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TE RŪNANGA O AOTEAROA MŌ TE RANGAHAU I TE MĀTAURANGA

Laying learning foundations to lift success at NCEA level 3

Paper presented at *Symposium on
Assessment and Learner Outcomes 2011*,
Victoria University of Wellington,
September 1-3, 2011

Rosemary Hipkins and Edith Hodgen

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Rosemary Hipkins and Edith Hodgen

New Zealand Council for Educational Research
P O Box 3237
Wellington
New Zealand

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Abstract

Leaving school with sound academic qualifications is known to confer individual and societal benefits. Efforts to increase qualification levels tend to focus on the secondary school years but learners come to these years with a strong “assessment careers” already in place. The longitudinal Competent Learners study offers a unique opportunity to investigate the learning foundations that these students built during their primary school years. This research tracked a sample of around 500 students from preschool, through school, into post-school study or work. Data collected at age 20 included highest level of school qualification. This paper focuses on those students who, despite being in the lowest quartile for reading and numeracy competencies at age 8, nevertheless succeeded in gaining a Level 2 or 3 National Certificate of Educational Achievement (NCEA) award. Looking back across the years of school the analysis identifies learner qualities that contributed to the difference between these students and other early low achievers (who continued to be low achievers). Indications are that the ability to identify intrinsic measures of success and attitudes to learning make a difference. Implications for teaching are discussed.

Introduction

This paper looks back across the years of the Competent Learners (CL) study to ask what makes the difference that allows some young people who initially struggle with some aspect of learning at school to find and follow successful learning pathways in their final years at school while others continue to struggle and indeed may even drop out of school with no qualifications at all.

The CL study is unique in the New Zealand context. This longitudinal study has followed a group of around 500 young people from near age 5 through their school years and beyond. The study has been funded by the Ministry of Education and the New Zealand Council for Educational Research (NZCER).

Extensive data were gathered at near-age 5, then ages 6, 8, 10, 12, 14, 16 and now at age 20. The main aim of the project has been to chart the development of young people’s competencies in the context of home and educational experiences, and to look for factors that might account for differences in patterns of development and young people’s performance. The most recent data were collected between December 2008 and October 2009, when 401 young people aged 20 remained in the study. The sample was originally drawn from the Wellington region, and 84 percent of the young people were still living there in 2009, when those remaining in the study were interviewed and filled out online surveys. The full reports from this phase of the study are available on Education Counts (Patterson, 2011; Wylie & Hodgen, 2011).

The measures used in this discussion

Over the years the CL study has used a wide range of measures. Many of these have evolved over time, partly to accommodate developmental changes in the young people themselves, and partly as a response to emergent findings which were seen to be in need of deeper probing in the next

round of the study. This paper mainly focuses on measures used at ages 8 and 14. Those central to the discussion are briefly introduced here so that the nature of what they measured is apparent. Full details can be found in the reports for the relevant age levels.¹

“Competency” in the context of the CL study refers to combinations of knowledge, skill and attitudes the participants deploy in their everyday lives and learning. Cognitive measures were based on standardised tests and attitudinal competency measures were based on banks of items drawn from similar research projects.

At age 8 the cognitive competency measure was composed of a composite of scores derived from: the Burt Word Reading Test; NZCER’s PAT² test of Reading Comprehension; a specially designed writing task; a subset of 20 items derived from the PAT Mathematics tool; and Raven’s Standard Progressive Matrices which measure logical problem solving. The attitudinal competency measure was a composite of individually designed measures of communication, curiosity, perseverance, social skills with peers, social skills with adults and individual responsibility. Each child’s teacher rated them on a 5-point scale for the various items that made up these attitudinal measures and factor analysis was used to confirm the internal consistency of each measure.

At age 14 the cognitive competencies continued to be measured using the appropriate age-related PAT standardised tests for Reading Comprehension, and cut-down versions of the age-related standardised PAT: Mathematics test, as well as Raven’s Standard Progressive Matrices. Writing was assessed using much the same task as at age 8, but asking for a greater length. The Burt Word Reading Test was no longer used because a ceiling effect became apparent at age 12. A composite attitudinal competency continued to be used at age 14 but, now in their secondary school years, students no longer had just one teacher who knew them really well. The teachers of three core subjects—English, mathematics and science—were asked to rate each student on the attitudinal competency measures and the composite measure was derived from all three sets of responses.

At each age level each student’s cognitive and attitudinal competencies were calculated for each component, such as literacy, numeracy, perseverance. Two overall scores were derived by combining all the relevant separate but highly correlated cognitive and attitudinal measures, respectively. For many of the analyses, the collated scores were divided into four quartile groups as this allowed easy comparison of higher and lower levels of competency. The NCEA study reported here is most concerned with those in the lowest quartile group for one or more composite measures at age 8. Fifty percent of the whole group who were below the lowest quartile for cognitive competencies at age 8 were also below the lowest quartile for attitudinal competencies—being in the lowest quartile group for one was not necessarily an indicator of being in the lowest quartile group for the other.

¹ For a full list of reports, go to <http://www.nzcer.org.nz/research/competent-children-competent-learners>

² Progressive Achievement Test: these are nationally standardised assessment tools that now use a common scale to measure progress across the years of primary school and middle school.

The analysis methods used for this NCEA study

As might be anticipated for such a large and lengthy study, a wide range of statistical methods has been used, depending on the question being probed. The outcome variable for the analysis of NCEA outlined in this paper divides the sample into four groups: those who gained NCEA Level 3 (57 percent of the whole sample); those who gained NCEA Level 2 (22 percent); those who only gained NCEA Level 1 (13 percent); and those who left school without any NCEA qualification (6 percent, with 2 percent unknown).

This paper looks *backwards* from the NCEA variable to compare success at this level of secondary school with earlier cognitive and attitudinal competency levels, primarily using straightforward cross-tabulations of the relevant measures.³ It would be easy to assume that a low level of performance on the cognitive competencies in the study at age 8 heralds a subsequent lack of qualification. But when we take the quartile groups of performance on the competencies at age 8 as our unit of analysis,⁴ and investigate where these quartile groups “ended up” in terms of their school qualifications, we find that many of those who had low performance at age 8 in fact gained NCEA Level 2 or Level 3. This paper explores the factors that supported them to do so (for full details, see Wylie & Hodgen, 2011).

NCEA success in relation to earlier competency levels

Many students who were in the lowest quartile for the different measures of cognitive competencies at age 8 nevertheless went on to gain a Level 2 or 3 NCEA award. As Table 1 shows, 27 percent of those in the lowest quartile group for cognitive competency at age 8 went on to achieve an NCEA Level 3 award, as did 35 percent of those who were in the lowest quartile group for their attitudinal competencies. Thirty-five percent of these students were also in the lowest quartile for Raven’s progressive matrices at age 8⁵ but nevertheless managed to lift their overall learning performance sufficiently to gain an NCEA Level 3 award. Clearly, some aspects of the learning opportunities they experienced between age 8 and the final year of secondary school allowed them to strengthen their overall learning performance.

³ Multivariate analysis was also conducted but the strength of one or two key variables tended to swamp the models derived, making this method less informative than the cross-tabulations reported here.

⁴ The CL sample includes more young people from families with above average incomes and higher levels of maternal qualification compared to this age group nationally. Reflecting this, average scores on the Burt Word Reading Scale, for example, were 7 to 10 points higher for our sample than for a national sample at ages 8, 10 and 12. However, participants’ average score on the Ravens Standard Progressive Matrices did match the average national score: i.e. these really were lower achieving students.

⁵ The lowest quartile scores at age 8 the Raven’s Standard Progressive Matrices ranged from 7 to 37, with a mean of 28.

Table 1 **School qualifications achieved by the lowest quartile on age-8 competency measures ($n = 81-104$)**

Qualification → Age-8 competency level— lowest quartile	No completed NCEA/NQF qualification	NCEA Level 1/other Level 1 NQF	NCEA Level 2 /other Level 2 NQF	NCEA Level 3 /other Level 3 NQF
Cognitive composite ($n = 100$)	17	24	32	27
Attitudinal composite ($n = 100$)	14	23	28	35
Burt Word Reading ($n = 104$) ⁶	11	16	33	40
PAT: Reading Comprehension ($n = 81$)	12	19	33	36
Writing ($n = 101$)	11	20	35	35
PAT: Mathematics ($n = 98$)	17	28	31	24
Raven's Standard Progressive Matrices ($n = 100$)	12	22	30	35

Note: Rows may not add to 100 because of missing data and rounding.

Factors associated with a more successful learning trajectory

The learning trajectories of those who were in the lowest quartile groups for cognitive and/or attitudinal competencies at age 8, but who nevertheless gained a Level 3 NCEA award, were further investigated by cross-tabulating the NCEA variable with a core set of other variables used in the CL study. These include social characteristics, age-14 and age-16 experiences, relationships and views and students' competency levels between ages 10 and 14. These cross-tabulations produced relatively small subgroups for the students in question (numbers ranged from 17 to 32) so some apparent differences did not reach statistical significance (at the $p = 0.05$ or below level). It is likely that some of the trends we found would be statistically significant with larger numbers.

Cognitive competency-related factors

The following cognitive competency factors were associated with later NCEA success for the CL students who started out in the lowest quartile group for cognitive or attitudinal competencies, or both, at age 8:

- improved reading and mathematics achievement between ages 8 and 10
- improved writing achievement between ages 10 and 12
- increased vocabulary scores by age 12.

⁶ The lowest quartile scores at age 8 on the Burt Word Reading ranged from 1 to 37, with a mean of 30; and on the Raven's Standard Progressive Matrices ranged from 7 to 37, with a mean of 28.

The clear implication is that working with lower achieving students to improve their chances of gaining worthwhile school-exit qualifications cannot be deferred until they reach secondary school. The nature of these students' learning trajectories in their final years in primary school, and on into their middle school years, really does matter. Supporting students to make real gains in achievement becomes harder the longer it is left.

Attitudinal competency-related factors

For lower performing students on cognitive competencies at age 8, later success in NCEA was also associated with demonstrating higher scores for attitudinal competencies *by* age 8, with increases in levels of *perseverance* standing out as clearly associated with later NCEA achievement. At age 8, this perseverance factor incorporated the classroom teacher's estimation of the following indicators: persisting with solving a problem; having a good concentration span when working; finishing all class work; finishing all homework; meeting any personal goals the student set; meeting any promises they made. It is not difficult to see how these behaviours, with their strong dispositional components, would stand students in good stead for ongoing learning success.

We found a difference related to student self-reports of *intrinsic* motivation at age 14 when they responded to an item set prefaced with "I feel I'm doing well at school when ...". The items in this *Internal markers of achievement* factor were: I work really hard, I solve a problem by working hard, I do my very best; I get a new idea about how things work; I learn something interesting; something I learn makes me think about things; what I learn really makes sense; and I catch on quickly. Learners in the lowest attitudinal quartile at age 8, but who went on to achieve NCEA Level 3, had higher age-14 scores for this factor compared to those from the lowest age-8 attitudinal quartile who experienced less success in NCEA. The implication here is that teachers need to foster a sense of intrinsic achievement related to both effort and active personal meaning making. This aligns strongly with the message in the New Zealand Curriculum that it is important to foster learning-to-learn approaches at all levels of schooling (Ministry of Education, 2007).

NCEA success in relation to opportunities to learn

At age 14, the *Positive learning environment* factor was composed of the following items, which began with the phrase "the teacher": gives clear expectations; gives clear instructions; gives useful feedback on work; helps me do my best; uses examples that are relevant to me; is interested in my ideas; keeps teaching till we understand; is happy to explain things again; knows about what interests us; treats me fairly; and really understands how I feel about things. The other items in this factor were: I like the teacher; I understand my teacher's attitudes and rules; I can count on the teacher for help if needed; and I enjoy doing the homework I get. These items were part of a longer list to which students responded using a 5-point scale of agreement. Responses to the items

that composed the *Positive learning environment* factor showed a reliability of around 0.9. Students responded to the list for each of English, mathematics and science, giving a clear picture of both similarities and differences between these subjects.⁷

Compared to their peers who did not lift their achievement levels, low performers at age 8 who went on to gain a Level 3 NCEA award were more likely to report at age 14 that they were experiencing positive learning environments in English, mathematics and science and that they were enjoying these classes. Similar patterns of association were found at ages 12 and 16. The *Positive learning environments* factor appeared to be particularly important for the students who showed early low performance in the attitudinal competencies. No doubt students' own attitudes are important to the learning opportunities they experience, but clearly, so is what the teacher does. Almost all the items in this factor describe a teacher behaviour, albeit as perceived by the student.⁸

We found another thought-provoking association at the whole-school level of organisation. Of the 401 young people whose qualification level could be determined, 31 left school without a qualification. Three-quarters of this small group expressed low levels of satisfaction with their school subject mix at age 16 (some were looking back, having left school). A third of the 53 students who left school with NCEA Level 1 were similarly dissatisfied with their subject mix, compared to just 11 percent of the rest of the sample who all left school with NCEA Level 2 or Level 3. The LC research conducted in the earliest NCEA years pointed to timetabling challenges that schools face as they try to accommodate the diverse learning needs of all students within their resourcing constraints (Hipkins & Vaughan, with Beals, Ferral, & Gardiner, 2005). The options on any one timetable line are inevitably limited and across timetable lines these options tend to combine into a small number of "clusters". In turn, these clusters appear to reflect views of "types" of learners. The consequence can be that students are placed in at least some of their subjects because they are perceived by others to fit there, not because they are interested in what is on offer. This can happen to any student of course, but is arguably more disengaging for those already tending to find school less interesting and worthwhile.

Social and leisure associations

Some social and leisure variables showed nonsignificant trends in associations with different NCEA achievement trajectories. Those who left school with no qualification or a Level 1 NCEA award were more likely to:

⁷ For more detail, see the age-14 report (Wylie & Hipkins, 2006).

⁸ Further analysis of the corresponding item set at age 16 showed clear differences between teachers' estimations of the learning opportunities students might experience in their favourite and least favourite classes. (It was no longer possible to use the three core subjects because students have a wider choice of subjects at age 16.) For more detail, see Wylie, Hipkins and Hodgen (2008).

- live in low-income families at age near-5, and again at age 16 (this association was significant)
- report low levels of enjoyment of leisure reading at ages 8, 10, 12 and 14
- have few leisure interests themselves, and have parents who also had less intellectually involving leisure interests such as TV watching
- have friends who engaged in risky behaviour, or have problematic family relationships.

Those who were in the lowest quartile for attitudinal competencies at age 8, but whose mother had a university qualification, were more likely to go on to achieve a Level 3 NCEA award.

Gaining a qualification matters

Leaving school with an NCEA qualification at either Level 2 or Level 3 was associated with having established a more satisfying pathway into early adulthood. NCEA opened doors to study pathways and the learning habits developed at school carried over to ensure a greater likelihood of post-school course completion. By contrast, the small number of students who left school without a qualification were more likely to be unemployed and also to have more regrets. They were less happy and optimistic and more likely to have experienced depression and mental ill health. Post-school study did not improve the opportunities for these young people: instead, they had higher rates of not completing courses they undertook. These findings indicate the importance of leaving school with a sound academic qualification on which to build, in combination with the disposition to decide on a course of action and then stick to it.

Looking back from NCEA success has allowed us to sketch a picture of opportunities that can potentially make a difference for students whose early learning record might seem to predict later failure, with all the associated negative consequences outlined above. Teachers, parents and the young people themselves can all contribute positively to this success. The association between higher levels of intrinsic motivation and subsequently gaining a Level 3 NCEA award is particularly interesting, given the New Zealand Curriculum focus on learning to learn and key competency development, with their metacognitive dimensions, and the assessment policy impetus to more directly engage learners and their families in the assessment of students' learning progress (Ministry of Education, 2010). By contrast to the student-centred ethos of these policies, recent fine-tuning of NCEA has focused on extrinsic motivation (via enhanced Merit and Excellence levels at which the award can be made). Schools believe these changes have been successful in motivating higher achievers but not so much the types of students who are the focus of this paper (Hipkins, 2010). The analysis reported here suggests that helping these early low achievers gain NCEA success requires a different type of solution, with greater attention paid to the nature of the learning opportunities that students experience, not the rewards they might or might not gain.

Limitations to this analysis

When considering the implications of these findings we do need to keep in mind that the judgement of each student's *attitudinal* competencies at age 8 was made by one teacher (but this reservation does not apply to the cognitive competencies). In some cases a poor relationship might have resulted in an underestimation of the child's attitudinal competencies. This could then account for some of the lift they appeared to show by age 14. Attitudinal judgements of one learner made by three different teachers at ages 14 and 16 certainly showed this possibility for variation.

Another potential limitation of the analysis discussed in this paper is that we have taken no account of the *qualities* of the Level 2 or 3 NCEA award achieved. What was the mix of unit and achievement standards? How many of the standards were achieved at Merit or Excellence levels? Did the student also get University Entrance? (This requires the credit total to be spread in a way that indicates a focus on several subjects, rather than a scattergun spread across many.) These qualities do matter to the learning pathways kept open (see, for example, the salutary case studies in Madjar & McKinley, 2011). Countering this limitation, the main report at age 20 does show that gaining a Level 2 or 3 NCEA award is, in and of itself, a useful pointer to productive further learning pathways (Wylie & Hodgen, 2011). A Level 2 or 3 NCEA award—however the award is composed—does open doors to ongoing learning opportunities, and better life chances. Aspiring to increase the numbers of students who reach this academic milestone should be seen as important work in every New Zealand school.

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