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Measuring "Value Added" in New Zealand Schools

ROB STRATHDEE AND THERESE BOUSTEAD

Abstract:

The New Zealand Curriculum, Evaluation and Management (CEM) Centre is an educational research unit based at the University of Canterbury. It is taxed with supplying statistical measurement and analysis services for schools on the progress of their students. In particular, it provides data on the value added progress of participating schools. This article aims to situate the work of the CEM Centre in contemporary educational debates, and to inform the wider educational community about the CEM Centre's work.

The New Zealand Curriculum, Evaluation and Management (CEM) Centre is an educational research unit based at the University of Canterbury. Through the provision of clear graphical feedback and comparisons against thousands of other school students throughout New Zealand, it supplies high quality statistical measurement and analysis for schools on the progress of their students. The key innovation of the CEM Centre is to provide data on the value added progress of participating schools. It achieves this by gathering baseline achievement data on every student, and then comparing this to subsequent assessments of their achievement.

Comparisons of student progress can be made in many ways. For example, an individual student's achievement gain in a range of curriculum areas can be compared to the achievement gain of the whole cohort of students. From individual pupil progress scores, calculations of a school's effectiveness in various subject areas can be made. Moreover, these progress scores also allow schools to compare progress between groups (such as between high and low achievers). This activity situates the CEM Centre's research activities firmly within the indicator systems and school effectiveness research paradigm.

CEM Canterbury is modelled on the successful CEM Centre at Durham University, which has been in operation since 1983. The CEM Centre (Durham) has a full-time staff of over 60 people, works in 30 countries and deals with information from more than one million pupils aged 3–18 years (Tymms & Coe, 2003). The CEM Centre (Canterbury), established in 1999, is much smaller, with a staff of four, collecting data from approximately 31,200 students in over 360 primary, intermediate and secondary schools throughout New Zealand.

The creation of the CEM Centre comes at a time when many within the education sector in New Zealand are demanding quality information about the impact of schools on students. This demand is being driven by a number of forces, including government, which wants better feedback about the impact of its educational investments, and parents, who want better information about the progress of their children. Demand for value added measures of school performance has also been driven by schools, which want to improve their effectiveness, and demonstrate it publicly. In this respect, the development of value added has also been a reaction against the introduction of secondary school "league" tables, which typically rank schools on the basis of their performance in examinations. Critics point out that league tables are a poor measure of school performance, because they do not take into account the background characteristics of students, nor do they account for the level of achievement students have attained before they entered school. Commentators argue very cogently that league tables, which report outcomes only in terms of levels of achievement, say more about the backgrounds of students than they do about the quality of teaching they have received and the impact of schools on learning outcomes.

The development of value added assessment has stimulated strong debate within the academic community in the United Kingdom, the United States and elsewhere. It would be fair to say that the debate has become polarised between those who see benefits to students, government, parents and schools in assessing the "distance travelled" by school students, and those who see value added as a further example of the influence of neo-liberalism on schools. Proponents of value added see it as a way of empowering teachers and improving the quality of instruction and professional development (Reynolds & Teddlie, 2001), while critics see it as a further manifestation of the "name, blame and close down" approach to school improvement (Thrupp, 1999). This approach was closely aligned with neo-liberal administrations dominant in the 1980s and 1990s in England and New Zealand. More recently, it

has been associated with so-called Third Way administrations, which draw pragmatically on social democratic and neo-liberal approaches to political and economic management. For example, critics in England point out that New Labour has embraced research about value added because it supports their broader neo-liberal agenda (Demaine, 2003, pp. 133-134).

To date, there has been little debate about the merits of the value added concept in New Zealand. This is not surprising, given that the present Labour Government has not pursued the introduction of school league tables as fervently as have administrations in England or the United States. In this article, we attempt to situate the work of the CEM Centre in contemporary educational debates, to inform the wider educational community about the CEM Centre's work, and to illustrate how the data can be used to improve our understanding of schools. We achieve the latter through presenting a preliminary analysis of the relationship between value added and other factors related to achievement, such as students' use of libraries.

The Political Context of Value Added

The origins of value added, and school effectiveness research more generally, can be traced back to major studies conducted in the United States by Coleman et al. (1966) and Jencks et al. (1972), which showed social class to be an overwhelming influence in school achievement. These studies provided a foundation for the belief that schools could not compensate for society (Bernstein, 1970). Teachers and the schools in which they worked were unable to alter students' destinies, which were seen to be relatively fixed. Subsequent accounts built on these foundations by arguing that the education system was designed to reproduce and to legitimise social class divisions (Bowles & Gintis, 1976). The view that schools could do little but reproduce existing social divisions was challenged by later works, such as that by Rutter et al., (1979), Brookover et al., (1979) and Edmonds (1979). These authors argued that although the impact of schools was limited, they could make a difference. Moreover, these studies held out the promise that, through reform and innovation, schools could compensate for society to a limited extent. In turn, this stimulated growth in school effectiveness research, which has come to be seen by its proponents as a discipline in its own right. For example, Reynolds and Teddlie (2001) argue that school effectiveness research has evolved to the point where it has an agreed methodology and has generated a new knowledge base. The discipline

has grown to include researchers from a very wide range of countries, and as further evidence of its success, Reynolds and Teddlie cite their flagship publication, the international journal *School Effectiveness and School Improvement*. They point out that the journal only began in 1991, but now sits in the middle of international rankings in terms of citation counts (2001, p. 99). An additional achievement of the discipline has been to dispel the myth that schools can do little to compensate for student background characteristics that limit achievement.

By demonstrating the impact of schooling on progress and achievement, proponents of school effectiveness research argue they are empowering teachers and providing much needed feedback on the effectiveness of changes in teachers' practices and the like (Fitz-Gibbon, 1992). In this way, the school effectiveness research provides a way for schools located in areas of low socio-economic status to demonstrate the value they have added to their students. Indeed, some school effectiveness researchers maintain that schools serving disadvantaged students are likely to benefit from value added assessment more than schools serving advantaged students (Teddlie & Reynolds, 2001, pp. 64-65). This is because disadvantaged students generally start with lower levels of achievement, and can show significant progress. Proponents of value added also argue their findings will empower disadvantaged schools by showing that there exists greater variation in value added between departments within individual schools than between whole schools (MacBeath & Mortimore, 2001, pp. 10-11). Such findings are seen to undermine the use of crude league tables or other indicators that support competition between schools.

However, not all support value added research. Because it offers a politically and socially decontextualised assessment of the impact of schools, which is consistent with neo-liberalism, some critics go as far as to describe it as politically promiscuous (Slee at al., 1998). They argue that school effectiveness researchers are too close to, and too ready to embrace, the goals of government. There is also a risk that the technology developed by "progressive" school effectiveness researchers will be used by others in unintended ways.

In the main, school effectiveness researchers are unmoved by such criticism and see themselves as pragmatists who prefer to work within the confines of the current social order to improve learning outcomes (Teddlie & Reynolds, 2001, p. 69). For some, this explanation is inadequate, and whether school effectiveness researchers like it or not, there is always a politics of schooling, and school effectiveness

researchers play a vital role in supporting particular views of the world (Thrupp, 1999). For example, through their actions, some school effectiveness researchers contribute to the neo-liberal and neo-conservative agenda by helping to erase the idea that social class background is a key influence on achievement. One way they do this is by understating the relationship between social class and achievement. An example of this position can be found in the views of Carol Fitz-Gibbon, the founder of the Durham CEM Centre, who has argued that to build social class into indicator systems was to use social class as an excuse for differences in progress (Fitz-Gibbon, 1992). Such positions contribute to the erosion of class and have added to the view that schools can function neutrally. Indeed, some argue such views are what makes working with school effectiveness researchers worthwhile for politicians (Demaine, 2003, pp. 133-134). However, Fitz-Gibbon's (1992) views are not widely supported within school effectiveness research and many attempt to account for social class in their modelling.

A further issue for the critics is that many of the promised progressive outcomes of value added research are elusive and unlikely to be realised. Thus, they question the extent to which school effectiveness researchers can deliver on their promise to improve schooling. For example, most researchers in the field report a "school effect" of between 5 and 15 percent. In other words, when all other factors are held constant, the difference between the most effective and the least effective schools is between 5 and 15 percent (MacBeath & Mortimore, 2001). In New Zealand, studies by Harker and Nash (1996) and by Lauder et al. (1999) report a school effect of between 5.5 and 7 percent and between 12 and 21 percent respectively.

Not only is the proportion of difference that can be attributed to the school effect close to what we might have expected on the basis of Coleman's 1966 analysis, but fundamental problems exist with the models used by school effectiveness researchers. One problem is that it is very difficult to define, let alone accurately measure, background and contextual factors that may impact on achievement. Because many aspects of reality that are related to school effectiveness cannot be measured in a manner useful to quantitative research methods, it is difficult to isolate a school effect. Critics point out that schools are complex social organisations and it is not possible to develop with any degree of certainty an understanding of precisely how they add value. Moreover, even if proponents of school effectiveness research are correct in their belief that improvements can be made to the instruments, such

that they become better at distilling "school effects", it is difficult to convert this knowledge into improved school practices (Fink, 2000, pp. 5-6).

Another problem resides in the nature of what we consider "effective" to mean. The main focus of value added is on cognitive achievement. Although this is an important aspect of schooling, it is not the only one. The danger here is that other areas regarded as important aspects of education are minimised, as schools attempt to increase their "effectiveness". Indeed, there is a need to avoid the dominance of assessment-led development, in which assessment has a colonialising effect and can distort the educational enterprise by, for example, introducing a "management by numbers" approach to education. Evidence from England suggests that secondary school league tables are having this effect, with some secondary schools attempting to increase their performance in the league tables through rationing access to education. For example, students perceived by teachers to have ability, but who are underachieving, gain access to support ahead of those students who are seen as achieving to capacity and those students whose cases are seen as hopeless (Gillborn & Youdell, 2001, p. 89).

These criticisms raise important issues about the limits and possibilities of school effectiveness research. Rowe argues that "even when suitable adjustments for students' intake characteristics and prior achievement have been taken into account, the resulting value added estimates have too much uncertainty attached to them to provide reliable rankings" (2000, p. 80). In this respect, until school effectiveness research is able to define and incorporate contextual variables into its modelling, it will have a limited effect. Indeed, one effect of school effectiveness research and the neo-liberal critique of education has been to shift the blame for educational failure towards educators. Because, school effectiveness research is premised on the idea that schools can be improved through the development of better instructional methods, the creation of new curricula, and the like, it presents the view that teachers and, to a lesser extent the schools in which they work, can compensate for certain cultural forms. A good example of the influence of the school effectiveness research can be seen in the way policy makers and politicians in New Zealand have formed the view that teacher quality has the single biggest influence on student learning. For example, New Zealand's Ministry of Education suggests that differences in teaching quality account for between 16 and 60 percent of the difference in student achievement (New Zealand Ministry of Education, 2004). This

belief has buttressed investments in teacher education and increased certification requirements for early childhood teachers. The Ministry of Education does not provide sufficient information about how the figures were derived, and the limits are extremely wide, but the official position adds to the view that teachers make the critical difference to student achievement.

Although it is highly likely that the Ministry of Education has overstated the impact of teaching quality on student achievement, quality teaching is nevertheless a crucial aspect of learning. Indeed, it is critical that pedagogy and school organisation be constantly scrutinised to improve learning outcomes. In this respect, Rowe (2000, pp. 82-83) argues that although serious limitations exist, value added measures when used sensitively can provide useful information to schools about student progress. For example, they can be used as an indicator system to identify "outliers" – those schools which perform much better or much worse than expected – and they can be used by "failing" schools to demonstrate that they do indeed work effectively with their own students. Moreover, there is considerable work that could be done to measure effectiveness in ways that further challenge neo-conservative efforts to naturalise inequality. For example, school effectiveness could place greater emphasis on measuring the impact of contextual variables such as the impact of the school mix on achievement.[1]

Debate about the validity and underlying philosophy of value added research will continue, and school effectiveness researchers will continue to respond to critics' challenges by refining the technology of assessment to improve their usefulness. For example, new "affective" measures of learning outcomes have been developed (e.g., student satisfaction and the like). Another point in the favour of proponents of school effectiveness research is that although school effectiveness researchers have only managed to identify a relatively small school effect, the difference between outliers can be significant. Thus, the cumulative effects of attending "effective" or "ineffective" schools is likely to be even greater.

It should be stressed that value added is just one way amongst many to assess progress, and teachers need to continue to measure outcomes in a variety of ways. Moreover, the insights generated by critics of schooling such as Bernstein (1970) and Bowles and Gintis (1976) must continue to inform our understanding of how schools work to reproduce inequality. Nevertheless, even if value added measures are unlikely to change social divisions, the possibility that they can improve our

understanding of how schools operate and improve student outcomes cannot be dismissed. Moreover, they can be used by schools to demonstrate their performance.

Whether or not such a cautionary approach is like "throwing a wet fish at a runaway train" remains to be seen (Rowe, 2000, p. 87). As a first step, school effectiveness researchers need to continue developing and refining contextual variables that can improve our understanding of the relationship between schools and the communities in which they are situated. Another way to strengthen the use of value added and to guard against its misuse, is to develop a strong research and teaching community. We shall return to this point in the conclusion. For the moment, discussion turns more directly to the work of the CEM Centre at Canterbury, particularly its concept of "distributed research".

The Canterbury CEM Centre

The CEM Centre's work is driven by the needs of schools and is encapsulated in the concept of "distributive research" (Fitz-Gibbon, 1995). Distributive research encourages schools to use value added data to target and monitor individuals, groups and subjects, and to undertake further investigation within the school. For this to be effective, value added analysis should be statistically valid and easily understood (Tymms & Coe, 2003). As indicated above, over time the amount of progress pupils make and the influences on that progress will vary. This is a result of a range of factors including the quality of teaching and learning, and the social context in which pupils live and learn. In distributive research there is a balance between clarity of analysis and complexity of contextual factors. If the analysis is based on prior achievement as the strongest indicator of later achievement, then data should be supplemented with a collection of information that focuses on possible factors affecting pupil progress.

The CEM Centre has been collecting value added data in New Zealand schools since 1999. Based on systems developed in England (Tymms & Coe, 2003) the Centre currently operates a number of value added programmes at the primary, intermediate and secondary school levels, and plans are in progress for further projects at primary level. The Centre defines "value added" as the measurement of relative individual progress showing whether a pupil kept pace, lagged behind, or progressed further than others of like ability within the same subject. Analysis is based on prior achievement, and quality measures of progress are best obtained over fairly long periods of one to three years.

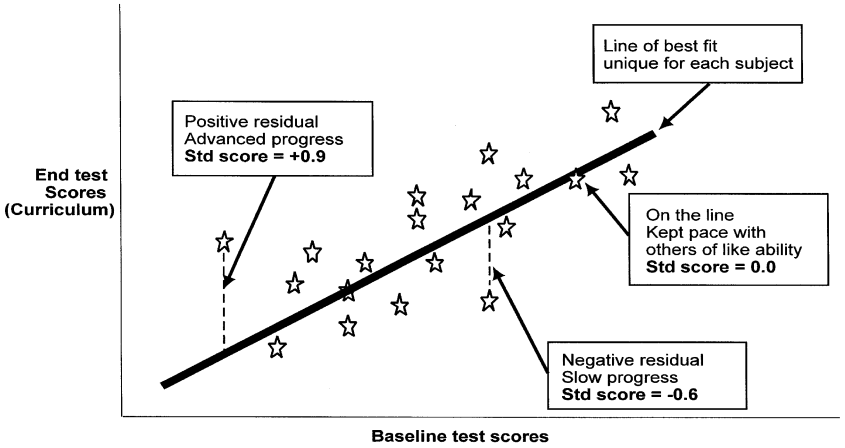

Figure 1 Simplified diagram showing how value added is measured

Pupils normally increase in academic achievement with age, and the amount of improvement can be thought of as progress. Over time, the level of progress will naturally differ between pupils and between years. An initial assessment of basic skills is administered at the beginning of the measurement period and curriculum-based assessments are done at a later date. Progress is measured statistically from the initial baseline assessment to the end assessments. Figure 1 shows how the statistical measurement is reported. Each star represents a pupil in the school, and each pupil is positioned by his or her first and final assessment scores. The Line of Best Fit is the national line based on all pupils registered for that project in a particular subject. The vertical distance (dotted line) from the pupil to the heavy trend line is said to be the residual or value added score.

As part of their feedback, schools are given a graph showing the Line of Best Fit based on the national data, and their own pupils' scores scattered around this line. As depicted in Figure 1, a pupil with a standardised residual (or value added) score of 0.0 is keeping pace with others who started on the same baseline score. In the chart, they would be located on the Line of Best Fit. If a value added score is positive, e.g. 0.9, the pupil has progressed further than expected and would be located above the Line of Best Fit on the chart. A score of 2.0 would show significant progress. Likewise, if a value added score is negative, e.g. -0.6, the pupil has not kept pace as expected. A score of -2.0 would indicate significantly low relative progress.

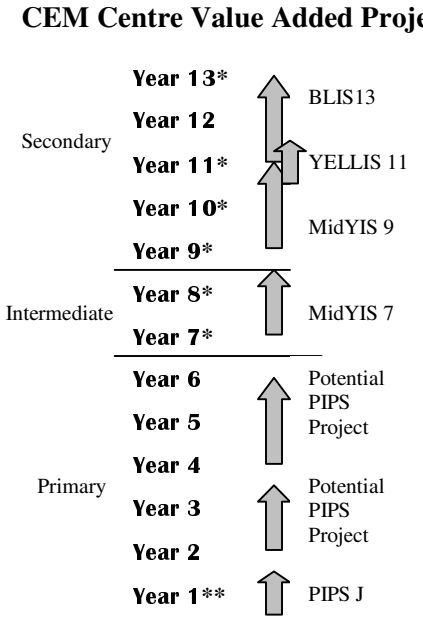

Figure 2 The range of CEM Centre's current and planned value added projects available in the primary, intermediate and secondary school levels in New Zealand

The CEM Centre calculates the school's progress in a variety of subjects and traces subject progress over time. In addition, from the individual pupil scores, schools can easily compare progress between groups (such as gender, ethnicity). At present, the CEM Centre provides data on pupil performance in between 18 and 22 subjects at Years 11 and 13, and English, mathematics and science at Year 8. In addition, the CEM Centre currently runs five value added projects, and plans are afoot to add more projects at the primary level.

As described above, quality of teaching, availability of resources and many other factors both inside and outside the school can affect a pupil's progress. To help account for these factors, for most of the projects the CEM Centre uses pupil perception questionnaires to give a wider educational perspective on progress. The range of projects is outlined in Figure 2, and each project name is an acronym, such as Performance

Indicators in Primary Schools (PIPS), Middle Years Information System (MidYIS) or Bursary Level Information System (BLIS). Year levels that include pupil attitude questionnaires are also indicated in Figure 2.

The Centre will continue to build the number of participating schools. It is these schools that provide the comparison cases. In addition to this work, other areas that require further development include creation of more contextual variables in all projects. The Year 11 Information System (YELLIS) project asks pupils about cultural capital, career aspirations and attitudes to learning. It also uses the Elley-Irving scale (Elley & Irving, 2001) for parental job categories. For most of the other projects, this type of information is at the school level rather than linked to individuals. The data on SES backgrounds of schools not opting for the perception questionnaire is limited to the decile ratings of the schools the pupils attend. Similarly, in the future, more work needs to be undertaken in identifying what makes schools, identified by the CEM Centre's method, effective. This is likely to involve detailed case studies in identified schools.

Despite its limitations, the CEM Centre's data set provides an opportunity to assess some of the claims made by critics and proponents of value added, and to present this information in a form that is useful to both schools and researchers. In the following section we present a preliminary analysis of the relationships between achievement and progress and other factors related to achievement, such as the use of libraries, from information that arises out of a YELLIS project. The aim of this section is to demonstrate to readers how the data set might be used in the future to improve our understanding of value added in New Zealand.

Progress and achievement

In 2003, the YELLIS Project registered 3,102 pupils from 22 schools and measured progress from the beginning to the end of Year 11 for 2728 pupils. Like all CEM Centre Projects, YELLIS calculates value added results for each pupil and reports results to participating schools that are compared to the cohort average. In addition to achievement data, the YELLIS Project gathers data (through questionnaires) on student attitudes. Based on previous research literature, Fitz-Gibbon (1996) identified categories of variables that were found to influence progress, such as attitudes to schools, aspirations for the future, quality of school life, attitudes to lessons and homework, home background (cultural capital) and freedom from fear in schools. Each area in the YELLIS

questionnaire was covered by a number of specific questions. For example, "cultural capital" included questions about the number of books in the home, use of resources (libraries), proportion of time reading for pleasure, frequency of parents asking about their children's learning, and frequency of visits to museums and galleries. The purpose of gathering these data was to provide schools with information on factors which other previous research had indicated were related to progress. Cultural capital measures were included in this analysis to illustrate the possible relationships that could be investigated between home background and progress, or home background and achievement.

For the YELLIS project, prior achievement is measured from an assessment administered at the beginning of Term 1, and final achievement is taken from National Certificate in Educational Achievement (NCEA) assessments in Year 11. In NCEA, a pupil doing *achievement standards* can attain either "achieved", "achieved with merit" or "achieved with excellence". A *unit standard* is simply scored as "achieved". This means that achievement standards are effectively graded, while unit standards are not. For this illustration, a subject area is defined by a wide range of associated unit and achievement standards. A discriminating score is obtained by taking into account the number of standards, the credit level of each standard, and the result obtained. The final outcome score used in this illustration is defined as the average of all subject scores for pupils registered for 14 or more credits in at least one subject area. The figure of 14 credits is the New Zealand Ministry of Education's definition of full-time study.

When considering the link between our home background variables and achievement or progress, it is important to remember that achievement and progress are not necessarily the same. A higher outcome score implies greater achievement. Progress, as described earlier, is the difference between two achievement scores, relative to a benchmark. This means that a pupil with a low prior achievement score can have a high progress score if his/her increase between assessments is large.

To illustrate, on a scale from 0 to 1 (where 1 is the perfect score), the information from the 2003 YELLIS Project has a statistical correlation of 0.72 between progress and outcome achievement. In the Figure 3 scattergram opposite, the horizontal axis has the Year 11 overall average score based on NCEA calculations, while the vertical axis shows the progress score, where a value of zero means "keeping pace".

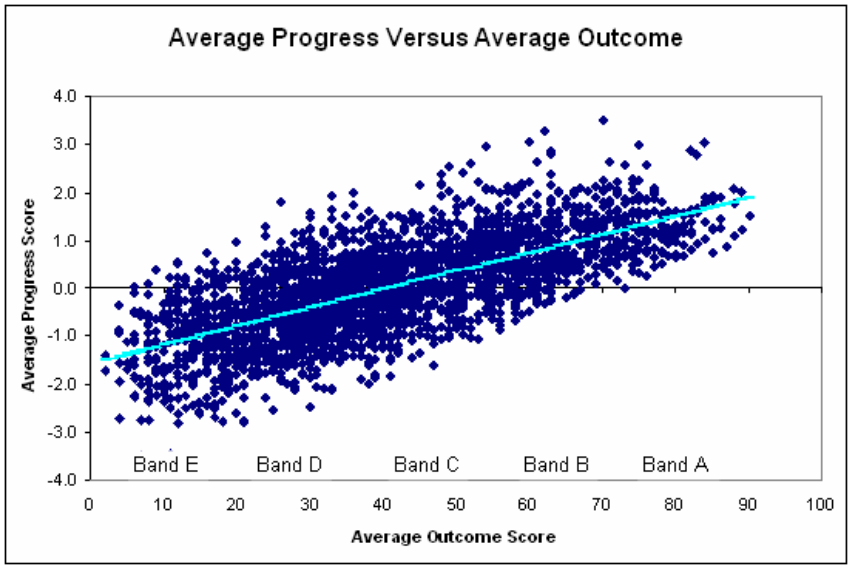

Figure 3 Scattergram showing average progress against average outcome in the 2003 YELLIS Year 11 project

To assess the relationship between outcomes and the data gathered in the student questionnaires on the use of libraries and the like, we first grouped all learners in achievement outcome bands, on the basis of a series of calculations. Broadly speaking: pupils in Band A passed all standards and obtained at least a merit average; pupils in Band B gained some merit and mainly credit in all standards that they registered for; pupils in Band C gained credit in all or most of the standards; pupils in Band D gained credit in about half the standards; pupils in Band E gained credit in fewer than half the standards.

Figure 4 shows that pupils with higher achievement results had more than 50 books in the home, used both the school and other libraries, read for pleasure, and visited museums and galleries. Parental interest in learning appeared to be unrelated to achievement and was consistently high for all achievement bands in 2003 YELLIS 11.

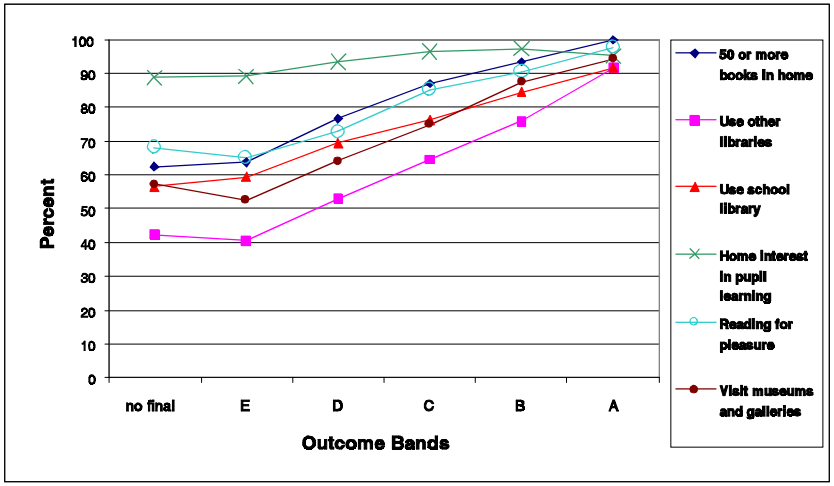

Figure 4 Responses for each Year 11 outcome achievement band based on 2692 pupils registered for 14 or more credits in at least one subject area

In Figure 4 and Figure 5, "no final" refers to responses from pupils without final achievement scores. The percentage of pupils for whom no final score was obtained (for whatever reason) who used the various "cultural capital" resources was similar to the corresponding percentage of pupils in the lowest outcome achievement category (Band E).

Having discussed the relationship between our measures of cultural capital and achievement, we can focus on the critical issue of progress. In the YELLIS Project, progress is summarised as seven categories ranging from "significantly below average" progress to "significantly above average" progress, where "average" means keeping pace with others who obtained a similar prior score. Progress scores equal to 2.0 or greater are defined as significantly above average; between 1.0 and 1.99 as well above average; between 0.5 and 0.99 as above average; between -0.49 and 0.49 as average; between -0.5 and -0.99 as below average; between -1 and -1.99 as well below average; and equal to -2.0 or less as significantly below average.

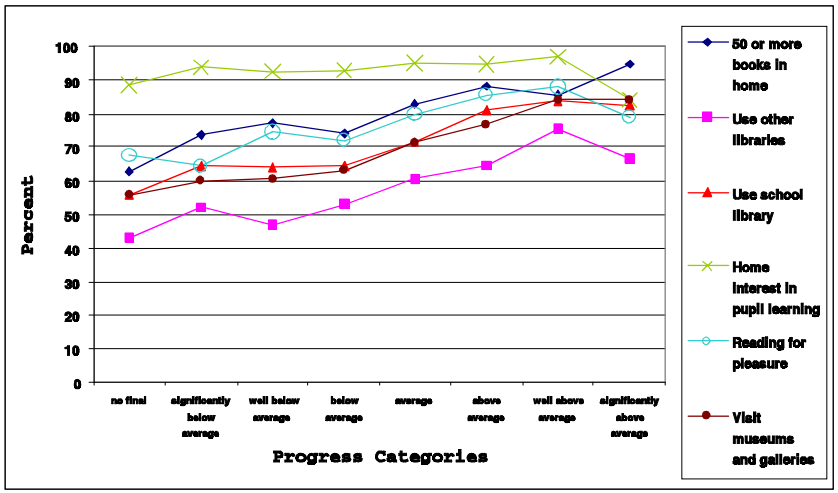

Figure 5 Responses for each Year 11 progress category based on 2727 pupils registered for 14 or more credits in at least one subject area

As with achievement in Figure 4, an increase in progress, irrespective of achievement, corresponds with an increase in the percentage of Year 11 pupils who had more than 50 books in the home, used both the school and other libraries, read for pleasure, and visited museums and galleries (Figure 5).

Conclusion

In this contribution, we have described the debate over value added assessment and situated the work of the CEM Centre in this debate. We have also demonstrated how the CEM data can be used to improve our understanding of the relationship between progress and other factors associated with learning. In this respect, it was shown that both high achievers and pupils making extremely good progress, irrespective of achievement level, used more resources and read more for pleasure. They also have more books in the home.

Although it carries risks, we believe that value added research, used sensitively, is a useful addition to the range of evaluative instruments used by schools to assess pupil progress. In addition, value added can be a powerful weapon in the hands of the teachers and researchers as they face up to questions about school and student performance. One way to

strengthen the use of value added and to guard against its misuse, is to develop a strong research and teaching community. In this respect, the Ministry of Education is keen to build links between research and teaching. For example, although there are strong financial incentives for the move, much of the justification for merging the colleges of education with universities is that it will increase the relationship between research and teaching. The work of the CEM Centre contributes to this goal by providing reliable and accessible information about student achievement and progress. However, to maximize the benefits of this "distributed research" it is important that teachers be well informed of the limits and possibilities of value added assessment. This will require a continued commitment from universities, teacher unions, and others involved with teacher professional development to develop and refine the concept.

Note

1. The school mix effect is the effect on achievement that results from grouping students from similar backgrounds together in particular schools.

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The authors

Rob Strathdee is a Senior Lecturer in the School of Education Studies at Victoria University of Wellington. His teaching and research interests are in the sociology of education and in political economy.

Therese Boustead is Director of the Curriculum, Evaluation and Management (CEM) Centre at the University of Canterbury. Her research interests are in mathematics and computing education, indicator systems, assessment and evaluation.