates well 16 | 0.18 | 0.04 | < 0.0001 | 3.9 | 0.20 |
| Rejection 14 | 0.14 | 0.05 | 0.005 | 1.9 | 0.14 |
| History of enjoyment of school 8–14 | | | 0.003 | 3.2 | |
| –enthusiastic | 0 | | | | |
| –fairly enthusiastic | -0.38 | 0.15 | 0.009 | | |
| –mixed | 0.23 | 0.15 | 0.141 | | |
| –unhappy at least once | 0.06 | 0.21 | 0.754 | | |
| Reading pattern 8–14–enjoy reading | 0 | | 0.026 | 2.1 | |
| –mainly enjoy reading | -0.35 | 0.14 | 0.017 | | |
| –mixed responses | -0.40 | 0.15 | 0.007 | | |
| –repeated lack of enjoyment | -0.30 | 0.25 | 0.228 | | |

Students who at age 16 received praise and achieved things were likely to have had similar success at age 14. They were likely to have *solid friendships* and a *family that communicates well*, and not to have experienced *adverse events* and *rejection*. Between the ages of 8 and 14 they were likely to have enjoyed reading, and to have been enthusiastic about school.

### *Adverse events 16*

Experiencing *adverse events* at 16 was not strongly associated with other variables, probably because most of these events are not predictable (death of a friend, an accident or injury, moving, family break-up).

The model presented in Table 45 accounted for 16 percent of the variability in adverse events at age 16. Four young people were excluded from the analysis as their data exerted excessive leverage.

Table 45: Model to estimate adverse events at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 0.52 | 0.20 | 0.008 | | |
| Praise and achievement 14 | -0.09 | 0.03 | 0.002 | 2.6 | -0.16 |
| Family pressure 16 | 0.08 | 0.02 | 0.001 | 2.7 | 0.16 |
| Risky behaviour 14 | 0.09 | 0.04 | 0.015 | 1.6 | 0.12 |
| Attendance 16–excellent | 0 | | < 0.0001 | 8.3 | |
| –very good | 0.15 | 0.11 | 0.186 | | |
| –good | 0.20 | 0.11 | 0.079 | | |
| –fair | 0.27 | 0.13 | 0.033 | | |
| –poor | 0.71 | 0.14 | < 0.0001 | | |
| –absence due to illness | 0.77 | 0.25 | 0.002 | | |
| –absence for other reasons | -0.51 | 0.45 | 0.260 | | |

Those who experienced *adverse events* were less likely to also have done something resulting in *praise and achievement* at age 14, but were more likely to have *family pressure*, or have shown *risky behaviour* at age 14. There is a strong association between *adverse events* and *school attendance*, with those who had a fair or poor attendance record, particularly if the absences were related to illness, being more likely to have experienced adverse events. In the case of ill-health, this is not surprising, as poor health counted as one of the possible contributors to the adverse events score.

### *Social skills 16*

*Social skills* is one of the attitudinal competencies, and it is most strongly associated with the age-14 attitudinal competencies. The perceptions of the teachers across the two years between rounds of data collection are more strongly associated than the perceptions of the young people or parents. Or possibly, the young people the teachers were judging appeared to be different from the young people's perceptions of themselves, or how they behaved at home. Another possibility is that the frames of reference of the teachers and family members were very different.

The model presented in Table 46 accounted for 32 percent of the variability in social skills at age 16.

Table 46: Model to estimate social skills at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.88 | 0.51 | < 0.0001 | | |
| Social skills with peers and adults 14 | 0.50 | 0.06 | < 0.0001 | 15.3 | 0.39 |
| Attendance 16–excellent | 0 | | 0.005 | 4.8 | |
| –very good | 0.05 | 0.17 | 0.756 | | |
| –good | 0.00 | 0.17 | 0.994 | | |
| –fair | -0.44 | 0.19 | 0.021 | | |
| –poor | -0.56 | 0.21 | 0.009 | | |
| –absence due to illness | 0.58 | 0.38 | 0.129 | | |
| –absence for other reasons | 0.39 | 0.58 | 0.501 | | |
| Reading pattern 8–14–enjoy reading | 0 | | 0.0009 | 4.3 | |
| –mainly enjoy reading | -0.24 | 0.14 | 0.092 | | |
| –mixed responses | -0.62 | 0.15 | < 0.0001 | | |
| –repeated lack of enjoyment | -0.56 | 0.27 | 0.042 | | |
| Values 16–satisfying life | 0 | | 0.001 | 3.4 | |
| –aspirational | 0.30 | 0.15 | 0.044 | | |
| –standing out | -0.28 | 0.14 | 0.046 | | |

Young people who were perceived to have good social skills by their teachers at age 14 were also likely to be similarly perceived at age 16. Teachers tended to perceive those whose attendance was fair or poor as having lesser *social skills* (but not if the absences were due to illness or other reasons). Young people who did not really enjoy reading between the ages of 8 and 14 were likely to have lower scores for *social skills*, as were those whose values were "standing out". Those with aspirational values were likely to have higher scores for *social skills*.

### *Social difficulties 16*

*Social difficulties* is another of the attitudinal competencies, and is most strongly associated with the age-14 attitudinal competencies.

The model presented in Table 47 accounted for 30 percent of the variability in social difficulties at age 16.

Table 47: Model to estimate social difficulties at 16 from age-14 variables and age-16 family variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 11.02 | 0.76 | 0.166 | | |
| Social skills with peers 14 | -0.75 | 0.09 | < 0.0001 | 15.5 | -0.39 |
| Attendance 16–excellent | 0 | | 0.004 | 5.0 | |
| –very good | -0.02 | 0.26 | 0.933 | | |
| –good | -0.30 | 0.27 | 0.263 | | |
| –fair | 0.96 | 0.30 | 0.001 | | |
| –poor | 0.46 | 0.34 | 0.177 | | |
| –absence due to illness | -0.18 | 0.60 | 0.758 | | |
| –absence for other reasons | 0.72 | 0.92 | 0.432 | | |
| School decile pattern 8–14–mainly 1–2 | 0 | | 0.005 | 3.9 | |
| –unknown | -1.07 | 0.50 | 0.031 | | |
| –mainly 3–8 | -0.81 | 0.40 | 0.043 | | |
| –mainly 9–10/private | -1.30 | 0.40 | 0.001 | | |
| –mixed | -0.59 | 0.44 | 0.177 | | |
| Values 16–satisfying life | 0 | | 0.013 | 2.3 | |
| –aspirational | 0.21 | 0.24 | 0.374 | | |
| –standing out | 0.64 | 0.22 | 0.003 | | |
| Gender–male | 0 | | 0.041 | 1.1 | -0.11 |
| –female | -0.39 | 0.19 | 0.041 | | |

Young people who were perceived to have poorer *social skills* by their teachers at age 14 were likely to be perceived as having *social difficulties* at age 16. Teachers tended to perceive those whose attendance was fair or poor as having more *social difficulties* (but not if the absences were due to illness or other reasons). Young people whose values were "standing out" were more likely to be perceived as having *social difficulties* than those who wanted a satisfying life. Young females were less likely to have *social difficulties* than young males. Young people who had mainly attended schools that were decile 3 or higher were less likely to be judged to have *social difficulties*.

The results for *solid friendships*, *social skills*, and *social difficulties* all suggest that some of those with fair attendance may not attend school for reasons of alienation or isolation—at least because of a lack of good friends.

# 7. Relationship between class, friends, and home

We now link what was happening at home, with their friends, and in their life in general with what happened in class according to the young people and their teachers. In this chapter we link the family, friends, and life variables described in the previous chapter with the descriptions given by the student of the class and their behaviour in it and the descriptions of the student given by the teacher (attitudinal competencies). In the next chapter, we look more specifically at engagement, as it appears to relate to what happens in class.

## Age-16 variables derived from the classroom environment

These variables are derived by aggregating the responses of three teachers (of English, and most and least enjoyed subject) when describing the student, or the responses of the student when describing the three classes. How the responses compare across the three subjects/teachers is discussed in more detail in the next chapter.

*Social skills* and *social difficulties* were modelled in *Family and friends*, as they are essentially social competencies. They are modelled again here, using a slightly different set of explanatory variables, as they are also reflections of how the young people are perceived by the teacher in the class environment.

### Outcome variables used

#### *Teacher descriptions of student*

A set of the teacher ratings of the students has been used to form the attitudinal competencies (see Hodgen, 2006):

- *thinking and learning*
- *focused and responsible*
- *social skills*
- *social difficulties.*

The three teachers were asked to rate the student's *overall ability* in relation to others of the same year level. The teachers were asked also their views on the student in relation to *NCEA assessment* (the quality and quantity of effort they put in, their level of organisation, time management, how they cope with pressure, and how they reach decisions about NCEA).

We have values of these variables for 414 of the young people.

#### *Student measures of success and attitudes to work*

Students were asked how they knew when they were doing well. Their responses can be grouped into *internal markers of achievement* and *external markers of achievement*.

The two measures that indicate something about the students' attitude to work are *absorbed in learning,* which is about taking responsibility for learning, and quality of work produced and *attitude to work,* which is about being confident in achievement, and having success in assessment.

We have values of these variables for 420 of the young people.

### *Student perceptions of class*

The students were asked about English, their most enjoyed, and least enjoyed class. The scales were created averaging the responses across the three classes for three reasons: it is easier to have a single scale than to have three separate scales; the combined scales perform at least as well as the separate scales, and often better; and there are fewer missing scale values (students who may have left out some items for one of the teachers/classes are likely to have answered the matching items for at least one of the other teachers/classes). These variables are about how the young people feel about and behave in their classes.

The *positive about teacher* and *class* scales ($r$ = 0.84) are about the student feeling good about the class and teacher, that the learning environment is a safe and stimulating one, and one where it is safe to explore new ideas and developing abilities; *disengaged in learning* is about behaving responsibly and co-operatively; *disrupted learning environment* is about not having an effective teacher, or a learning-friendly school environment.

We have values for these variables for 420 of the young people.

## Explanatory variables used

### *Continuous variables*

The age-16 family variables are:

- *inclusive family*
- *supportive family*
- *family communicates well*
- *family pressure*
- parent perception of young person's *self-confidence*
- parent perception of young person's *self-efficacy*
- parent perception of young person's *responsibility*.

The age-16 friends variables, which include some life variables, are:

- *rejection*
- *praise and achievement*
- *adverse events*
- *friends with risky behaviour*
- *solid friendships*
- *risky behaviour*
- *extending friendships.*

The class environment variables is:

- *relevant learning opportunities.*

In addition, where they are available, the corresponding age-14 class and teacher variables were used:

- *attitudinal composite*
- *cognitive composite*
- *comparative learning environment*
- *engaged at school*
- *disengaged in learning*

- *confident at school*
- *absorbed in learning*
- *internal markers of progress*
- *external markers of progress*
- *overall achievement*
- *positive about class*
- *positive about teachers.*

### *Demographic variables*

These are the "usual suspects" of gender, ethnicity, maternal qualifications, age-14 family income and financial situation, as well as school-level "demographics" of decile and gender mix.

### *Discrete variables*

These are a mix of one age-16 variable, and several age-14 variables that were created either as a result of a cluster analysis (e.g., motivation) or to capture a history of experiences (e.g., history of involvement in bullying, or enjoyment of reading). The age-14 variables are the same ones used in *Overview of the relationships between factor and cluster variables and school and social characteristics*.

For these models, two versions of *attendance* at age 16 were used: the full version, with seven possible levels, and one dichotomised into acceptable and poor, where acceptable includes all students other than those whose attendance was rated poor. For some outcome variables, there is a graduation of response (see, for example, *thinking and learning*), in which case the 7-point scale was used; for others, the only real contrast was between those with poor attendance and the rest, in which case the dichotomised scale was used.

## Model-fitting process

The models included four categories of variables: the age-16 family, friends, and life variables; demographic variables; a mix of discrete age-14 and age-16 variables likely to be associated with some of all of the outcome variables; and the age-14 composite cognitive and attitudinal competency measures and class and school engagement variables.

## Fitting the models

The models were fitted in the stages:

- basic model of age-16 family, friends, and life variables that had a correlation with the dependent variable of at least 0.2 in absolute value. All variables not statistically significant (at the 5 percent level) were dropped from the model
- demographic variables were tested to see if any added significantly to the model
- discrete variables were tested to see if any added significantly to the model (both the dichotomous and 7-level versions of attendance were tested; if both were significant, the one that accounted for more variability was included in the model)
- the age-14 class variables and age-16 family, friends, and life variables not in the model were tested to see if any added significantly to the model
- examination of variance inflation factors, given that several of the explanatory variables are quite strongly correlated, and where necessary variable/s were dropped from the model

- examination of residual plots: several of our young people have atypical lifestyles or experiences, and in several of the models a residual plot showed that between one and five of the observations were exerting too much influence on the model[8], and typically it was the same individuals with high leverage across all models.

## Attitudinal competencies and other teacher perceptions

Following the same pattern as the previous chapters, we first look at all correlations, then at the models fitted.

### Interrelationships between the variables

The correlations between the explanatory variables have been described in *Family and friends*.

The correlations between the four attitudinal competencies and two teacher perceptions variables with the possible explanatory variables are given in Table 48.

[8] "Influence", measured by leverage, and in the sense that the inclusion of the outlier(s) changed the parameter estimates in the model substantially, or even changed which variables added significantly to the model.

Table 48: Correlations between the teacher description of student variables and explanatory variables

| | Thinking and learning | Focused and responsible | Social skills | Social difficulties | Ability to cope with NCEA | Overall ability |
|---|---|---|---|---|---|---|
| Focused and responsible | 0.85 | | | | | |
| Social skills | 0.80 | 0.73 | | | | |
| Social difficulties | -0.48 | -0.65 | -0.52 | | | |
| Ability to cope with NCEA | 0.82 | 0.91 | 0.65 | -0.58 | | |
| Overall ability | 0.79 | 0.79 | 0.59 | -0.45 | 0.79 | |
| Cognitive composite 14 | 0.54* | 0.53* | 0.41* | -0.44* | 0.50* | 0.34* |
| Attitudinal composite 14 | 0.62* | 0.65* | 0.54* | -0.45* | 0.62* | 0.63* |
| Relevant learning opportunities 16 | – | – | – | – | – | – |
| Comparative learning environment 16 | -0.19 | -0.20 | -0.23 | 0.20 | -0.18 | -0.13 |
| Friends with risky behaviour 16 | -0.31 | -0.45 | -0.23 | 0.29 | -0.44 | -0.32 |
| Solid friendships 16 | – | – | – | – | – | – |
| Extending friendships 16 | 0.16 | 0.10 | 0.18 | -0.13 | – | 0.11 |
| Inclusive family 16 | 0.16 | 0.16 | 0.12 | – | 0.12 | 0.14 |
| Supportive family 16 | – | 0.10 | – | – | 0.10 | 0.11 |
| Family communicates well 16 | 0.24 | 0.23* | 0.21 | -0.13 | 0.21* | 0.18 |
| Family pressure 16 | -0.21 | -0.25 | -0.17 | 0.17 | -0.22 | -0.19 |
| Rejection 16 | – | – | – | – | – | – |
| Praise and achievement 16 | 0.14 | – | 0.15* | – | – | – |
| Risky behaviour 16 | -0.35* | -0.51* | -0.30* | 0.34* | -0.49* | -0.37* |
| Adverse events 16 | -0.12 | -0.27 | – | 0.16 | -0.21 | -0.15 |
| Parent view of self-confidence 16 | 0.27* | 0.13 | 0.22 | – | 0.16 | 0.22* |
| Parent view of self-efficacy 16 | 0.29 | 0.22 | 0.29* | -0.23 | 0.23 | 0.24 |
| Parent view of responsibility 16 | 0.34 | 0.34 | 0.28 | -0.24 | 0.33 | 0.35 |
| Internal markers 16 | 0.37 | 0.33 | 0.32 | -0.20 | 0.33 | 0.33 |
| External markers16 | 0.23 | 0.19 | 0.15 | -0.11 | 0.19 | 0.23 |
| Positive learning environment 16 | 0.34 | 0.36 | 0.30 | -0.20 | 0.33 | 0.27 |
| Positive about class 16 | 0.31 | 0.32 | 0.28 | -0.18 | 0.30 | 0.24 |
| Positive about teachers 16 | 0.38 | 0.40 | 0.36 | -0.21 | 0.35 | 0.31 |
| Absorbed in learning 16 | 0.29 | 0.33 | 0.26 | -0.14 | 0.32 | 0.24 |
| Disengaged in learning 16 | -0.30 | -0.44 | -0.33 | 0.32 | -0.41 | -0.27 |
| Disrupted learning environment 16 | -0.14 | -0.17 | -0.18 | 0.20 | -0.13 | -0.14 |
| Attitude to all work 16 | 0.39 | 0.35 | 0.29 | -0.22 | 0.39 | 0.48 |
| Internal markers 14 | 0.36 | 0.33 | 0.35* | -0.17 | 0.34 | 0.31 |
| Overall ability 14 | 0.61 | 0.63 | 0.48 | -0.46 | 0.60 | 0.73 |

* Variable is included in relevant model.

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in bold face.

We have two measures of cognitive ability: the cognitive competency (based on a series of tests) and overall ability (based on the perceptions of up to three teachers). These two measures are strongly correlated ($r$ = 0.76 and 0.64 at ages 14 and 16, respectively), and usually it was the cognitive competency that added more to the model than overall ability.

## Models fitted

The models are presented in the same order in which they are listed in Table 48, for ease of cross-referencing.

### *Thinking and learning at 16*

*Thinking and learning* is one of the attitudinal competencies, and correlates most strongly with the age-14 *cognitive* and *attitudinal competencies* and measure of *overall ability*.

The model presented in Table 49 accounted for 50 percent of the variability in *thinking and learning* at 16. The data for four of the young people were excluded from the model as those observations exerted excessive leverage. Most of the variability was accounted for by the *attitudinal composite* at 14 (about 13 percent).

Table 49: Model to estimate thinking and learning at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 0.81 | 0.50 | 0.104 | | |
| Attitudinal composite 14 | 0.41 | 0.06 | < 0.0001 | 12.6 | 0.36 |
| Cognitive composite 14 | 0.26 | 0.05 | < 0.0001 | 8.3 | 0.29 |
| Parent perception of self-confidence 16 | 0.18 | 0.04 | < 0.0001 | 4.2 | 0.21 |
| Risky behaviour 16 | -0.19 | 0.05 | < 0.0001 | 4.3 | -0.21 |
| Praise and achievement 16 | 0.09 | 0.04 | 0.034 | 1.2 | 0.11 |
| Attendance 16–excellent | 0 | | 0.026 | 3.5 | |
| –very good | -0.08 | 0.15 | 0.615 | | |
| –good | -0.10 | 0.15 | 0.531 | | |
| –fair | -0.37 | 0.17 | 0.034 | | |
| –poor | -0.64 | 0.20 | 0.002 | | |
| –absences for health reasons | -0.31 | 0.39 | 0.427 | | |

The students whose attendance was rated fair, poor, or who had chronic ill-health were rated lower than those whose attendance was rated excellent or who had frequent absences for other reasons (such as sport).

### *Focused and responsible at 16*

*Focused and responsible* is another of the attitudinal competencies, and correlates most strongly with the age-14 *cognitive* and *attitudinal competencies* and measure of *overall ability*, and moderately strongly with *risky behaviour* on the part of the responding student and their friends.

The model presented in Table 50 accounted for 58 percent of the variability in *focused and responsible* at 16. Most of the variability was accounted for by the *attitudinal composite* at 14 (about 18 percent).

Table 50: Model to estimate focused and responsible at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.48 | 0.47 | < 0.0001 | | |
| Attitudinal composite 14 | 0.47 | 0.05 | < 0.0001 | 17.9 | 0.42 |
| Risky behaviour 16 | -0.32 | 0.04 | < 0.0001 | 13.6 | -0.37 |
| Cognitive composite 14 | 0.24 | 0.04 | < 0.0001 | 7.8 | 0.28 |
| Family communicates well 16 | 0.10 | 0.04 | 0.009 | 1.8 | 0.13 |
| Attendance 16–acceptable | 0 | | < 0.0001 | 6.0 | -0.24 |
| –poor | -0.86 | 0.18 | < 0.0001 | | |

The teachers' perceptions on the items used to construct this scale were strongly associated with by the students' behaviour (*risky behaviour*) and unexplained absences than they were on the items used to construct *thinking and learning*.

### *Social skills at 16*

*Social skills* is another of the attitudinal competencies, and correlates most strongly with the age-14 *cognitive* and *attitudinal competencies* and measure of *overall ability*.

The model presented in Table 51 accounted for 36 percent of the variability in *social skills* at 16, slightly more than was accounted for by the model using family and friends variables only, in the previous chapter (32 percent). The data for two of the young people were excluded as those observations exerted excessive leverage. Most of the variability was accounted for by the *attitudinal composite at 14* (almost 10 percent).

Table 51: Model to estimate social skills at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 0.85 | 0.59 | 0.148 | | |
| Attitudinal composite 14 | 0.34 | 0.05 | < 0.0001 | 9.4 | 0.31 |
| Parent perception of self-efficacy 16 | 0.14 | 0.05 | 0.004 | 2.1 | 0.14 |
| Cognitive composite 14 | 0.13 | 0.05 | 0.006 | 2.0 | 0.14 |
| Praise and achievement 16 | 0.12 | 0.04 | 0.002 | 2.4 | 0.16 |
| Risky behaviour 16 | -0.12 | 0.05 | 0.008 | 1.8 | -0.14 |
| Internal markers of progress 14 | 0.11 | 0.05 | 0.017 | 1.5 | 0.12 |
| Student values 16–satisfying life | 0 | | 0.008 | 2.5 | |
| –aspirational | 0.29 | 0.14 | 0.036 | | |
| –standing out | -0.15 | 0.13 | 0.242 | | |

The young people judged by their teachers to have better *social skills* tended to also be those judged by their parents to have better *self-efficacy*. There was a measure of association between *cognitive achievement*, getting

*praise and achieving* things, and *social skills*. Those with aspirational values had *social skills* scores that on average were 0.45 (equivalent to 4.5 on a percentage scale, $p = 0.002$) higher than those with standing out values, taking all the other variables into account. The variables used in the model presented in Table 51 are different from those in the model presented in Table 46, although the total amounts of variability accounted for are similar.

### *Social difficulties at 16*

*Social difficulties* is the last of the attitudinal competencies, and correlates most strongly with the age-14 *cognitive* and *attitudinal competencies* and measure of *overall ability*.

The model presented in Table 52 accounted for 29 percent of the variability in *social difficulties* at 16, about the same amount as was accounted for by the model using family and friends variables only, in the previous chapter. Data for one of the young people were excluded from the model because of concerns about leverage. Most of the variability was accounted for by the *cognitive* and *attitudinal composites at 14* (about 11 percent each).

Table 52: Model to estimate social difficulties at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | ***p*-value** | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 9.22 | 0.69 | < 0.0001 | | |
| Attitudinal composite 14 | -0.42 | 0.09 | < 0.0001 | 11.9 (8.4, 16.2) | -0.23 |
| Cognitive composite 14 | -0.38 | 0.07 | < 0.0001 | 11.2 (7.5, 15.2) | -0.25 |
| Risky behaviour 16 | 0.30 | 0.07 | < 0.0001 | 6.8 (3.8, 10.7) | 0.21 |

It is not surprising that *risky behaviour* is associated with *social difficulties*, as similar behaviours are used in both measures (one reported by the student, one by the teacher).

### *Ability to cope with NCEA at 16*

*Ability to cope with NCEA* correlates most strongly with the age-14 *cognitive* and *attitudinal competencies* and measure of *overall ability*.

The model presented in Table 53, accounted for 59 percent of the variability in *ability to cope with NCEA* at 16. Most of the variability was accounted for by the *attitudinal composite at 14* (about 18 percent). Data for five young people were excluded as the observations exerted excessive leverage.

Table 53: Model to estimate ability to cope with NCEA at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.73 | 0.49 | < 0.0001 | | |
| Attitudinal composite 14 | 0.40 | 0.05 | < 0.0001 | 15.1 | 0.39 |
| Risky behaviour 16 | -0.28 | 0.04 | < 0.0001 | 12.7 | -0.36 |
| Cognitive composite 14 | 0.17 | 0.04 | < 0.0001 | 4.2 | 0.20 |
| Family communicates well 16 | 0.08 | 0.03 | 0.019 | 1.5 | 0.12 |
| Attendance 16–excellent | 0 | | < 0.0001 | 10.3 | |
| –very good | -0.01 | 0.14 | 0.935 | | |
| –good | -0.11 | 0.14 | 0.438 | | |
| –fair | -0.45 | 0.16 | 0.005 | | |
| –poor | -0.95 | 0.18 | < 0.0001 | | |
| –absences for health reasons | -1.01 | 0.32 | 0.001 | | |
| History of school decile–mainly 1–2 | 0 | | 0.006 | 4.0 | |
| –mainly 3–8 | 0.36 | 0.22 | 0.106 | | |
| –mainly 9–10/private | 0.68 | 0.22 | 0.002 | | |
| –mixed | 0.36 | 0.24 | 0.129 | | |
| Student values–satisfying life | 0 | | 0.049 | 1.7 | |
| –aspirational | 0.15 | 0.13 | 0.232 | | |
| –standing out | -0.18 | 0.12 | 0.147 | | |

Young people who did not or were not able to attend school regularly were on average judged to be markedly less likely to cope with and succeed in NCEA. Those with aspirational values were perceived to be more likely to be successful than those whose values were "standing out" ($p = 0.015$).

### *Overall ability at 16*

*Overall ability* correlates most strongly with the age-14 *cognitive competency* and measure of *overall ability*.

The model presented in Table 54 accounted for 59 percent of the variability in *overall ability* at 16. Data for five of the young people were excluded as those observations exerted excessive leverage. Most of the variability was accounted for by *cognitive competency* at 14 (about 34 percent).

Table 54: Model to estimate overall ability at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -1.25 | 0.61 | 0.042 | | |
| Cognitive composite 14 | 0.56 | 0.06 | < 0.0001 | 21.8 | 0.47 |
| Attitudinal composite 14 | 0.48 | 0.07 | < 0.0001 | 11.5 | 0.34 |
| Parent perception of self-confidence 14 | 0.20 | 0.05 | 0.0002 | 3.8 | 0.19 |
| Risky behaviour 16 | -0.20 | 0.05 | 0.002 | 3.8 | -0.20 |
| Attendance–excellent | 0 | | 0.003 | 6.3 | |
| –very good | 0.19 | 0.19 | 0.316 | | |
| –good | -0.09 | 0.19 | 0.630 | | |
| –fair | -0.44 | 0.22 | 0.046 | | |
| –poor | -0.96 | 0.25 | 0.0002 | | |
| –absences for health reasons | -0.70 | 0.44 | 0.111 | | |

Young people who did not attend school regularly were on average judged to have a lower ability level. Those who showed good *cognitive* and *attitudinal competency at age 14* were likely to be judged to have high levels of ability at age 16.

## Student perceptions of the class: attitudes to work

The correlations between the four variables that capture the student's attitude to work, and with the possible explanatory variables are given in Table 55.

Table 55: Correlations between the student description of their attitude variables and explanatory variables

| | Internal markers of success 16 | External markers of success 16 | Absorbed in learning 16 | Attitude to all work 16 |
|---|---|---|---|---|
| External markers of success 16 | **0.52** | | | |
| Absorbed in learning 16 | **0.51** | 0.18 | | |
| Attitude to all work 16 | 0.39 | 0.21 | **0.45** | |
| Cognitive composite 14 | 0.33* | 0.28* | – | 0.34 |
| Attitudinal composite 14 | 0.28 | 0.16 | 0.15 | 0.29 |
| Relevant learning opportunities 16 | 0.10 | – | 0.35* | 0.11 |
| Comparative learning environment 14 | – | – | – | – |
| Friends with risky behaviour 16 | -0.14 | – | -0.21* | -0.15 |
| Solid friendships 16 | 0.12 | -0.10 | – | – |
| Extending friendships 16 | 0.29 | – | 0.27 | 0.17 |
| Inclusive family 16 | 0.28 | – | 0.20 | 0.18 |
| Supportive family 16 | 0.24 | – | 0.23 | 0.23* |
| Family communicates well 16 | 0.32* | 0.11 | 0.39* | 0.21 |
| Family pressure 16 | -0.14 | – | – | -0.14 |
| Rejection 16 | – | – | – | – |
| Praise and achievement 16 | 0.26* | – | 0.22* | 0.19* |
| Risky behaviour 16 | -0.13 | – | -0.19 | -0.15 |
| Adverse events 16 | – | – | – | – |
| Parent view of self-confidence 16 | 0.20 | – | 0.14 | 0.21 |
| Parent view of self-efficacy 16 | 0.15 | – | – | 0.13 |
| Parent view of responsibility 16 | 0.26* | 0.15 | 0.12 | 0.19 |
| Internal markers 14 | **0.41*** | 0.20 | 0.27 | 0.25 |
| External markers 14 | 0.23 | 0.39* | – | 0.13 |
| Engaged 14 | 0.24 | – | 0.20 | 0.24 |
| Confident at school 14 | 0.27 | 0.18 | 0.18 | 0.25 |
| Positive about class 14 | 0.20 | – | 0.24 | 0.14 |
| Positive about teachers 14 | 0.21 | – | 0.23 | 0.16 |
| Absorbed in learning 14 | 0.31 | 0.11 | 0.38* | 0.25* |
| Disengaged in learning 14 | -0.14 | – | 0.14 | 0.20 |
| Overall achievement 14 | 0.35 | 0.28 | 0.16 | 0.37* |

* Variable is included in relevant model.

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

## Models fitted

### *Internal markers of progress at 16*

*Internal markers* correlates most strongly with the age-14 *cognitive competency* and measure of *internal markers of progress*.

The model presented in Table 56 accounted for 27 percent of the variability in *internal markers* at 16. Most of the variability was accounted for by *internal markers of progress at 14* (about 10 percent).

Table 56: Model to estimate internal markers of progress at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 1.47 | 0.51 | 0.004 | | |
| Internal markers 14 | 0.26 | 0.05 | < 0.0001 | 9.1 (4.6, 14.4) | 0.27 |
| Cognitive composite 14 | 0.18 | 0.04 | < 0.0001 | 6.4 (3.5, 10.3) | 0.20 |
| Family communicates well 16 | 0.19 | 0.04 | < 0.0001 | 5.8 (2.7, 10.0) | 0.21 |
| Praise and achievement 16 | 0.14 | 0.04 | 0.0008 | 3.6 (1.3, 6.7) | 0.17 |
| Parent view of responsibility 16 | 0.12 | 0.05 | 0.018 | 3.1 (1.2, 6.1) | 0.12 |

How the young people judged their progress had not changed markedly between age 14 and age 16, and using *internal markers of progress* was associated with, among other things, *cognitive* achievement, and success at something or recognition in some area (*praise and achievement*).

### *External markers of progress at 16*

*External markers* correlates with little else. The strongest association is with the age-14 measure of using external markers.

The model presented in Table 57 accounted for 20 percent of the variability in *external markers* at 16.

Table 57: Model to estimate external markers of progress at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.68 | 0.42 | < 0.0001 | | |
| External markers 14 | 0.34 | 0.04 | < 0.0001 | 13.2 | 0.36 |
| Cognitive composite 14 | 0.20 | 0.06 | 0.002 | 2.3 | 0.15 |
| Maternal qualifications–none | 0 | | 0.048 | 2.3 | |
| –mid-secondary school/trade | 0.29 | 0.26 | 0.262 | | |
| –senior secondary school/tertiary | -0.31 | 0.31 | 0.305 | | |
| –university | 0.16 | 0.31 | 0.619 | | |
| –difference between mid-secondary/trade and senior secondary/tertiary | -0.61 | 0.21 | 0.005 | | |

There are indications of some possible differences with respect to use of external markers of progress between those with mothers with mid-secondary or trade qualifications (more likely to use external markers) and those with mothers with senior secondary or tertiary qualifications (less likely to use them).

### *Absorbed in learning at 16*

*Absorbed in learning* correlates moderately with few of the age-14 variables. The strongest associations are with *relevant learning opportunities*, *family communicates well*, and *absorbed in learning 14*.

The model presented in Table 58 accounted for 40 percent of the variability in *absorbed in learning* at 16.

Table 58: Model to estimate absorbed in learning at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 0.92 | 0.42 | 0.029 | | |
| Relevant learning opportunities 16 | 0.34 | 0.04 | < 0.0001 | 13.8 | 0.37 |
| Absorbed in learning 14 | 0.29 | 0.04 | < 0.0001 | 10.5 | 0.32 |
| Family communicates well 16 | 0.15 | 0.03 | < 0.0001 | 4.7 | 0.22 |
| Praise and achievement 16 | 0.09 | 0.03 | 0.007 | 1.8 | 0.14 |
| Friends with risky behaviour 16 | -0.07 | 0.03 | 0.010 | 1.7 | -0.13 |
| Student values 16–satisfying life | 0 | | 0.0006 | 3.7 | |
| –aspirational | 0.17 | 0.11 | 0.130 | | |
| –standing out | -0.27 | 0.10 | 0.010 | | |
| Pattern of TV watching–mainly low | 0 | | 0.009 | 2.3 | |
| –mixed | -0.22 | 0.11 | 0.042 | | |
| –mainly high | -0.33 | 0.12 | 0.005 | | |
| History of involvement in bullying 8–14 | | | 0.001 | 3.3 | |
| –been involved once | 0 | | | | |
| –involved at least twice | 0.32 | 0.10 | 0.002 | | |
| –no involvement | -0.04 | 0.11 | 0.686 | | |
| Student interests 14–sports | 0 | | 0.027 | 2.3 | |
| –computer games/none | 0.20 | 0.12 | 0.113 | | |
| –reading, arts, sports | 0.18 | 0.11 | 0.108 | | |
| –creative interests | 0.41 | 0.14 | 0.003 | | |

Young people who were *absorbed in learning* at 16 were likely to have shown similar tendencies at age 14, to see the connection between what they learn at school and the real world, to have aspirational values or to value a satisfying life (rather than valuing standing out), to have mainly watched less TV than others between the ages of 8 and 14, to have been involved occasionally in bullying (possibly as the victim, because of their interests), and to have creative interests.

### *Attitude to all work at 16*

Attitude to all work correlates moderately with age-14 cognitive competency and overall ability.

The model presented in Table 59 accounted for 21 percent of the variability in *attitude to all work* at 16.

Table 59: Model to estimate attitude to all work at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.3 | 0.37 | < 0.0001 | | |
| Overall achievement 14 | 0.16 | 0.02 | < 0.0001 | 12.0 (7.9, 16.6) | 0.34 |
| Absorbed in learning 14 | 0.14 | 0.04 | 0.001 | 4.6 (2.1, 8.6) | 0.16 |
| Supportive family 16 | 0.09 | 0.03 | 0.004 | 2.9 (1.0, 6.2) | 0.14 |
| Praise and achievement 16 | 0.08 | 0.03 | 0.013 | 2.1 (0.5, 5.0) | 0.12 |

## Student perceptions of the class

There are some moderate correlations amongst the attitude to work and perceptions of class variables (Table 60). The strongest correlation is between *positive about class* and *teacher* and *absorbed in learning*. Students who are working in a safe, stimulating environment where they can explore new ideas and their developing abilities tend to take responsibility for their work, and for ensuring that it is high quality. There are slightly weaker correlations between *positive about class* and *teacher*, *disengaged in learning*, and *attitude to all work*. Students in a safe, stimulating environment are less likely to divert time and energy (or to feel the need to) behaving irresponsibly and unco-operatively, and are more likely to be confident in their achievement. *Disrupted learning environment* is moderately correlated with *disengaged in learning*, but shows no association with using *internal markers* of success, or with being *absorbed in learning*, or to the student's *attitude to work*. It seems that a student may behave badly where that is acceptable (or is happening anyway), but this does not necessarily mean that the student will have a bad attitude to work. Effective teachers working in a learning-friendly school environment are more likely to have classes in which students who behave responsibly and co-operatively are the norm.

Table 60: Correlations among the student description of class and attitude to work variables

| | Positive about class | Positive about teachers | Disengaged in learning | Disrupted learning environment | Internal markers | External markers | Absorbed in learning |
|---|---|---|---|---|---|---|---|
| Positive about teachers | 0.84 | | | | | | |
| Disengaged in learning | -0.39 | -0.43 | | | | | |
| Disrupted learning environment | -0.17 | -0.23 | 0.46 | | | | |
| Internal markers | 0.48 | 0.44 | -0.28 | – | | | |
| External markers | 0.16 | 0.17 | – | – | 0.52 | | |
| Absorbed in learning | 0.63 | 0.49 | -0.38 | – | 0.51 | 0.18 | |
| Attitude to all work | 0.41 | 0.40 | -0.23 | – | 0.39 | 0.21 | 0.45 |

– indicates -0.1 < *r* < 0.1; all correlations over 0.4 in absolute value are in bold face.

The correlations between the four variables that capture the student's attitude to class and how they themselves behave, and with the possible explanatory variables are given in Table 61.

Table 61: Correlations between the student description of their class and behaviour in it and explanatory variables

| | Positive about class 16 | Positive about teacher 16 | Disengaged in learning 16 | Disrupted learning environment 16 |
|---|---|---|---|---|
| Positive about teacher 16 | **0.84** | | | |
| Disengaged in learning 16 | **-0.39** | **-0.43** | | |
| Disrupted learning environment 16 | -0.17 | -0.23 | **0.46** | |
| Cognitive composite 14 | 0.14 | 0.20* | -0.17 | 0.17 |
| Attitudinal composite 14 | 0.18 | 0.22 | -0.24 | – |
| Relevant learning opportunities 16 | **0.41*** | 0.29* | – | – |
| Comparative learning environment 14 | – | – | 0.12 | 0.15 |
| Friends with risky behaviour 16 | 0.19 | 0.20 | -0.37* | – |
| Solid friendships 16 | 0.13 | 0.13 | – | -0.15 |
| Extending friendships 16 | 0.34* | 0.25 | -0.13 | – |
| Inclusive family 16 | 0.31* | 0.35* | -0.31* | -0.18* |
| Supportive family 16 | 0.28 | 0.32 | -0.26 | -0.14 |
| Family communicates well 16 | 0.32 | 0.32 | -0.30 | – |
| Family pressure 16 | 0.13 | 0.17 | 0.29 | 0.20 |
| Rejection 16 | – | 0.11 | 0.12 | 0.18* |
| Praise and achievement 16 | 0.16 | 0.13 | – | – |
| Risky behaviour 16 | 0.17 | 0.25* | 0.35 | 0.16 |
| Adverse events 16 | 0.14* | 0.16 | 0.17 | 0.12 |
| Parent view of self-confidence 16 | – | – | – | – |
| Parent view of self-efficacy 16 | – | – | – | – |
| Parent view of responsibility 16 | – | 0.13 | -0.17 | – |
| Internal markers 14 | 0.21 | 0.21 | -0.17 | – |
| External markers14 | – | – | – | – |
| Engaged 14 | 0.23 | 0.30 | -0.33 | -0.14 |
| Confident at school 14 | 0.18 | 0.20 | -0.18 | – |
| Positive about class 14 | 0.31* | 0.30 | -0.16 | – |
| Positive about teachers 14 | 0.30 | 0.35* | -0.20 | – |
| Absorbed in learning 14 | 0.30 | 0.27 | -0.23 | – |
| Disengaged in learning 14 | -0.13 | -0.20 | **0.46*** | 0.26* |
| Overall achievement 14 | 0.20* | 0.23 | -0.18 | -0.11 |

* Variable is included in relevant model.

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

## Models fitted

### *Positive about class at 16*

Positive about class correlates moderately with relevant learning opportunities at 16.

The model presented in Table 62 accounted for 38 percent of the variability in *positive about class* at 16. Data for three students were excluded from the model as they exerted excessive leverage.

Table 62: Model to estimate positive about class at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | ***p*-value** | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 1.73 | 0.36 | < 0.0001 | | |
| Relevant learning opportunities 16 | 0.33 | 0.04 | < 0.0001 | 14.9 (10.3, 19.9) | 0.43 |
| Positive about class 14 | 0.16 | 0.03 | < 0.0001 | 7.8 (4.8, 11.8) | 0.25 |
| Extending friendships 16 | 0.13 | 0.03 | < 0.0001 | 6.2 (3.2, 10.0) | 0.20 |
| Inclusive family 16 | 0.12 | 0.03 | < 0.0001 | 5.0 (2.4, 8.5) | 0.20 |
| Overall achievement 14 | 0.07 | 0.02 | 0.0001 | 3.3 (1.3, 5.8) | 0.19 |
| Adverse events 16 | -0.10 | 0.04 | 0.019 | 1.5 (0.3, 3.5) | -0.12 |

The largest single contribution to the model was made by *relevant learning opportunities*. How the young people felt age 14 showed far less of an association.

### *Positive about teacher at 16*

*Positive about teacher* is not strongly correlated with any of the other scales.

The model presented in Table 63 accounted for 30 percent of the variability in *positive about teacher* at 16. Data for eight students were excluded from the model as they exerted excessive leverage.

Most of the variability was accounted for by *relevant learning opportunities*.

Table 63: Model to estimate positive about teacher at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | ***p*-value** | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.26 | 0.49 | < 0.0001 | | |
| Relevant learning opportunities 16 | 0.27 | 0.04 | < 0.0001 | 6.7 (3.7, 10.1) | 0.30 |
| Positive about teacher 14 | 0.09 | 0.02 | < 0.0001 | 8.3 (5.0, 12.3) | 0.27 |
| Inclusive family 16 | 0.19 | 0.03 | < 0.0001 | 7.7 (4.2, 11.9) | 0.26 |
| Cognitive composite 14 | 0.13 | 0.03 | < 0.0001 | 3.6 (1.5, 6.7) | 0.20 |
| Risky behaviour 16 | -0.20 | 0.03 | < 0.0001 | 4.8 (2.2, 8.6) | -0.18 |

### *Disengaged in learning at 16*

*Disengaged in learning* correlates moderately with involvement with *risky behaviour* (self and friends) at age 16 and age-14 *disengaged in learning*.

The model presented in Table 64 accounted for 35 percent of the variability in *disengaged in learning* at 16. Data for four students were excluded from the model as they exerted excessive leverage.

Table 64: Model to estimate disengaged in learning at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 3.61 | 0.41 | < 0.0001 | | |
| Disengaged in learning 14 | 0.37 | 0.04 | < 0.0001 | 14.9 | 0.39 |
| Inclusive family 16 | -0.20 | 0.04 | < 0.0001 | 5.5 | -0.24 |
| Friends with risky behaviour 16 | 0.16 | 0.03 | < 0.0001 | 6.9 | 0.26 |
| Pattern of TV watching–mainly low | 0 | | 0.002 | 2.9 | |
| –mixed | 0.34 | 0.13 | 0.008 | | |
| –mainly high | 0.38 | 0.13 | 0.004 | | |

### *Disrupted learning environment at 16*

*Disrupted learning environment* correlates weakly with age-14 *disengaged in learning*.

The model presented in Table 65 accounted for 13 percent of the variability in *disrupted learning environment* at 16. Data for four students were excluded from the model as they exerted excessive leverage.

Table 65: Model to estimate disrupted learning environment at 16 from age-14 class variables, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 4.55 | 0.41 | < 0.0001 | | |
| Disengaged in learning 14 | 0.21 | 0.04 | < 0.0001 | 5.7 | 0.24 |
| Rejection 16 | 0.15 | 0.05 | 0.002 | 2.4 | 0.16 |
| Inclusive family 16 | -0.08 | 0.04 | 0.036 | 1.1 | -0.10 |
| Pattern of TV watching–mainly low | 0 | | 0.012 | 2.2 | |
| –mixed | 0.32 | 0.13 | 0.004 | | |
| –mainly high | 0.20 | 0.14 | 0.142 | | |

# 8. Engagement

In the age-16 round of data collection we have several variables that measure what could loosely be termed "engagement" (or lack of it). Some are derived from teacher responses about the classes they teach, and the study students; some are from the students' responses to how they feel about their schooling (in general); some are derived from the students' categorisation of what happens in their three classes (English, most, and least enjoyed subjects); and we also have measures of how they feel they know they're doing well in school. These variables are described fully in *Scale variables, cluster variables, and history variables.*

We also have several measures of achievement, and in this chapter we look at *overall ability*, *ability to cope with NCEA*, *number of Level 1 NCEA credits*, and *cognitive competency*. The first two are based on teacher perceptions, the second on a school outcome, and the third a more general measure that is more consistent with the cognitive measures used in Competent Children, Competent Learners over time.

This section attempts to unravel the complex set of inter-correlations between all these variables, and to determine which make "unique" contributions to engagement, over and above the contributions of the other variables with which they are correlated. We first present all the strongest correlations and inter-correlations, and then fit some linear models to the data.

In this section we are using the data for the 427 students still at school. However, in most of the analyses reported, we have complete data for considerably fewer students. Those not at a mainstream school do not have complete teacher data, as they do not have teachers who see them daily in a classroom situation. Those not enrolled for NCEA for one reason or another do not have data on NCEA (this includes those doing alternate qualifications, such as Cambridge, those not academically able to obtain any formal qualification, and those who nominated a most or least enjoyed subject in which no NCEA qualifications were offered). The sample sizes, then, vary between about 404 and 420, depending on the variables included in the particular analysis.

## Engagement and achievement variables

### The outcome variables

In this section, the two scale variables as to how they feel about their schooling in general are used as outcome variables (dependent variables). These variables are *engaged in school* (a high score is obtained by someone who *does* like their teachers, keeps out of trouble, enjoys learning, and *does not* want to leave school as soon as possible, gets tired of trying, gets bored, skips classes, or feels restless), and *affirmed at school* (a high score is obtained by someone who feels they belong, are safe, the discipline and rules are fair, it's important to do their best, is treated as an individual and an adult, has a say in how the school runs, learns quickly, can take leadership roles, and gets all the help they need). The correlation between these variables is 0.58, which is moderately strong.

Three achievement variables are also modelled: *overall ability* at 16 (the teachers' perception of the student's ability relative to their peers); *ability to cope with NCEA* (the teachers' perception of the student's ability to cope with NCEA); *number of Level 1 NCEA credits;* and *cognitive composite*. The first two have been modelled in the chapter *Relationship between class, family, and friends* but are included here again, using a slightly different set of explanatory variables because they give the teachers' perspective on the student's engagement in learning and [likely] achievement.

## The explanatory variables

The learning opportunities variables (teacher reports of what happened in their class), as well as corresponding age-14 variables where available (*engaged* or *affirmed*) and the age-14 composite cognitive and attitudinal competencies and age-16 family, friends, and life experience variables were used to model the six outcome variables. Models were also fitted using the age-16 class engagement variables. The demographic and other discrete variables were also used as explanatory variables in all models, where they added significantly to the model.

### *Learning opportunities*

These variables describe what tends to happen in the class (one of English, most and least enjoyed classes) and are described in *Scale variables, cluster variables, and history variables*. They are:

- *students involved and active*
- *feedback and support*
- *reflective learning*
- *students working alone*.

One set of three scale variables, those about *students working alone*, are at best weakly correlated with the other learning opportunities variables. This is not surprising as the items used to make this scale are about whether the students work on their own; many of those of the other scales are about what opportunities students have to work together. The other nine of the 12 scale variables (four for each of the three subjects) are moderately correlated within each subject ($0.37 < r < 0.53$), but are uncorrelated between subjects, as would be expected. In other words, there is some tendency for a teacher giving item responses about English, say, that give a relatively high score on *students involved and active* to also give responses that give a relatively high score on *feedback and support* and on *reflective learning*. But the responses of the English teacher and the other teachers showed no associations. The correlations within the subjects are shown in Table 66. The correlations for English classes are stronger than those for the other classes, perhaps because what happens in different English classes is more consistent than what happens in mathematics and visual art classes, for example.

Table 66: Correlations among the teacher description of class variables

| | Feedback and support | Reflective learning | Students working alone |
|---|---|---|---|
| Students involved and active | | | |
| English | **0.48** | **0.48** | -0.14 |
| Most enjoyed | 0.37 | 0.37 | -0.14 |
| Least enjoyed | **0.41** | **0.41** | -0.33 |
| Feedback and support | | | |
| English | | **0.52** | – |
| Most enjoyed | | **0.44** | -0.15 |
| Least enjoyed | | **0.43** | – |
| Reflective learning | | | |
| English | | | – |
| Most enjoyed | | | -0.21 |
| Least enjoyed | | | -0.23 |

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

We have values of these variables for between 408 (*reflective learning* in most enjoyed class) and 418 (*reflective learning* in English class) of the young people.

### *Family, friends, and experiences variables*

These are the age-16 versions of the variables used in the preceding chapters:

- *inclusive family*
- *supportive family*
- *family communicates well*
- *family pressure*
- parent perception of young person's *self-confidence*
- parent perception of young person's *self-efficacy*
- parent perception of young person's *responsibility*
- *rejection*
- *praise and achievement*
- *adverse events*
- *friends with risky behaviour*
- *solid friendships*
- *risky behaviour*
- *extending friendships.*

The class environment variables are *relevant learning opportunities* in each of the three classes.

### *Class engagement variables*

These include the age-16 attitudinal competency variables, as well as the student perceptions of class and their progress with and attitude towards work:

- *thinking and learning*
- *focused and responsible*
- *social skills*
- *social difficulties*
- *internal markers of achievement*
- *absorbed in learning*
- *attitude to work*
- *positive about teacher*
- *positive about class*
- *disengaged in learning*
- *disrupted learning environment.*

### *Demographic variables*

These are the "usual suspects" of gender, ethnicity, maternal qualifications, age-14 family income and financial situation, as well as school-level "demographics" of decile and gender mix.

### *Discrete variables*

These are a mix of one age-16 variable, and several age-14 variables that were created either as a result of a cluster analysis (e.g., motivation) or to capture a history of experiences (e.g., history of involvement in bullying, or

enjoyment of reading). The age-14 variables are the same ones used in *Overview of the relationships between factor and cluster variables and school and social characteristics*.

For these models, two versions of *attendance* at age 16 were used: the full version, with seven possible levels, and one dichotomised into acceptable and poor, where acceptable includes all students other than those whose attendance was rated poor. For some outcome variables, there is a graduation of response; for others, the only real contrast was between those with poor attendance and the rest.

Year level was included in the models if it was statistically significant, to allow for the possibility that there was an engagement or achievement difference between the Year 11 and Year 12 students.

## Model-fitting process

We first present two relatively simple models for the age-16 *cognitive competency* and the *number of Level 1 NCEA credits* achieved. These models include as possible explanatory variables only age-8 competencies, maternal qualifications, age-5 or age-14 family income, year level, and variables that track education history (school decile pattern, enjoyment of reading, and motivation at age 14). These models attempt to measure the extent to which current achievement can be traced back to early experiences.

How important are more recent experiences in determining outcomes at age 16? To answer this question we next present a series of more full models, which include a wider selection of variables from the categories:

- learning opportunities in each of the three classes (English, most, and least enjoyed)
- age-16 family
- age-16 friends and life experiences
- age-14 composite attitudinal and cognitive competencies
- age-14 engaged and affirmed at school
- social characteristics
- age-14 and 16 discrete variables (*motivation*, *student values*, etc.).

Once a model including these variables had been fitted, age-16 class engagement variables (including the attitudinal competencies) were tested to see if they added significantly to the model. This allowed a comparison of the importance of learning opportunities as reported by the teacher, and learning environment as reported by the student.

The models were fitted in the stages:

- basic model of learning opportunities, age-14 composite competencies, and age-14 engagement variables; variables not statistically significant were dropped from the model
- social characteristics, if any added significantly
- discrete variables, if any added significantly
- age-16 family, friends, and life variables, if any added significantly
- examination of variance inflation factors, and where necessary one or more of the variables were excluded from the model
- examination of residual plots, which led, as in models described in previous chapters, to some observations being excluded for one or more of the models.

## Inter-correlations between engagement and achievement variables

The correlations between the continuous explanatory variables have been described in *Family and friends* and *Relationship between class, friends, and home*.

The correlations between the outcome variables and between the explanatory and outcome variables are given in a series of tables, the first containing the correlations between the outcome variables, and between those variables and learning opportunities. The rest of the tables show the correlations between the outcome variables and other categories of explanatory variables.

The strongest correlations between the outcome variables (Table 67) are between the perceptions of the teacher about the student's ability and their ability to cope with NCEA ($r$ = 0.79). The relationship between the student's actual ability, whether measured by the *number of Level 1 NCEA credits* or our *composite competency* and these variables was weaker (0.64). Weaker again is the relationship between *engaged* or *affirmed* or *cognitive competency* and *ability to cope with NCEA.* The weakest correlations are between *engaged* or *affirmed* and *cognitive competency*, which may suggest that some students are under- or over-achieving.

Table 67: Correlation between the age-16 engagement and achievement variables and with the age-16 opportunities to learn variables

| | Engaged 16 | Affirmed 16 | Overall ability 16 | Ability to cope with NCEA 16 | Number of L1 credits | Cognitive competency 16 |
|---|---|---|---|---|---|---|
| Affirmed 16 | **0.58** | | | | | |
| Overall ability 16 | **0.64** | 0.37 | | | | |
| Ability to cope with NCEA 16 | **0.50** | **0.43** | **0.79** | | | |
| Number of Level 1 credits | **0.57** | 0.36 | **0.64** | **0.64** | | |
| Cognitive competency 16 | 0.32 | 0.22 | **0.64** | **0.50** | **0.57** | |
| English | | | | | | |
| –Students involved | – | – | 0.16 | 0.11 | – | – |
| –Feedback and support | – | – | – | – | – | – |
| –Reflective learning | – | – | 0.18 | 0.13 | – | – |
| –Students working alone | 0.18 | 0.12 | 0.26 | 0.25 | 0.27 | 0.22 |
| Most enjoyed subject | | | | | | |
| –Students involved | – | – | – | – | – | – |
| –Feedback and support | – | – | – | – | – | – |
| –Reflective learning | – | – | – | – | – | – |
| –Students working alone | – | – | 0.12 | – | 0.12 | 0.13 |
| Least enjoyed subject | | | | | | |
| –Students involved | – | – | – | – | – | – |
| –Feedback and support | – | – | – | – | – | – |
| –Reflective learning | – | – | – | – | – | – |
| –Students working alone | – | – | – | – | – | – |

– indicates -0.1 < $r$ < 0.1; all correlations over 0.4 in absolute value are in **bold face**.

The opportunities to learn variables have at best a weak correlation with the outcome variables. There are some stronger associations with the age-16 family, friends, and life variables (Table 68), particularly with those measuring risky behaviour at age 16.

Table 68: Correlation between the age-16 engagement and achievement variables and with the age-16 family, friends, and life variables

| | Engaged 16 | Affirmed 16 | Overall ability 16 | Ability to cope with NCEA 16 | Number of L1 credits | Cognitive competency 16 |
|---|---|---|---|---|---|---|
| Inclusive family | 0.25 | 0.33 | 0.14 | 0.12 | 0.14 | – |
| Supportive family | 0.21 | 0.31 | 0.11 | 0.10 | 0.14 | – |
| Family communicates well | 0.27 | 0.34 | 0.18 | 0.21 | 0.18 | – |
| Family pressure | -0.28 | -0.18 | -0.19 | -0.22 | -0.18 | -0.10 |
| Parent view of self-confidence | 0.19 | 0.13 | 0.22 | 0.16 | 0.16 | 0.20 |
| Parent view of self-efficacy | 0.25 | 0.19 | 0.25 | 0.23 | 0.28 | 0.26 |
| Parent view of responsibility | 0.27 | 0.22 | 0.35 | 0.33 | 0.34 | 0.39 |
| Friends with risky behaviour | **-0.41** | -0.27 | -0.32 | **-0.44** | -0.32 | -0.27 |
| Solid friendships | – | 0.22 | – | – | – | – |
| Extending friendships | 0.13 | 0.35 | 0.11 | 0.10 | 0.11 | 0.11 |
| Rejection | -0.18 | -0.12 | – | – | – | – |
| Praise and achievement | – | 0.27 | – | – | 0.10 | – |
| Risky behaviour | **-0.53** | -0.24 | -0.37 | **-0.49** | -0.35 | -0.30 |
| Adverse events | -0.28 | -0.15 | -0.15 | -0.521 | -0.22 | -0.21 |

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

There are considerably stronger correlations with the classroom engagement variables (Table 69), and with similar age-14 variables. Perhaps what is important in a class is not so much what the teacher thinks is happening, or what learning opportunities are offered, but how the students perceive or understand these opportunities and, even more, the interpersonal relationships that are built within the classroom.

Table 69: Correlation between the age-16 engagement and achievement variables and with the age-14 and age-16 class engagement variables

| | Engaged 16 | Affirmed 16 | Overall ability 16 | Ability to cope with NCEA 16 | Number of L1 credits | Cognitive competency 16 |
|---|---|---|---|---|---|---|
| Engaged at school 14 | **0.45** | 0.33 | 0.36 | **0.40** | 0.30 | 0.31 |
| Affirmed at school 14 | 0.27 | **0.42** | 0.29 | 0.33 | 0.29 | 0.21 |
| Cognitive composite 14 | 0.30 | 0.24 | **0.64** | **0.50** | **0.61** | **0.88** |
| Attitudinal composite 14 | **0.43** | 0.37 | **0.63** | **0.62** | **0.59** | **0.58** |
| Cognitive composite 8 | 0.22 | 0.24 | **0.56** | 0.39 | **0.51** | **0.77** |
| Attitudinal composite 8 | 0.13 | 0.16 | 0.35 | 0.26 | 0.33 | **0.44** |
| Thinking and learning 16 | **0.46** | **0.40** | **0.79** | **0.82** | **0.62** | **0.54** |
| Focused and responsible 16 | **0.55** | **0.42** | **0.79** | **0.91** | **0.64** | **0.54** |
| Social skills 16 | **0.42** | 0.38 | **0.59** | **0.65** | **0.46** | **0.42** |
| Social difficulties 16 | -0.35 | -0.26 | **-0.45** | **-0.58** | **-0.44** | **-0.43** |
| Internal markers of success 16 | 0.38 | **0.45** | 0.33 | 0.33 | 0.29 | 0.28 |
| External markers of success 16 | 0.10 | 0.18 | 0.23 | 0.19 | 0.19 | 0.25 |
| Positive about classes 16 | **0.43** | **0.51** | 0.24 | 0.30 | 0.15 | 0.11 |
| Positive about teachers 16 | **0.44** | **0.48** | 0.31 | 0.35 | 0.21 | 0.20 |
| Absorbed in learning 16 | **0.43** | **0.46** | 0.24 | 0.32 | 0.15 | – |
| Disengaged in learning 16 | **-0.55** | -0.35 | -0.27 | -0.41 | -0.26 | -0.17 |
| Disrupted learning environment 16 | -0.21 | -0.12 | -0.14 | -0.13 | -0.18 | -0.19 |
| Attitude to all work 16 | **0.43** | **0.42** | 0.18 | 0.39 | 0.30 | 0.35 |
| Relevant learning opportunities 16 | – | 0.15 | – | – | -0.14 | -0.11 |

– indicates $-0.1 < r < 0.1$; all correlations over 0.4 in absolute value are in **bold face**.

## Models fitted

### *Mainly age-8 variables*

#### *Cognitive competency age 16*

There is a relatively strong correlation between the age-8 and age-16 cognitive competencies ($r$ = 0.77), so the model for the *cognitive competency* accounts for 65 percent of the variability in the age-16 value (Table 70). Gender and ethnicity did not add significantly to the model.

Table 70: Model to estimate cognitive competency at 16 from age-8 competency variables, demographic variables, and age 8–14 history variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.42 | 0.26 | < 0.0001 | | |
| Cognitive composite 8 | 0.58 | 0.03 | < 0.0001 | 44.1 | 0.66 |
| Maternal qualifications–none | 0 | | 0.0009 | 3.7 | |
| –mid-secondary/trade | 0.16 | 0.13 | 0.213 | | |
| –senior secondary/tertiary | 0.31 | 0.15 | 0.046 | | |
| –university | 0.52 | 0.15 | 0.0009 | | |
| Year level–Year 11 | 0 | | 0.007 | 1.9 | |
| –Year 12 | 0.22 | 0.08 | 0.007 | | |
| School decile pattern 8–14–mainly 1–2 | 0 | | 0.016 | 3.1 | |
| –mainly 3–8 | 0.47 | 0.18 | 0.009 | | |
| –mainly 9–10 | 0.60 | 0.18 | 0.001 | | |
| –mixed | 0.55 | 0.19 | 0.004 | | |
| Motivation 14–high | 0 | | 0.010 | 2.4 | |
| –unsure | -0.13 | 0.10 | 0.192 | | |
| –low | -0.32 | 0.11 | 0.003 | | |
| Reading pattern 8–14–enjoy reading | 0 | | 0.007 | 3.1 | |
| –mainly enjoy reading | -0.22 | 0.10 | 0.029 | | |
| –mixed responses | -0.36 | 0.11 | 0.001 | | |
| –repeated lack of enjoyment | -0.33 | 0.19 | 0.079 | | |

The model above includes *motivation*, or the value placed on education, at age 14, and *enjoyment of reading* between ages 8 and 14. It can be argued that these both reflect aspects of the home environment as well as ability (enjoyment of reading in particular) and that these aspects of the home environment would have been influencing the child before age 8, so it is legitimate to include them in this baseline model. How much worse would the model be without them? The indications from Table 70 are that it would not be much worse (each accounts for less than 5 percent of the variability in the age-16 cognitive competency), and this is confirmed by the model in Table 71, which accounts for 63 percent of the variability.

Table 71: Model to estimate cognitive competency at 16 from age-8 competency variables, demographic variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 1.73 | 0.22 | < 0.0001 | | |
| Cognitive composite 8 | 0.63 | 0.03 | < 0.0001 | 51.5 | 0.72 |
| Maternal qualifications–none | 0 | | 0.0009 | 4.2 | |
| –mid-secondary/trade | 0.19 | 0.13 | 0.156 | | |
| –senior secondary/tertiary | 0.39 | 0.16 | 0.013 | | |
| –university | 0.56 | 0.16 | 0.0004 | | |
| Year level–Year 11 | 0 | | 0.004 | 2.1 | |
| –Year 12 | 0.25 | 0.08 | 0.004 | | |
| School decile pattern 8–14–mainly 1–2 | 0 | | 0.013 | 3.2 | |
| –mainly 3–8 | 0.47 | 0.18 | 0.010 | | |
| –mainly 9–10 | 0.63 | 0.19 | 0.008 | | |
| –mixed | 0.58 | 0.20 | 0.003 | | |

### *Number of Level 1 NCEA credits*

How well does the age-8 *cognitive competency* predict the *number of credits achieved in Level 1 of the NCEA*? Using only age-8 competencies, demographic variables, and some history variables, the model in 0 accounts for 34 percent of the variability in the number of Level 1 credits.

Table 72: Model to estimate number of Level 1 NCEA credits at 16 from age-8 competency variables and demographic variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 19.12 | 9.13 | 0.037 | | |
| Cognitive composite 8 | 9.75 | 1.15 | < 0.0001 | 15.5 | 0.39 |
| Attitudinal composite 8 | 3.18 | 1.20 | 0.005 | 2.0 | 0.14 |
| School decile pattern 8–14–mainly 1–2 | 0 | | 0.0001 | 7.3 | |
| –mainly 3–8 | 7.57 | 6.42 | 0.239 | | |
| –mainly 9–10 | 23.09 | 6.47 | 0.004 | | |
| –mixed | 10.42 | 6.86 | 0.130 | | |

Outcomes in the NCEA are more strongly influenced by environmental changes than are the basic literacy, numeracy, and problem-solving competencies captured in the *cognitive composite*. Adding more variables that capture some changes in environment between 8 and 14, as well as more attitudes and advantages (positive or negative) associated with home substantially improves the fit of the model (Table 73, , and see also Table 82), so that it accounts for 41 percent of the variability in the *number of Level 1 NCEA credits* achieved. Student values at 16 have been included in this model as they are likely to capture some differences at the family level, as well as between the young people themselves.

Table 73: Model to estimate number of Level 1 NCEA credits at 16 from age-8 competency variables and demographic variables, and age 8–14 history variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 42.03 | 10.69 | < 0.0001 | | |
| Cognitive composite 8 | 7.54 | 1.13 | < 0.0001 | 10.4 | 0.32 |
| Attitudinal composite 8 | 2.80 | 1.15 | 0.015 | 1.5 | 0.12 |
| School decile pattern 8–14–mainly 1–2 | 0 | | 0.0004 | 5.2 | |
| –mainly 3–8 | 4.07 | 6.13 | 0.507 | | |
| –mainly 9–10 | 17.07 | 6.31 | 0.007 | | |
| –mixed | 6.35 | 6.63 | 0.339 | | |
| Involvement in bullying 8–14 | | | | 4.3 | |
| –involved once | 0 | | 0.0002 | | |
| –involved at least twice | -12.62 | 3.12 | < 0.0001 | | |
| –no involvement | -2.90 | 3.32 | 0.383 | | |
| Family income 14–< $30K | 0 | | 0.003 | 4.2 | |
| –$30–60K | 7.56 | 4.74 | 0.111 | | |
| –$60–100K | 15.50 | 4.64 | 0.0009 | | |
| –$100K+ | 15.30 | 4.83 | 0.002 | | |
| Motivation 14–high | 0 | | 0.015 | 2.2 | |
| –unsure | -2.71 | 3.15 | 0.381 | | |
| –low | -9.89 | 3.53 | 0.005 | | |
| Student values 16–satisfying life | 0 | | 0.018 | 2.1 | |
| –aspirational | -4.64 | 3.44 | 0.118 | | |
| –standing out | -9.04 | 3.17 | 0.005 | | |

It would seem that what qualifications are achieved, certainly by Level 1 NCEA, does depend on achievement both cognitively and attitudinally that is shown as early as age 8, but depends even more on what happens to the young person in the intervening years: where they go to school, what experiences they have, the peer group with which they associate, and how family resources change (which in turn affects where they attend school).

For each of the next set of outcome variables examined, two models are presented, one which excludes all class engagement variables, and one that includes them.

### *Models using age-14 and age-16 data*

#### *Engaged at school*

From the reported correlations above we can see that a number of variables are moderately correlated with *engaged at school* (and each other). Not all added significantly to the model, because of the intercorrelations between the variables.

The final model for *engaged at school* excluding class engagement variables accounted for 43 percent of the variability in *engaged at school* (Table 74). The variable accounting for most of the variability was *risky behaviour* (about 15 percent). None of the opportunities to learn variables added significantly to the model.

Table 74: Model to estimate engagement at 16 from age-14 engagement and competency variables, opportunities to learn, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 3.26 | 0.45 | < 0.0001 | | |
| Risky behaviour 16 | -0.28 | 0.03 | < 0.0001 | 15.0 | -0.39 |
| Family communicates well 16 | 0.13 | 0.03 | < 0.0001 | 4.8 | 0.22 |
| Engaged at school 14 | 0.13 | 0.04 | 0.0006 | 3.2 | 0.18 |
| Attitudinal composite 14 | 0.14 | 0.04 | 0.0009 | 2.9 | 0.17 |
| Parent perception of responsibility 16 | 0.08 | 0.04 | 0.033 | 1.2 | 0.11 |
| Attendance 16–acceptable | 0 | | 0.045 | 1.1 | |
| –poor | -0.29 | 0.14 | 0.045 | | |

The final model for *engaged at school* that included classroom engagement variables (Table 75). accounted for 57 percent of the variability in *engaged at school*.

Table 75: Model to estimate engaged at school from classroom engagement and other variables

| | Parameter estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 3.74 | 0.49 | < 0.0001 | | |
| Risky behaviour | -0.23 | 0.03 | < 0.0001 | 13.5 (9.9, 17.2) | -0.35 |
| Disengaged in learning | -0.23 | 0.03 | < 0.0001 | 12.7 (9.7, 15.9) | -0.32 |
| Attitude to all work | 0.17 | 0.04 | < 0.0001 | 6.1 (3.8, 8.8) | 0.22 |
| Engaged at school 14 | 0.11 | 0.03 | 0.0006 | 6.9 (4.4, 10.0) | 0.17 |
| Focused and responsible | 0.08 | 0.03 | 0.007 | 9.4 (7.1, 12.3) | 0.13 |
| Internal markers of progress | 0.07 | 0.03 | 0.017 | 4.0 (2.0, 7.1) | 0.12 |
| Positive about classes | 0.10 | 0.05 | 0.038 | 4.7 (2.7, 7.1) | 0.10 |

From the table we can see that:

- A single unit increase in *risky behaviour* is associated with the largest increase or decrease in *engaged at school at 16* (a decrease of 0.23), and a single unit increase in *positive about classes* with the smallest (0.10)—both of these changes being when all other variables in the model are held constant.
- Appropriately, these are the variables with the highest and lowest partial correlations (in absolute value) with *engaged at school at 16*.
- The LMG measures show that *disengaged in learning* and *risky behaviour* account for almost equally-sized parts of the variability in *engaged in learning* (about 13 percent).
- The confidence intervals for the LMG estimates indicate that *disengaged in learning* and *risky behaviour* probably both account for significantly more of the variability in *engaged in learning at age-16* than do

*attitude to all work*, *internal markers of success*, and *positive about classes* (they account for almost twice as much of the variability, and the two sets of confidence intervals do not overlap).

This measure of engagement, then, is largely explained by a similar measure two years before, the teachers' perception of the student (*focused and responsible*; given the strong correlation between this variable and *thinking and learning*, it is not surprising that only one can be included in the model), and some aspects of the students' perceptions of the class (their attitude to work, how they measure their progress, and that they behave co-operatively and responsibly). A sense of engagement seems associated with attitudes to work and determination to succeed.

### *Affirmed at school*

From the reported correlations above we can see a number of variables that are moderately correlated with *affirmed at school* (and each other). Not all remained adding significantly to the model, because of the inter-correlations between the variables. The final model for *affirmed at school* that excluded the classroom engagement variables accounted for 39 percent of the variability in *affirmed at school* (Table 76).

Table 76: Model to estimate affirmed at school at 16 from age-14 engagement and competency variables, opportunities to learn, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -0.29 | 0.48 | 0.554 | | |
| Praise and achievement 16 | 0.13 | 0.03 | < 0.0001 | 4.5 | 0.21 |
| Attitudinal composite 14 | 0.13 | 0.04 | 0.0002 | 3.7 | 0.19 |
| Affirmed at school 14 | 0.13 | 0.04 | 0.0006 | 3.0 | 0.17 |
| Relevant learning opportunities 16 | 0.11 | 0.04 | 0.004 | 2.1 | 0.15 |
| Friends with risky behaviour 16 | -0.06 | 0.02 | 0.008 | 1.8 | -0.13 |
| Parent perception of responsibility 16 | 0.08 | 0.03 | 0.013 | 1.6 | 0.13 |
| Extending friendships 16 | 0.10 | 0.04 | 0.015 | 1.5 | 0.12 |
| Supportive family 16 | 0.06 | 0.03 | 0.016 | 1.5 | 0.12 |
| Positive about classes 14 | 0.11 | 0.04 | 0.005 | 2.1 | 0.14 |
| Student values 16–satisfying life | 0 | | 0.046 | 1.6 | |
| –aspirational | 0.05 | 0.10 | 0.636 | | |
| –standing out | -0.18 | 0.09 | 0.043 | | |
| –difference between aspirational and standing out | 0.23 | 0.10 | 0.025 | | |

Having standing out values is associated with lower scores for *affirmed at school*. A sense of affirmation is associated with positive family relationships, achieving things that result in praise, and having *relevant learning opportunities*. It is about getting recognition for success and as an individual.

A model that included classroom engagement variables accounted for 48 percent of the variability in *affirmed at school* (Table 77).

Table 77: Model to estimate affirmed at school from other engagement variables

| | Parameter estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -1.36 | 0.35 | 0.0001 | | |
| Positive about classes 16 | 0.21 | 0.05 | < 0.0001 | 8.4 (5.7, 11.8) | 0.21 |
| Affirmed at school 14 | 0.17 | 0.03 | < 0.0001 | 8.4 (5.3, 12.1) | 0.26 |
| Focused and responsible 16 | 0.12 | 0.03 | < 0.0001 | 7.4 (4.8, 10.4) | 0.23 |
| Internal markers of progress 16 | 0.11 | 0.03 | 0.0008 | 8.1 (5.2, 11.3) | 0.17 |
| Attitude to all work 16 | 0.10 | 0.04 | 0.012 | 5.5 (3.5, 8.2) | 0.13 |
| Extending friendships 16 | 0.11 | 0.04 | 0.004 | 5.2 (3.2, 7.8) | 0.14 |
| Supportive family 16 | 0.06 | 0.02 | 0.022 | 3.3 (1.6, 5.7) | 0.12 |
| Praise and achievement 16 | 0.06 | 0.03 | 0.017 | 2.8 (1.2, 5.2) | 0.12 |

From the table we can see that:

- A single unit increase in *positive about classes at 16* is associated with the largest increase in *affirmed at school at 16* (0.21), followed by *affirmed at school at age 14* (0.17), and a single unit increase in *praise and achievement* with the smallest (0.06)—all of these increases being when all other variables in the model are held constant.
- Appropriately, these are the variables with amongst the highest and lowest partial correlations with *affirmed at school at 16*.
- The LMG measures show that *affirmed at school at 14* accounts for the largest single part of the variability in *affirmed at school* (about 8 percent).

This measure of engagement, then, is largely explained by a similar measure two years before, the composite teachers' perception of the student at age 16, and some aspects of the students' perceptions of the class (their attitude to work, the quality of the learning environment, and how they judge that they have been successful).

### *Overall ability*

The model for *overall ability* that excluded the class engagement variables accounted for 60 percent of the variability in *overall ability*, a similar proportion to that accounted for by the model in *Relationship between class, friends, and home*. None of the opportunities to learn variables added significantly to the model. The *age-14 cognitive composite* made the largest single contribution to this (25 percent).

Table 78: Model to estimate overall ability at 16 from age-14 engagement and competency variables, opportunities to learn, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -1.61 | 0.62 | 0.010 | | |
| Cognitive composite 14 | 0.61 | 0.06 | < 0.0001 | 25.4 | 0.50 |
| Attitudinal composite 14 | 0.51 | 0.07 | < 0.0001 | 13.6 | 0.37 |
| Parent perception of self-confidence 16 | 0.22 | 0.2 | < 0.0001 | 4.4 | 0.21 |
| Risky behaviour 16 | -0.20 | 0.05 | 0.0001 | 4.1 | -0.20 |
| Atttendance 16–acceptable | 0 | | < 0.0001 | 4.4 | 0.21 |
| –poor | -0.91 | 0.23 | < 0.0001 | | |
| Year level–Year 11 | 0 | | 0.0003 | 3.7 | -0.19 |
| –Year 12 | -0.51 | 0.14 | 0.0003 | | |

Appropriately, the teachers' perception relative ability at age 16 was most strongly associated with the students' *cognitive competency* at age 14. Next most strongly associated was the age-14 *attitudinal composite*. Those whose attendance was poor were rated, on average, almost a point lower (equivalent to almost 10 percent on a percentage scale) even after taking the other variables into account. In our sample, the Year 12 students were rated as having a lower ability level than the Year 11 students.

A model that included the class engagement variables accounted for 67 percent of the variability in *overall ability* (Table 79). In this model, the age-16 attitudinal competency *focused and responsible* could not be added to the model because there appeared to be problems with multicollinearity (the signs of some of the estimates were reversed). Perhaps because of the reduced amount of residual error, one of the opportunities to learn variables was significant at the 5 percent level in this model.

Table 79: Model to estimate overall ability at 16 from age-14 engagement and competency variables, opportunities to learn, class engagement, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -4.04 | 0.66 | < 0.0001 | | |
| Cognitive composite 14 | 0.47 | 0.05 | < 0.0001 | 18.6 | 0.43 |
| Social skills 16 | 0.38 | 0.06 | < 0.0001 | 11.9 | 0.34 |
| Attitude to all work 16 | 0.32 | 0.06 | < 0.0001 | 7.7 | 0.28 |
| Attitudinal composite 14 | 0.32 | 0.07 | < 0.0001 | 6.4 | 0.25 |
| Risky behaviour 16 | -0.13 | 0.05 | 0.006 | 2.2 | -0.15 |
| Parent perception of self-confidence 16 | 0.12 | 0.05 | 0.013 | 1.6 | 0.13 |
| Career choice based on experience 16 | -0.09 | 0.04 | 0.030 | 1.4 | -0.12 |
| English: students working alone | 0.10 | 0.05 | 0.041 | 1.2 | 0.11 |
| Atttendance 16–acceptable | 0 | | 0.004 | 2.4 | 0.15 |
| –poor | -0.61 | 0.21 | | | |
| Year level–Year 11 | 0 | | 0.0001 | 4.2 | -0.21 |
| –Year 12 | -0.50 | 0.13 | | | |

### *Ability to cope with NCEA*

The model that excluded the class engagement variables accounted for 57 percent of the variability in *ability to cope with NCEA*. The variable accounting for the single largest amount of the variation was the age-14 attitudinal competency (about 13 percent).

Table 80: Model to estimate ability to cope with NCEA at 16 from age-14 engagement and competency variables, opportunities to learn, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 2.82 | 0.47 | < 0.0001 | | |
| Attitudinal composite 14 | 0.38 | 0.05 | < 0.0001 | 13.1 | 0.36 |
| Risky behaviour 16 | -0.25 | 0.04 | < 0.0001 | 10.1 | -0.32 |
| Cognitive composite 14 | 0.19 | 0.04 | < 0.0001 | 5.1 | 0.23 |
| English: students working alone | 0.08 | 0.04 | 0.028 | 1.3 | 0.11 |
| Ethnicity—Mäori/Pacific | 0 | | 0.027 | 2.0 | |
| –Päkehä/European | 0.38 | 0.15 | 0.015 | | |
| Atttendance 16–excellent | 0 | | < 0.0001 | 9.2 | |
| –very good | -0.03 | 0.14 | 0.839 | | |
| –good | -0.12 | 0.14 | 0.404 | | |
| –fair | -0.48 | 0.16 | 0.003 | | |
| –poor | -1.00 | 0.19 | < 0.0001 | | |
| –absences for health reasons | -0.67 | 0.33 | 0.042 | | |
| –absences for other reasons | -0.47 | 0.49 | 0.337 | | |
| Student values–satisfying life | 0 | | 0.015 | 2.3 | |
| –aspirational | 0.17 | 0.13 | 0.202 | | |
| –standing out | -0.23 | 0.12 | 0.067 | | |
| –difference between aspirational and standing out | 0.40 | 0.14 | 0.004 | | |

A model that includes classroom engagement variables accounts for 84 percent of the variability in *ability to cope with NCEA*. More particularly, inclusion in the model of *focused and responsible*, which has a correlation of 0.79 with *ability to cope with NCEA*, results in a major increase in the amount of variability accounted for (almost all of it), to the extent that very few of the other continuous variables remain significant. It would appear that the teachers' perceptions of the students' ability in the NCEA was very tightly bound up with their perception of the students' ability to stay on task, and apply themselves in a positive way in the classroom.

Table 81: Model to estimate ability to cope with NCEA at 16 from age-14 engagement and competency variables, opportunities to learn, class engagement, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 0.17 | 0.25 | 0.488 | | |
| Focused and responsible 16 | 0.78 | 0.02 | < 0.0001 | 78.2 | 0.88 |
| Attitude to all work 16 | 0.12 | 0.03 | < 0.0001 | 4.1 | 0.20 |
| English: students working alone | 0.05 | 0.02 | 0.017 | 1.4 | 0.12 |
| Motivation 14–high | 0 | | 0.029 | 1.8 | |
| –unsure | -0.18 | 0.07 | 0.013 | | |
| –low | -0.17 | 0.08 | 0.030 | | |
| Parent interests–read widely, involved | 0 | | 0.010 | 2.8 | |
| –TV, not involved | -0.01 | 0.07 | 0.897 | | |
| –mixed | -0.17 | 0.11 | 0.115 | | |
| –TV, few interests | -0.25 | 0.08 | 0.002 | | |

### *Number of Level 1 credits in NCEA*

The model that excluded the class engagement variables accounted for 56 percent of the variability in *number of Level 1 credits in NCEA*. The variable accounting for the single largest amount of the variation was the age-14 cognitive competency (about 16 percent).

The parameter estimates in this model look considerably different than those in the other models, as the number of credits has values up to almost 300, rather than being a 1–10 scale as the other outcome variables are. The parameter estimates for the continuous scale variables represent the number of additional credits achieved for a single unit increase in the scale. For example, for each unit increase in *cognitive competency at 14*, holding all other variables constant, students achieved on average almost eight extra credits.

The parameter estimates for categorical variables represent the change in the number of credits achieved compared to the reference category. For example, students with poor attendance achieved an average of about 18.5 fewer credits than other students (holding all other variables constant).

Table 82: Model to estimate number of Level 1 NCEA credits at 16 from age-14 engagement and competency variables, opportunities to learn, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -42.9 | 11.2 | 0.0002 | | |
| Cognitive composite 14 | 7.9 | 1.0 | < 0.0001 | 15.5 | 0.39 |
| Attitudinal composite 14 | 6.7 | 1.1 | < 0.0001 | 9.5 | 0.31 |
| Family communicates well 16 | 1.9 | 0.8 | 0.018 | 1.6 | 0.13 |
| English: students working alone | 5.0 | 2.0 | 0.013 | 1.8 | 0.13 |
| Parent perception of responsibility | 2.2 | 1.0 | 0.022 | 1.5 | 0.12 |
| Family income age 14–< $30K | 0 | | 0.008 | 3.9 | |
| –$30–60K | 8.4 | 4.3 | 0.051 | | |
| –$60–100K | 13.3 | 4.2 | 0.002 | | |
| –$100K+ | 14.6 | 4.3 | 0.0007 | | |
| Attendance 16–acceptable | 0 | | < 0.0001 | 6.4 | |
| –poor | -18.5 | 3.8 | | | |
| Involvement in bullying 8–14 | | | | 3.2 | |
| –involved once | 0 | | 0.004 | | |
| –involved at least twice | -6.7 | 2.8 | 0.018 | | |
| –no involvement in bullying | 5.9 | 2.3 | 0.012 | | |
| Year level–Year 11 | 0 | | 0.012 | 1.8 | |
| –Year 12 | 5.92 | 2.3 | 0.012 | | |

The fact that Year 12 students achieved on average almost six extra credits, taking all other variables into account, suggests that several of the Year 12 students achieved further Level 1 credits in Year 12.

A model that includes classroom engagement variables accounts for 60 percent of the variability in *number of Level 1 NCEA credits*.

Table 83: Model to estimate number of Level 1 NCEA credits at 16 from age-14 engagement and competency variables, opportunities to learn, class engagement, and age-16 family and friends variables

| | Parameter estimate | Standard error | *p*-value | $\eta_p^2$ (%) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -23.1 | 8.85 | 0.009 | | |
| Cognitive composite 14 | 6.7 | 1.0 | < 0.0001 | 12.3 | 0.35 |
| Thinking and learning 16 | 6.1 | 1.0 | < 0.0001 | 9.5 | 0.31 |
| Attitudinal composite 14 | 3.9 | 1.2 | 0.0008 | 3.1 | 0.18 |
| English: students working alone | 2.6 | 0.84 | 0.002 | 2.7 | 0.16 |
| Attendance 16–acceptable | 0 | | < 0.0001 | 4.3 | -0.21 |
| –poor | -14.5 | 3.6 | | | |
| Involvement in bullying 8–14 | | | | | |
| –involved once | 0 | | 0.0006 | 4.1 | |
| –involved at least twice | -9.9 | 2.6 | 0.001 | | |
| –no involvement in bullying | -5.5 | 2.7 | 0.039 | | |
| Family income age 14–< $30K | 0 | | 0.026 | 3.0 | |
| –$30–60K | 7.8 | 4.0 | 0.051 | | |
| –$60–100K | 10.5 | 3.9 | 0.007 | | |
| –$100K+ | 12.7 | 3.9 | 0.001 | | |
| Year level–Year 11 | 0 | | 0.005 | 2.2 | 0.15 |
| –Year 12 | 6.3 | 2.2 | | | |

This model tells much the same story as the previous one: students' success is associated with their cognitive competency, and their attitude to work. There are students achieving Level 1 credits in Year 12 (on average, accounting for the other variables, six or seven credits).

### *Cognitive competency*

The model that excluded the class engagement variables accounted for 78 percent of the variability in *cognitive competency*. The variable accounting for the single largest amount of the variation was the age-14 cognitive competency (about 60 percent). Because of the strong correlation between the two cognitive competency measures ($r$ = 0.88), few other variables remain in the model.

Table 84: Model to estimate cognitive competency at 16 from age-14 engagement and competency variables, opportunities to learn, and age-16 family and friends variables

| | Parameter estimate | Standard error | ***p*-value** | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 0.71 | 0.23 | 0.003 | | |
| Cognitive composite 14 | 0.75 | 0.03 | < 0.0001 | 59.5 (55.6, 63.4) | 0.82 |
| Attitudinal composite 14 | 0.08 | 0.03 | 0.007 | 15.2 (12.1, 18.4) | 0.13 |
| Risky behaviour 16 | -0.05 | 0.02 | 0.047 | 3.1 (1.8, 5.0) | -0.10 |

In this instance, the model fit is not improved by adding any of the class engagement variables. The *cognitive competency* scores are relatively constant over time: a high score is associated with "good attitudes", a good general ability level, and an absence of risky behaviour.

# 9. NCEA results and our competency measures

The NCEA is a new way of measuring student achievement, and has proved to be somewhat controversial, with many claims and counterclaims about how understandable the results are, how well they measure student ability, how robust the system is, and how well it serves to predict success at university.

The Competent Children, Competent Learners study provided us with an opportunity to measure the students' NCEA results against our cognitive and attitudinal competency measures. We have separate literacy, numeracy, and logical problem-solving measures, but for the comparison it is probably most helpful to use the age-16 composite competency measure, as this measure covers all three aspects together, and to look at the overall pattern of achievement in the NCEA (rather than looking at literacy and/or numeracy standards separately). This allows us to compare our measures and those from NCEA overall as measures of cognitive achievement.

What comparisons are meaningful? There are two fundamental questions we can ask of the data. Firstly, how well do our measures of achievement and engagement predict success in the NCEA? And secondly, the reverse question: How well do NCEA results (overall) predict literacy and numeracy as measured by our composite cognitive competency?

We look first at the possible measures of achievement derived from NCEA results, then at the inter-correlations between the possible measures, and lastly use linear models to investigate the two comparability questions.

## NCEA measures

The measures we have used of achievement in the NCEA are:

- the percentage of achievement standards attempted that were achieved (the number of As divided by the total number of A, M, E, and N results for achievement standards[9])
- the percentage of achievement standards attempted that were merits (Ms)
- the percentage of achievement standards that were excellences (Es)
- the total number of credits (Unit Standards or Achievement Standards) gained
- the total number of Level 1 credits achieved.

These measures are all simple to calculate from NCEA results, and do not attempt to discriminate in any way between the actual standards attempted. There is no attempt to distinguish qualitatively between possible standards, nor is there any attempt to distinguish between courses that "measure" basic literacy or numeracy and those that "measure" other skills.

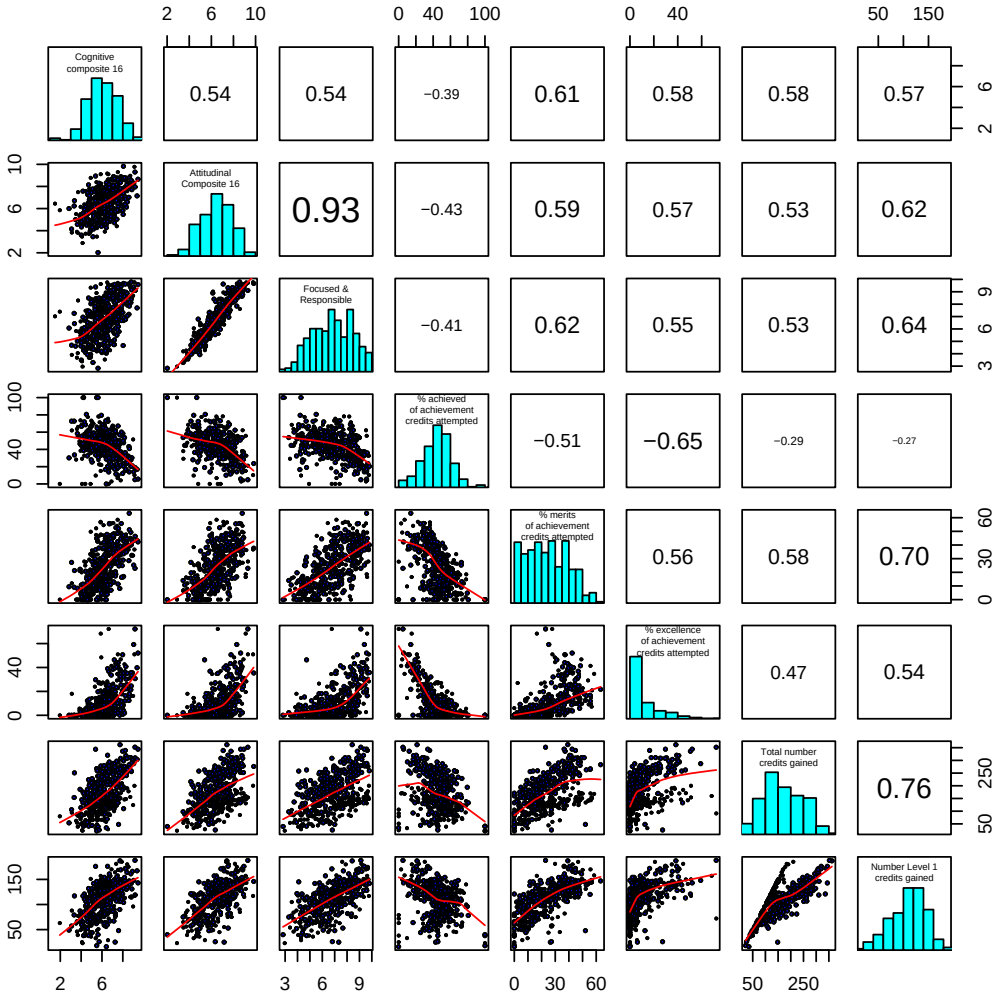
## Correlations

Preliminary investigations showed that the NCEA measures were more strongly associated with *focused and responsible* than with *attitudinal composite* or any of the other attitudinal competencies, in particular the two social skills measures. As far as the cognitive competencies are concerned, the *cognitive composite* was more strongly associated with the NCEA measures than were any of the three separate competencies. Figure 2 shows

[9] A=Achieved, M=Merit, E=Excellence, and N=Not achieved.

the distribution of the achievement measures down the diagonal (the little histograms); the scatter plots showing the relationship between the measures, and the corresponding correlations.

Figure 2: Correlations between cognitive and attitudinal competencies and NCEA measures




The first three rows and columns show the Competent Learners competencies, and the bottom five rows and right-hand five columns show the data for the NCEA results. The strongest correlations are between the three Competent Learners competencies (particularly between *attitudinal composite* and *focused and responsible*, one of the competencies used to construct the composite), and between the five NCEA measures, particularly between the number of Level 1 credits and the total number of credits gained, and the percentage of merits gained out of the number of achievement standards attempted. The percentage achievement standards getting an A (Achieved) is negatively correlated with the other variables, as getting a high percentage of just achieved is typically not an indication of academic excellence.

The lines through the scatter plots give an indication of the extent to which the typical assumption that the relationships measured are linear (if the line is straight) is satisfied. The percentage of Es gives several indications of departure from linearity, mainly because most students received very few Es, but a few received a high percentage of Es.

The total number of credits gained is heavily dependent on the year (we had students in both Year 11 and Year 12). In a plot where the year levels are distinguished, the points corresponding to Year 11 students lie mainly under the slightly wiggly line, and those for Year 12 lie mainly above it in each of the plots involving the total number of credits gained. In the plots against *attitudinal composite*, *focused and responsible*, and the percentage of merits achieved it is actually possible to make out two separate clouds of points, running at slightly different angles: the Year 11s below the wiggly line (with a less steep gradient), and the Year 12s above (with a steeper gradient). This separation is clearest of all for the total number of credits plotted against the number of Level 1 credits, as Year 12 students have more credits in total, but for most Year 11 students the two measures are the same or very similar.

In education, correlations in the region of 0.5–0.6 represent relatively strong associations. For example, the correlations between our *literacy*, *numeracy*, and *logical problem-solving* scores are between 0.51 (between *literacy* and *logical problem-solving*) and 0.68 (between *numeracy* and *logical problem-solving*). The correlations between the NCEA measures and our competency measures are all between 0.43 and 0.60 (ignoring sign); in other words, they are all relatively strong. As the correlations between *focused and responsible* and the NCEA variables are stronger than the corresponding measures using *attitudinal composite*, we use *focused and responsible* in the models fitted.

If associations exist, how well can we predict the one set of outcomes from the other?

## Models

Each of the models that follow is based on different numbers of observations. We had a total of 447 students, 27 of whom had left school (so do not have age-16 attitudinal competency measures), five are not in mainstream school (again, no attitudinal competency measures), two or three could or would not complete the cognitive competency tasks, up to another 10 have one or more of the attitudinal competency measures missing as one or more of their teachers gave no response to too many of the items used to form the attitudinal competencies, up to seven were not assessed using NCEA, and about four students refused us permission to access their NCEA results.

The numbers of students excluded from each of the models is given in Table 85.

Table 85: Number of students with missing data

| Model | Year 11 | Year 12 | Total |
|---|---|---|---|
| Total number of credits | 40 | 47 | 80 |
| Percent of A results | | | 52 |
| Percent of M results | | | 64 |
| Percent of E results | | | 64 |
| Cognitive competency | | | 46 |

Imputing missing values is increasingly popular and commonplace. However, most of the missing values in these data are missing because of a difference between the individuals with measures and those without them. Imputation would make these students "the same" as the rest, as the imputations could not be made taking the differences into account, as it is these differences that were the initial cause for the missingness in the first place.

A consequence of excluding these students from the modelling process is that the models can only be regarded as applying to students in mainstream schools, doing the kinds of subjects and qualifications that do not give rise to missing data in any of the ways described above.

## Predicting NCEA results from Competent Learners measures

We look in turn at predicting the *number of credits gained*, the *number of Level 1 credits gained*, the *percentage of just achieved*, the *percentage of merits achieved*, and the *percentage of excellences achieved*. The original model fitted included our *cognitive composite, focused and responsible*, year level (and we tested for interactions between year level and the other variables, in case the effect of some was different as the students neared the end of their secondary education), the English teachers' judgement of the students' attitudes to NCEA and working for it (*NCEA assessment*), and our three school-wide engagement variables: *engaged at school*, *confident at school*, and *satisfaction with subject mix*.

### *Total number of credits gained*

It was necessary to model the results for Year 11 ($n$ = 155) and Year 12 ($n$ = 261) students separately.[10] This allows different gradients (different parameter estimates) for Year 11 and Year 12 students, as suggested by the scatter plots in the bottom row in Figure 2. This difference in gradient is possibly because Year 12 students, particularly the more able ones, do more high-credit standards than Year 11 students. The total credit score of Year 12 students increases more rapidly with increasing ability than the score for Year 11 students does.

We could account for 68 percent of the variability in the total number of credits gained by Year 11 students with a model that included *focused and responsible*, *NCEA assessment* (English teachers' views of the students in relation to NCEA), and *cognitive composite*. The three school-wide engagement measures did not add significantly to the models (and in fact were too strongly correlated with the variables already in the model to be included, to avoid multicollinearity).

Table 86: Model to predict the total number of credits gained for Year 11 students

| Parameter | Estimate | Standard error | ***p*-value** | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -50.49 | 10.01 | < 0.0001 | | |
| Cognitive composite | 14.28 | 1.88 | < 0.0001 | 28.6 (22.9, 34.9) | 0.56 |
| Focused and responsible | 6.89 | 1.95 | 0.0006 | 23.0 (18.7, 27.8) | 0.29 |
| NCEA assessment | 9.80 | 3.50 | 0.006 | 15.9 (11.5, 20.7) | 0.23 |

The picture for Year 12 students is very similar; the biggest difference is in the rate of increase in the number of credits achieved for each unit increase in each of the explanatory variables. This model accounted for 60 percent of the variability in the total number of credits gained.

[10] A single model, with year level included in an interaction term (required for the differing gradients, particularly for *focused and responsible*, at the two year levels) provided parameter estimates that suggested the data were collinear (in particular, negative parameter estimates for some of the terms that clearly have a positive relationship, and very large standard errors for those estimates). The estimates for models for the years fitted separately, and the variance inflation factors for the models, suggest that the separate models give an adequate and consistent description of the data.

Table 87: Model to predict the total number of credits gained for Year 12 students

| Parameter | Estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -74.26 | 15.63 | < 0.0001 | | |
| Cognitive composite | 17.80 | 2.46 | < 0.0001 | 20.9 (16.1, 26.6) | 0.42 |
| Focused and responsible | 16.50 | 2.79 | < 0.0001 | 24.4 (20.1, 29.3) | 0.36 |
| NCEA assessment | 15.87 | 5.28 | 0.003 | 14.7 (10.2, 20.0) | 0.19 |

What we can read from the models (in a sense, working backwards) is that the total number of credits gained is likely to be a useful measure at either year level of someone's overall cognitive ability. Higher numbers of credits gained are also associated with positive attitudes to work, in particular work for the NCEA, and the ability to focus on the task in hand and take responsibility.

For illustrative purposes, we can divide the explanatory variables into quartile groups, and then calculate the average number of credits gained by students in each of these groups (Table 88). Notice that the number of credits achieved by the Year 12 students in our study is markedly more variable than the number achieved by Year 11 students (the standard deviation is in the order of twice as big).

Table 88: Mean (and standard deviation) of total number of credits by students of different competency levels

| | Cognitive composite | | Focused and responsible | | NCEA assessment | |
|---|---|---|---|---|---|---|
| Quartile group | Year 11 | Year 12 | Year 11 | Year 12 | Year 11 | Year 12 |
| Lowest | 78.7 (29.6) | 146.2 (51.0) | 79.2 (28.9) | 142.8 (53.5) | 88.7 (35.1) | 149.9 (48.4) |
| Second lowest | 111.4 (31.6) | 179.9 (63.1) | 99.6 (35.8) | 186.0 (52.8) | 107.4 (28.7) | 185.8 (63.3) |
| Second highest | 121.3 (31.4) | 210.3 (60.0) | 127.4 (29.5) | 221.8 (51.9) | 121.9 (35.9) | 223.8 (51.5) |
| Highest | 154.9 (26.5) | 249.5 (60.0) | 145.9 (24.7) | 270.0 (43.3) | 147.5 (27.0) | 253.3 (60.3) |

### *Number of Level 1 credits gained*

The situation is much the same as for the total number of credits gained. The model for Year 11 students accounted for 54 percent of the variability in number of Level 1 credits gained.

Table 89: Model to predict the total number of Level 1 credits gained for Year 11 students

| Parameter | Estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -27.9 | 10.6 | 0.010 | | |
| Cognitive composite | 9.6 | 1.9 | < 0.0001 | 22 (16, 30) | 0.38 |
| Focused and responsible | 11.1 | 1.5 | < 0.0001 | 32 (25, 40) | 0.53 |

The picture for Year 12 students is very similar; the biggest difference is in the lower rate of increase in the number of credits achieved for each unit increase in each of the explanatory variables. This model accounted for 45 percent of the variability in the number of Level 1 credits gained.

Table 90: Model to predict the total number of Level 1 credits gained for Year 12 students

| Parameter | Estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 9.3 | 7.6 | 0.222 | | |
| Cognitive composite | 7.1 | 1.3 | < 0.0001 | 19 (14, 25) | 0.34 |
| Focused and responsible | 8.8 | 1.1 | < 0.0001 | 27 (20,33) | 0.46 |

Because some of the Year 12 students increased their number of Level 1 credits while in Year 12, the association between *cognitive competency* and *number of Level 1 NCEA credits* is weaker for Year 12 students; the number of Level 1 credits achieved by Year 11 is a better indicator of cognitive competency and attitude than a more general total where there is no distinction between credits achieved in or after Year 11.

### *Percentage of achievement standards that were "Achieved"*

As this is a measure of the *percentage* of standards achieved, not the total number of credits, there were no marked differences between Year 11 and Year 12 students. A single model could be fitted and this model accounted for 20 percent of the variability in the percent of A results (out of the number of A, M, E, and N results). The only explanatory variables that were statistically significant in the model were the two composite competency measures (Table 91).

Table 91: Model for percentage of A results

| Parameter | Estimate | Standard error | *p*-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 83.2 | 3.97 | < 0.0001 | | |
| Cognitive composite | -3.09 | 0.65 | < 0.0001 | 10.2 (5.9, 16.2) | -0.24 |
| Attitudinal composite | -3.06 | 0.63 | < 0.0001 | 10.3 (6.5, 14.8) | -0.24 |

The relationship between the competency measures and the percentage of As is *negative*, as the students with *lower* competency scores tended to have *higher* proportions of A results. For each unit increase in the explanatory variables (on the 1–10 competency scales), on average, the students had about 3 percent fewer A results (and so correspondingly more M or E results).

A summary of the differences across competency levels, and lack of difference across year levels is given in Table 92. The results for the two year levels are very similar, although the lower percentages for the higher quartile groups are more marked for Year 12 students, and the results for the Year 12 students are consistently slightly less variable than those for the Year 11 students.

Table 92: Mean (and standard deviation) of percentage of A achievement standard results by students of different competency levels

| | Cognitive composite | | Attitudinal composite | |
|---|---|---|---|---|
| Quartile group | Year 11 | Year 12 | Year 11 | Year 12 |
| Lowest | 49.3 (22.1) | 51.3 (14.4) | 51.8 (17.0) | 51.8 (16.1) |
| Second lowest | 48.8 (15.8) | 50.2 (13.2) | 46.8 (18.8) | 48.5 (11.0) |
| Second highest | 43.1 (16.8) | 45.5 (14.1) | 46.2 (18.5) | 43.1 (12.0) |
| Highest | 33.0 (17.4) | 33.9 (14.2) | 35.0 (17.3) | 33.7 (14.6) |

### *Percentage of achievement standards that were "Merit"*

For this measure there was a difference between Year 11 and Year 12 students. A single model could be fitted (the gradients were the same for the Year 11 and Year 12 students) and this model accounted for 53 percent of the variability in the percent of M results (out of the number of A, M, E, and N results). The explanatory variables that were statistically significant in the model were the *cognitive composite*, *NCEA assessment*, *focused and responsible*, *affirmed at school,* and year level (Table 93).

Table 93: Model for percentage of M results

| Parameter | Estimate | Standard error | ***p*-value** | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -11.75 | 13.19 | 0.37 | | |
| Cognitive composite | 4.71 | 0.49 | < 0.0001 | 21.4 (17.5, 26.2) | 0.44 |
| Focused and responsible | 2.66 | 0.56 | < 0.0001 | 17.2 (14.3, 20.3) | 0.24 |
| NCEA assessment | 2.31 | 1.03 | 0.025 | 9.6 (7.2, 12.5) | 0.11 |
| Affirmed at school | 3.00 | 1.37 | 0.029 | 4.0 (2.4, 6.3) | 0.11 |
| Year level (if Year 12) | -2.64 | 1.15 | 0.022 | 3.6 (0.1, 1.4) | -0.11 |

For each unit increase in the explanatory variables, other than year level (that is, for those on the 1–10 competency scales), on average, the students had 2 to 5 percent more M results. Year 12 students had 2 to 3 percent fewer M results than Year 11 students.

A summary of the differences across competency levels for the three explanatory variables that accounted for the most variance in the percentage of M results, and lack of difference across year levels is given in Table 94. The results for the two year levels are very similar, although the lower percentages for the higher quartile groups are more marked for Year 12 students, and the results for the Year 12 students are consistently slightly less variable than those for the Year 11 students.

Table 94: Mean (and standard deviation) of percentage of M achievement standard results by students of different competency levels

| | Cognitive composite | | Focused and responsible | | NCEA assessment | |
|---|---|---|---|---|---|---|
| Quartile group | Year 11 | Year 12 | Year 11 | Year 12 | Year 11 | Year 12 |
| Lowest | 11.0 (12.3) | 10.8 (8.5) | 11.4 (11.3) | 11.6 (9.4) | 17.1 (15.2) | 13.4 (11.0) |
| Second lowest | 23.6 (15.3) | 18.8 (10.4) | 24.2 (13.5) | 20.8 (10.6) | 21.4 (13.5) | 21.0 (13.2) |
| Second highest | 29.4 (13.8) | 25.7 (14.0) | 28.2 (17.6) | 28.8 (13.6) | 29.0 (17.1) | 27.7 (12.3) |
| Highest | 38.8 (10.4) | 35.6 (10.9) | 34.0 (13.1) | 36.9 (10.2) | 33.9 (14.1) | 33.9 (12.2) |

There is a clear trend of increasing percentage of M results with increasing competency measure, and for Year 11 students to have achieved a slightly higher percentage of M results than Year 12 students. The less able students achieve Merit in just over 10 percent of their achievement standards, compared with the most able students who on average have Merit in over a third of their achievement standards.

### *Percentage of achievement standards that were "Excellence"*

For this measure there was a difference between Year 11 and Year 12 students. A single model could be fitted (the gradients were the same for the Year 11 and Year 12 students) and this model accounted for 52 percent of the variability in the percent of E results (out of the number of A, M, E, and N results). The explanatory variables that were statistically significant in the model were the *cognitive composite*, *attitudinal composite*, *NCEA assessment*, and year level (Table 95).

Table 95: Model for percentage of E results

| Parameter | Estimate | Standard error | ***p*-value** | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | -12.07 | 11.91 | 0.31 | | |
| Cognitive composite | 4.32 | 0.44 | < 0.0001 | 23 (17, 26) | 0.44 |
| Attitudinal composite | 2.36 | 0.55 | < 0.0001 | 15 (12, 19) | 0.22 |
| NCEA assessment | 2.29 | 0.87 | 0.009 | 9 (6, 12) | 0.13 |
| Year level (if Year 12) | -2.32 | 1.02 | 0.024 | 0.4 (0.1, 1) | -0.11 |

For each unit increase in the explanatory variables, other than year level (those on the 1–10 competency scales), on average, the students had 2 to 4 percent more E results. Year 12 students had about 2 percent fewer E results than Year 11 students.

A summary of the differences across competency levels for the three explanatory variables that accounted for the most variance in the percentage of E results, and lack of difference across year levels is given in Table 96. The results for the two year levels are similar, although the lower percentages for the higher quartile groups are more marked for Year 12 students, and the results for the Year 12 students are consistently slightly less variable than those for the Year 11 students.

Table 96: Mean (and standard deviation) of percentage of E achievement standard results by students of different competency levels

| | Cognitive composite | | Attitudinal composite | | NCEA assessment | |
|---|---|---|---|---|---|---|
| Quartile group | Year 11 | Year 12 | Year 11 | Year 12 | Year 11 | Year 12 |
| Lowest | 2.2 (4.2) | 2.0 (3.2) | 2.4 (4.6) | 2.8 (6.7) | 5.7 (9.4) | 3.0 (5.1) |
| Second lowest | 9.4 (13.2) | 5.3 (6.7) | 8.4 (9.7) | 6.5 (7.5) | 9.9 (14.0) | 6.7 (9.1) |
| Second highest | 13.3 (15.1) | 8.8 (10.0) | 11.0 (14.0) | 10.7 (11.0) | 12.4 (13.1) | 10.3 (10.7) |
| Highest | 24.9 (14.7) | 21.3 (15.8) | 24.1 (16.7) | 22.2 (16.2) | 19.9 (17.9) | 21.7 (16.8) |

Students in the lowest quartile groups tended to achieve Excellence for only about 2 percent of their achievement standards, while those in the highest quartile groups tended to achieve Excellence for a fifth to a quarter of their achievement standards. The variability in the percentage of E results increased with increasing ability level.[11]

## Predicting Competent Learners measures from NCEA results

If knowing something about attitudinal and cognitive competencies allows relatively good predictions (for education) of NCEA results, does the process work in reverse? If we know NCEA results, can we predict cognitive competency?

A model including the total number of credits gained, the percentage of the achievement standards (AS) that were Merit, and the percentage that were Excellence accounted for 51 percent of the variability in *cognitive competency*.

Table 97: Model for cognitive composite predicted by NCEA results

| Parameter | Estimate | Standard error | p-value | LMG (%) (confidence interval) | Partial correlation |
|---|---|---|---|---|---|
| Intercept | 4.488 | 0.120 | < 0.0001 | | |
| Percent AS that were Excellence | 0.032 | 0.0046 | < 0.0001 | 18 (14, 22) | 0.33 |
| Percent AS that were Merit | 0.024 | 0.0041 | < 0.0001 | 17 (14, 21) | 0.27 |
| Total number credits gained | 0.0047 | 0.0008 | < 0.0001 | 16 (12, 20) | 0.29 |

# Conclusion

Our competency measures are measures of attitudinal and social competency, and of literacy, numeracy, and problem solving. NCEA results are measuring achievement of standards in a number of subject areas. However, we can explain a reasonable amount of the variability in NCEA results if we know an individual's cognitive (literacy, numeracy, and logical ability) and attitudinal skills (in particular the extent to which they are focused

[11] This calls into question the appropriateness of a linear model for a distribution that a) is severely skewed (see the histogram on the diagonal of 0), and b) has indications of heteroscedasticity. The residual plots for the model showed fewer warning signs than expected, but the results for the model should be read with some caution.

on their work and take responsibility for it). And we can explain a reasonable amount of the variability in cognitive skill by NCEA results alone.

NCEA results do allow us to distinguish between students' abilities, even if we only use very rough measures such as the number of credits they achieve or the percentage of their achievement standards that are Merit or better.

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