

## Reflections on Class Size and Teacher Quality

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EXECUTIVE SUMMARY

Teachers all over the world have long called for lower class sizes, and New Zealand is no exception.

Research ostensibly demonstrating a link between smaller classes and greater student achievement has been cited so often that parents and other members of the community have joined the call. Governments, in many cases, have responded. Yet a thorough appraisal of the research on class sizes reveals the following:

- Many studies have methodological problems that make their application in a real world context doubtful.
- Many studies have introduced other reforms such as curriculum changes at the same time as class size reduction, making their individual effects impossible to determine.
- The large majority of studies have found no significant effects of class size on student achievement. The remainder have shown small benefits, usually only when classes have less than 20 students.
- Reducing classes from 25 to 20 would obtain only two minutes more individual instruction per day.
- Class size has less effect when teachers are competent.
- The single most important influence on student achievement is teacher quality.

It is far more valuable, both in educational and economic terms, to have good teachers than lots of teachers. The first priority is to ensure that the current and incoming teaching force is as good as it can be, by improving teacher education and in-service training and removing ineffective teachers.

**Effective teaching is much more important than the number of children in the classroom.**

## **Introduction**

In the area of school reform, class size reduction seems to hold all the aces. It is popular with academics, teachers, students and parents alike. It seems intuitive that to have fewer children in a class is better.

It is often claimed that research unequivocally confirms this. Examination of the research on class sizes and student achievement, however, reveals that this claim is false.

A thorough review of the research on class size and student achievement shows that much of it is flawed in ways that make it unreasonable to expect the same results in a real-world situation. Many studies have introduced other reforms at the same time as class size reduction, making the effect of class size alone impossible to determine. In most cases the persons participating in the experiment were motivated to produce positive results. Only a small minority of studies found any positive effect of smaller classes on student achievement, usually in classes of less than 20, and few of these effects were large.

The findings on class size suggest that there is little if any reason to believe that class reduction in the order of 25 students to 20 students would have an effect large enough to warrant the cost. Research tells us that effective teaching is much more important than the number of children in the classroom. It is therefore much wiser to invest in the quality of teachers, rather than quantity.

## **Class Size and Achievement**

Several large scale studies and many smaller ones find a relationship between learning and class size. But a closer examination reveals crucial methodological problems and generalisations that make the findings less than definitive, even meaningless.

Reviewers of this research, who present it as evidence for the importance and efficacy of class size reduction, often either ignore these problems or acknowledge them in passing. The caveats are such that much of the research is inapplicable in other contexts. That is, the same results cannot be expected under different circumstances.

Hundreds of studies can be cited on the relationship between class size and student achievement. Education researchers Ronald Ehrenberg and colleagues claim that

Most have found some evidence that smaller classes benefit students, particularly in the early grades, and especially kids at risk of being underachievers. Unfortunately, most of these studies were poorly designed. Teacher and student assignments were rarely sufficiently random; a number of studies were simply too brief or too small, and too few had independent evaluation.<sup>1</sup>

Other researchers, such as Eric Hanushek, go further, arguing that most of these studies are not only flawed but also fail to produce convincing evidence that class size has any significant effect on student achievement.<sup>2</sup> Hanushek is not without his critics and their points of contention with his research should be considered.

## **Hanushek versus Krueger**

Economists Eric Hanushek of Stanford University and Alan Krueger of Princeton University have used different methods to conduct meta-analyses of studies providing estimates of class size effects up to 1994. The debate that has taken place in recent years between these two economists is very important.

Hanushek is well-known for his research demonstrating that there is no direct relationship between financial resources and school performance. He claims that only a small minority of studies show a significant positive effect of smaller classes on student achievement.

Krueger is best known for his work on Project STAR. One of the largest and most influential studies of class size reduction, its results are frequently cited as proof of the benefits of smaller classes.

In a meta-analysis of 59 studies yielding 277 estimates of the effect of class size on student achievement, Hanushek found that 14.8% of these estimates were positive and significant. That is, students in smaller classes showed significantly higher achievement than their counterparts in larger classes. The remaining estimates were either insignificant (no difference in achievement—71.9%) or negative and significant (smaller classes had lower achievement—13.4%).<sup>3</sup>

Krueger argues that Hanushek's method of selecting studies, extracting and counting the estimates is irrational and has produced a biased result. Krueger's main criticisms are:

- The studies from which Hanushek drew the most estimates are those which produced insignificant or negative results.
- When an insignificant or unexpected result is found by researchers, it reduces their chance of publication so they often look for disaggregated effects, separating the sample into smaller sub-samples.
- This has two consequences. First, an over-representation of insignificant and negative estimates. Second, these estimates are less powerful because the sample size is smaller.
- It is, therefore, erroneous to count each of the effect estimates from multiple-estimate studies and give them equal weight as effect estimates from single-estimate studies.

Krueger proposes three alternative methods of analysis:

1. Estimates should be given weights proportional to the number of estimates yielded in the study. For example, a single-estimate study should be counted as one, but an estimate from a study yielding four estimates should be counted as one quarter.
2. Since some studies are better designed than others, these should be given more weight in the analysis. His suggested method is citation frequency; that is, studies which are referred to more often in academic literature would be given more weight.
3. Because the smaller sub-samples in multiple-estimate studies reduce their statistical power, regression analysis should be used to estimate what the effect estimate would be if the study had yielded one estimate only.

Only the first of these is convincing. If Krueger is correct that multiple estimates from one sample are biased towards insignificance and that these results have a greater margin of error, they probably should have less weight in a meta-analysis and therefore less influence on the results.

Proposed methods 2 and 3 are problematic. Regarding the second, citation frequency is not a proven indicator of quality. It may just as easily be biased toward studies with one type of result or the other. As for the third, the further a statistical analysis moves from the original data, the more room for error and the less meaningful the results.

Hanushek counters Krueger's criticisms well.

- He argues that multiple-estimate studies provide more information than a single estimate and should not be weighted less in an analysis.
- He responds to Krueger's claim of over-representation of insignificant results from multi-estimate studies by restating Krueger's own argument that insignificant results are less likely to be published, implying that there is a bias toward positive significant results in the literature.
- He dismisses the accuracy of deriving single estimates from multiple estimates on the basis that different sub-samples of students (for example, disadvantaged students) will yield different results. This important information is lost with aggregation.

Whether one is persuaded more by the case presented by Hanushek or by Krueger, the strongest evidence is in the statistics produced by their various methods of analysis.

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**Table 1. Krueger's (2002) Re-analysis of Hanushek's (1997) Meta-analysis**

	<i>Hanushek: Estimates weighted equally</i>	<i>Krueger (1): Estimates weighted by inverse of number of estimates in study</i>	<i>Krueger (2): Estimates weighted by citation frequency</i>	<i>Krueger (3): Estimates derived from regression analyses of original estimates</i>
<i>Result</i>				
Positive and significant	14.8%	25.5%	30.6%	33.5%
Insignificant	71.9%	61.2%	62.3%	58.4%
Negative and significant	13.4%	10.3%	7.1%	8.0%

*Source:* Lawrence Mishel and Richard Rothstein (eds), *The Class Size Debate* (Washington DC: Economic Policy Institute, 2002).

Table 1 shows that even when estimates are weighted and manipulated so as to avoid perceived bias toward studies showing no effect of class size—arguably creating bias in the opposite direction—the statistics do not show the ‘systematic evidence of a relationship between class size and achievement’ claimed by Krueger.<sup>4</sup>

If we accept Krueger’s first and least controversial proposal—that multiple estimates from a single study should not carry as much weight as a single estimate (which is debatable even so)—only one in four studies found that students in smaller classes had achievement rates significantly higher than students in larger classes.

### **Other Evidence**

The above conclusion is consistent with the findings of other literature reviews. The recent Inquiry into Public Education in NSW (the ‘Vinson Report’) describes two national data analyses and four literature reviews as follows.

National data analyses:

- Rees and Johnson (2000): ‘. . . no evidence that smaller classes alone led to greater student achievement’.<sup>5</sup>

Literature reviews:

- Glass & Smith (1979): ‘. . . the major benefits of reducing class size occurred where the number of students was less than 20’.<sup>6</sup>
- Robinson & Wittebols (1986): ‘positive effects were less likely if teachers did not change their methods and procedures in the smaller classes’.<sup>7</sup>
- Slavin (1990): Found that classes of less than 20 had a ‘small positive effect on students that did not persist after they were removed from the smaller class’.<sup>8</sup>

Of the above studies, two conclude that there is no lasting benefit to students of reducing class size, one concludes that classes must have less than 20 students to make a difference and one found that the effect of class size was mediated by teaching style.

### Project STAR (Student Teacher Achievement Ratio) in Tennessee:

This has been described as the ‘most scientifically rigorous’ and ‘best-designed field experiment ever’.<sup>9</sup> The findings usually reported are that the positive effects of small classes (13-17 students) in K-3 on achievement levels are cumulative (the longer the time spent in a small class, the larger the effect) and persistent (the effect lasts into later grades when student return to regular size classes). Gains were greater for disadvantaged students.<sup>10</sup>

A more recent analysis of the Project STAR data by its principal researchers is less straightforward. In a 2001 article, Jeremy Finn and colleagues reported that the gains made by small class students on their regular class peers declined when they returned to regular classes, and that significant enduring effects of class size occurred

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only for students who had been in a small class for three or four years. There was only weak and mixed evidence of a larger effect for minorities.<sup>11</sup>

Another study from principal researchers on Project STAR found that classroom practices differed between the small classes that achieved the largest and smallest gains.<sup>12</sup> That is, small class benefits were mediated by the quality and method of teaching.

Many reviews citing the results of Project STAR do not explain the full ramifications of the fact that Project STAR suffers from the methodological problem of the 'Hawthorne Effect'. This is where the participants in an experiment are aware of their role and the potential consequences. Caroline Hoxby<sup>13</sup> explains that this causes three problems: First, incentive conditions are altered, so that results produced under experimental conditions may not necessarily be the results in reality. Second, some people temporarily increase their productivity while being evaluated, especially if they have an interest in the experiment succeeding. Third, people sometimes undo the randomness of the experiment due to external pressures, for instance by placing certain children in small classes due to demands from parents.

Furthermore, the non-random self-selection of schools into the project may be a problem, because such schools might have a greater interest and enthusiasm for such reforms, perhaps inflating the results.

The methodological problems of Project STAR cannot be dismissed as 'criticisms'. They create serious doubt over whether the results achieved by Project STAR would be replicated under different conditions.

Even if these doubts could be set aside, the findings are often inappropriately applied to classes of different sizes. Small classes in Project STAR are 13-17 students. Barbara Nye of Tennessee State University, who has studied the results in detail, has been quoted as saying that 'the public shouldn't necessarily expect the same results from classes of around 20 as those of 15. It's taken a long time to get that message across.'<sup>14</sup>

#### The SAGE (Student Achievement Guarantee in Education) in Wisconsin:

Under the SAGE programme, K-3 classes were reduced to an average of 15 in schools where at least 50% of students were living below the poverty line. A 1999 study showed that 'Year 1 students in the SAGE program achieved better test results than students in comparison schools in language, arts and maths. Results from grades two and three generally follow the same pattern'.<sup>15</sup>

Recent evidence published by the same researchers<sup>16</sup> confirms that students in SAGE schools performed significantly better than students in comparison schools on a variety of measures.

Most importantly, however, this cannot be attributed to reductions in class size. Schools involved in the SAGE programme implemented a variety of reforms at the same time:

1. class-size reduction;
2. a longer school day and increased collaboration with community organisations;
3. a more rigorous academic curriculum;
4. staff development and accountability mechanisms.

In addition, the same team of researchers discovered important differences in teaching styles between SAGE and comparison schools. Instruction in SAGE schools was predominantly teacher-centred as opposed to student-centred.<sup>17</sup> Differences were also identified between classrooms within SAGE schools. Teachers in higher achieving classrooms showed a preference for structured, goal-oriented, explicit instruction and classrooms with established routines where learning proceeds sequentially and at a quick pace. Teachers in lower achieving classes tended to believe that the primary advantages of reduced-size classes are the opportunities to develop critical thinking, to permit students to choose their activities and to have more activities and problem-solving lessons. They also had a more permissive management style and a more random lesson structure.

So, as in Project STAR, the aptitude of the classroom teacher is the key, not the number of children.

**The methodological problems of Project STAR cannot be dismissed as 'criticisms'.**

**The large number of extra teachers demanded by Class Size Reduction led to a deterioration in teacher quality.**

#### Prime-Time project in Indiana:

The initial results of a two year study in 24 schools where classes were reduced to an average of 18 were 'so promising'<sup>18</sup> that K-3 class sizes were reduced in all Indiana state schools. One analysis apparently found 'substantially larger gains in reading and maths achievement for students in small classes'.<sup>19</sup>

This study is arguably even more flawed than those described earlier. It was not random, other changes in school policy occurred at the same time and it is possible that teachers were motivated to ensure that small classes worked.

The extension of class size reduction from the original 24 schools to all schools occurred after only one year. Even reviewers who favour class size reduction have admitted it was therefore 'not possible to compare results for small classes with a comparable group of larger classes'.<sup>20</sup>

#### California Class Size Reduction Initiative:

Inspired by Project STAR, K-3 class sizes in all Californian schools were reduced from a maximum of 33 (average 29) to a maximum of 20. To meet this requirement, schools were forced to hire underqualified teachers.

The Class-Size Reduction (CSR) Research Consortium concluded on the basis of four years of data analysis that 'no strong relationship can be inferred between achievement and CSR'.<sup>21</sup> Christopher Jepsen and Steven Rivkin found that the large number of extra teachers demanded by CSR led to a deterioration in teacher quality which in some cases fully offset any benefits of smaller classes.<sup>22</sup>

#### Hoxby's (2000) Population Variation Study in Connecticut:

In this study, Caroline Hoxby,<sup>23</sup> a Harvard economist, looked at the relationship between achievement and changes in class size due to natural variation in age cohorts in the population. This observational approach avoids possible experimental manipulation effects. She uses two different methods to compare the class size and achievement of adjacent cohorts, taking into account enrolment data and maximum class size regulations.

Neither method shows that smaller classes produced achievement gains. Even given the precision of the data analysis, which allowed tiny improvements to be significant at the 5% level (the improvements found in Project STAR would have been significant if found in this study), the effect of reducing class size was estimated to be close to zero. Further, the results do not suggest that class size reductions are more effective in schools that serve low-income or African American students (in fact, the only significant result was an improvement in fourth grade reading scores of high-income students).

#### UK National Child Development Study

In another observational study of existing data from the 1960s, Maria Iacovou<sup>24</sup> controlled for school type/size and streaming to account for the possibility (and some evidence) that less able children are more likely to be allocated to a smaller class—which would make the difference in achievement in different size classes internally created.

Iacovou looked at average class size at age 7 (excluding students in classes of less than 20 and more than 45) and found that class size was related to student attainment in reading but not maths. A smaller effect persisted to age 11 only for girls and for children from large families. There was no evidence of greater benefit to disadvantaged students.

#### Third International Maths and Science Survey (TIMSS)

Class size effects for 18 countries were estimated using maths and science performance in TIMSS and average class size data. Ludger Woessmann and Martin West<sup>25</sup> found that class size effects varied greatly between countries, with large effects in only two countries: Greece and Iceland.

When they compared these countries with those where no class size effect was found, several things were apparent. First, countries with large class size effects performed below average internationally, whereas those with small or no class size effects performed above average internationally. Also, countries with large class size effects had less educated, lower paid teachers compared to countries with small or no class size effects.

From this they drew several conclusions. First, class size effects cannot be imputed from one country to another because school systems vary significantly. Second, class size is more important when teachers are less effective. Investment in fewer, more highly educated and better paid teachers seems to result in higher student achievement.

## **New Zealand Research**

### Christchurch Health and Development Survey:

A longitudinal study conducted in New Zealand, although not designed to study class size effects, has yielded information that can be used as an observational study.

Michael Boozer and Tim Maloney<sup>26</sup> first compared the results of children permanently in small (19), medium (29.9) and large (33.8) classes between the ages of 8 to 13 years. Only a small number of students were permanently in classes of these sizes over the age period, and the results were insignificant. They then compared students whose *average* class size over this age period was small (21.2), medium (29.7) or large (33.2). They found significant effects only for children in *persistently* smaller average classes between the ages of 8 and 13, on both childhood test score improvements as well as on early adult outcomes such as completed education and unemployment.

### Third International Maths and Science Survey

Because many New Zealand schools failed to provide class size data, leaving too few schools to form a sample with sufficient statistical power, no relevant information from this study is available for New Zealand.

## **Implications**

Reducing class size is very expensive. The cost of 'reducing the overall average ratio of State primary and secondary students to teaching staff by one pupil (to 18.4 and 14.5 respectively)' has been estimated to be around NZ\$113 million per year.<sup>27</sup> This is just for one less student per class on average, and would be an ongoing commitment not a one-off investment.

Even this figure underestimates the cost of class size reduction as it accounts only for extra staffing costs. Each additional teacher necessitates an additional classroom, must be educated and trained, will need extra classroom resources and require on-going professional development.

Not only is the cost large, but the findings of the studies described above are mixed and weak at best on the issue of class size. The one major New Zealand study seems to be an exception, but it is not clear why. It is also not clear whether the gains found are analogous to the costs involved. Further research should be done to explore this.

Only one thing comes through loud and clear from all of the research: what goes on in the classroom is more important than how many children are involved. This is not to say that classroom activity is unaffected by the number of children, but that proven and appropriate teaching methods are paramount.

## **Theories and Fallacies of Class Size Reduction**

There are several theories as to why smaller classes should be beneficial:

1. Increased individual attention and instruction;
2. Greater scope for innovation and student-centred teaching;
3. Increased teacher morale;
4. Fewer disruptions.

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**Reducing class size will have little or no effect without ensuring that teachers adopt instruction and management practices proven to be effective in small classes.**

The idea that a teacher can devote more time to each student in a smaller class, thereby increasing the amount students learn, is the most intuitively appealing of all these theories. Yet simple calculations show this appeal to be misplaced.

In a six hour school day, approximately five hours are spent in the classroom. If half of this time is spent directly addressing the class, and the other half on individual attention, each child would hypothetically receive six minutes of individual instruction in a class of 25, or 7.5 minutes of individual instruction in a class of 20. That is, a class size reduction of this magnitude buys an extra 1.5 minutes per day of teacher's time. If two-thirds of classroom time is spent on individual attention, students get two minutes more in a class of 20 than 25.

These calculations may be simplistic, but indicate the insubstantial change in individual attention that a 20% reduction in class size brings, at considerable cost.

Another counter to the individual instruction theory comes from Project STAR. Some of the regular size classes were assigned a teacher's aide. Even though children in these classes presumably had twice as much individual attention, there was no difference in achievement levels between regular size classes with and without teacher's aides.

The second theory—that small classes provide the potential for more effective teaching strategies—suggests that class size may be conducive to greater student achievement but does not guarantee it. It also suggests that small classes alone do not produce gains in learning; that their benefits are mediated by teacher quality. Research discussed earlier demonstrates that there were notable differences in teaching and classroom management styles between high and low achieving small classes.

Teachers rarely change their teaching and classroom management styles. Even Project STAR data shows this, with few teachers modifying their classroom practices in different size classes after attending a professional development programme.<sup>28</sup> If this is the case, then reducing class size will have little or no effect without ensuring that teachers adopt instruction and management practices proven to be effective in small classes. This substantial investment in professional development once again adds to the cost of class size reduction, and would more than likely be equally effective without changing class sizes.

The last two theories of small class benefits are related and are the most convincing. Small classes are overwhelmingly popular with classroom teachers and it is not difficult to understand why. Schools are being forced to cope with, and attempt to educate, an increasing number of students who are uninterested and badly behaved. In some areas, schools have difficulty attracting and retaining teachers primarily for this reason and teachers in all areas are finding their jobs more and more difficult and stressful.

Fewer students like this in a class would make teaching much easier. Reducing class sizes might be justifiable if it can be shown that the increased cost of reducing class size is offset by the decreased cost of teacher attrition, stress and sick leave.

It must be ensured, however, that a new demand for teachers does not result in the same situation as in California, where the least qualified and least experienced teachers were disproportionately employed in the most disadvantaged schools. The most simple and effective way to avoid this is to offer financial incentives for teachers in difficult-to-staff schools, which means departing from rigid wage structures based on years of service.

### **Teacher Quality**

Commonsense says that it is better to have a great teacher in front of a large class than a mediocre teacher in front of a small one.<sup>29</sup>

Writing in the Bulletin of the US National Association of Secondary School Principals, Leslie Kaplan and William Owings state that 'Research affirms that teaching quality is the single most important factor influencing student achievement',<sup>30</sup> and cite a wide variety of supporting studies. Australian research has also shown that the largest differences in achievement between students is that between students in different classes.<sup>31</sup>



The ‘Ramsay Report’ on the Review of Teacher Education in NSW,<sup>32</sup> provides plenty of international evidence to support the primacy of teacher quality, demonstrating the impact of teachers on student achievement and the benefits from investing in teacher education.

Although much has been said about the importance of teacher quality, what makes a good teacher is yet to be adequately defined. We know that some teachers bring about higher levels of achievement from their students than others, but consensus on exactly how is still elusive.

A certain proportion of good teaching comprises temperament, charisma, enthusiasm and other qualities that cannot be measured or taught. However, several criteria can be identified:

1. mastery of subject matter and curriculum content;
2. awareness of the individual abilities and capabilities of students;
3. classroom management skills;
4. use of teaching strategies that are proven effective;
5. good verbal communication skills.

Each of these capacities is necessary but insufficient on its own. Strong content knowledge is crucial but not enough—teaching also requires a set of professional skills separate from but related to the subject being taught.<sup>33</sup> These skills are supposed to be gained from teacher education courses.

What constitutes effective pedagogy is beyond the scope of this paper, but there is evidence that teacher education in New Zealand universities is inadequate in imparting both pedagogical and behaviour management skills to teachers.<sup>34</sup>

The New Zealand Education Review Office found in a 1999 report that ‘recent graduates from training programmes are found to have shortcomings in some areas which are critical to their meeting the learning needs of all their pupils’.<sup>35</sup> This report revealed a ‘lack of specific or national entry standards’ for teacher education courses and that there are ‘no national standards for graduation’ related to pedagogical practice, assessment of student learning or aspects of the New Zealand curriculum. There was also a view that the practicum, considered by the large majority of student teachers to be the most important part of their training,<sup>36</sup> is insufficient and/or unproductive.

Preparatory teacher education is important, but so is ongoing *effective* professional development and in-service training for classroom teachers. Teachers need to be aware of new developments in both curriculum, pedagogy and behaviour management, and equipped to deal with changing social needs of students.

While New Zealand spends a significant amount of money on in-service training—around \$60 million annually—little effort is made to ensure that it results in improved learning outcomes for students. Only 11% of schools surveyed in 2000 evaluated in-service programmes in terms of improvements in student achievement.<sup>37</sup> The Education Forum has suggested that government be less prescriptive in telling teachers how and what they should teach, and more resolute in holding teachers accountable for the results.<sup>38</sup>

The priority for New Zealand education reform is to ensure that the existing and future teaching force is equipped with the necessary skills and knowledge to teach effectively. Only when it can be confidently asserted that teacher education and training, and the quality of the teaching force, are as good as they can be, should the idea of increasing the size of that teacher force be considered.

## Conclusions

Evidence shows that most research is either flawed or shows a marginal effect of reducing class size or both. Good teaching practices are far more effective.

When it comes to teachers, quality is far more important than quantity. The push for class size reduction serves only to weaken the case for more urgent and supportable concerns, such as improving teacher education and professional development, as well as removing ineffective teachers.

**The priority for New Zealand education reform is to ensure that the existing and future teaching force is equipped with the necessary skills and knowledge to teach effectively.**

## Endnotes

- <sup>1</sup> Ronald G. Ehrenberg, Dominic J. Brewer, Adam Gamoran & J. Douglas Willms, 'Does class size matter?', *Scientific American* 285: 5 (2001), 78-85.
- <sup>2</sup> Eric Hanushek, 'The evidence on class size', *Occasional Paper* 98-1 (W. Allen Wallis Institute of Political Economy: University of Rochester, 1998).
- <sup>3</sup> Percentages do not add to 100 because of rounding.
- <sup>4</sup> Alan B. Krueger, 'Understanding the magnitude and effect of class size on student achievement' in *The Class Size Debate*, ed. Lawrence Mishel & Richard Rothstein (Washington, D.C: Economic Policy Institute, 2002), 31.
- <sup>5</sup> Vinson Report 1, p.83.
- <sup>6</sup> See 5.
- <sup>7</sup> Vinson Report 1, p. 84.
- <sup>8</sup> See 7.
- <sup>9</sup> Vinson Report 1, p. 82.
- <sup>10</sup> Vinson Report 1; Bruce J. Biddle and David C. Berliner, 'What research says about small classes and their effects', *Policy Perspectives* (San Francisco: WestEd, 2002),.
- <sup>11</sup> Jeremy Finn, Susan B. Gerber, Charles M. Achilles, Jayne Boyd-Zaharias, 'The enduring effects of small classes', *Teachers College Record* 103: 2 (2001), 145-183.
- <sup>12</sup> Jayne Boyd-Zaharias and Helen Pate-Bain, 'Early and new findings from Tennessee's Project STAR', in *How Small Classes Help Teachers Do Their Best*, eds. M.C. Wang and J.D. Finn (Philadelphia: Temple University Center for Research in Human Development and Education and the U.S. Department of Education, 2000), 65-97.
- <sup>13</sup> Caroline M. Hoxby, 'The effects of class size on student achievement: New evidence from population variation', *The Quarterly Journal of Economics* 115 :4 (2000), 1239-1285.
- <sup>14</sup> Linda Jacobson, 'Research: Sizing up small classes', *Education Week* February 28, 2001.
- <sup>15</sup> Vinson Report 1, p.83 refers to a 1999 evaluation by Molnar, Smith and Zahorik, but a complete reference is not provided.
- <sup>16</sup> Alex Molnar, Philip Smith, John Zahorik, Anke Halbach, Karen Ehrle, Lawrence M. Hoffman and Beverley Cross, *2000-2001 Evaluation Results of the Student Achievement Guarantee in Education (SAGE) Program* (Centre for Education Research, Analysis and Evaluation, University of Wisconsin-Milwaukee, 2001).
- <sup>17</sup> See 16.
- <sup>18</sup> Vinson Report 1, p. 83.
- <sup>19</sup> Vinson Report 1, p. 83, results cited are those from McGivern, Gilman and Tillitski (1989).
- <sup>20</sup> Bruce J. Biddle and David C. Berliner, 'What research says about small classes and their effects', *Policy Perspectives* (San Francisco: WestEd, 2002), 6. Apart from the fact that they play down the problems associated with class size research showing a positive effect and play up the problems associated with class size research showing no effect, Biddle and Berliner make it clear where their allegiances lie through their choice of words. Critics of negative class size research 'point out', while critics of positive class size research 'pounce' and 'decry'.
- <sup>21</sup> Brian M. Stecher & George W. Bohrnstedt (Eds), *Class Size Reduction in California: Summary of Findings from 1999-2000 and 2000-0* (CSR Research Consortium, California Department of Education, 2002), 2.
- <sup>22</sup> Christopher Jepsen and Steven Rivken, 'What is the tradeoff between smaller classes and teacher quality?', *Working Paper* 9205 (Cambridge, MA: National Bureau of Economic Research, 2002).
- <sup>23</sup> See 13.
- <sup>24</sup> Maria Iacovou, 'Class size in the early years: Is smaller really better?', (Institute for Social and Economic Research, Essex University, 2001).
- <sup>25</sup> Ludger Woessmann and Martin R. West, *Class Size Effects in School Systems Around the World: Evidence from Between-Grade Variation in TIMSS* (Research Paper PEPG/02-02, Program on Educational Policy and Governance, 2002), <http://www.ksg.harvard.edu/pepg/pdf/PEPG02-02.pdf>
- <sup>26</sup> Michael A. Boozer & Tim Maloney 2001, 'The effects of class size on the long-run growth in reading abilities and early adult outcomes in the Christchurch Health and Development Study', (*Working Paper* 01/14, New Zealand Treasury, 2001).
- <sup>27</sup> Preston Davies, 'Does size matter? The school class size debate', *Education Forum Briefing Paper* pending publication.
- <sup>28</sup> Ronald G. Ehrenberg, Dominic J. Brewer, Adam Gamoran and J. Douglas Willms, 'Class size and student achievement', *Psychological Science in the Public Interest* 2: 1 (2001), 1-30.
- <sup>29</sup> Edward Lazear, a Stanford University economist, also said something like this. ([www-hoover.stanford.edu/publications/digest/001/lazear.html](http://www-hoover.stanford.edu/publications/digest/001/lazear.html))

- <sup>30</sup> Leslie S. Kaplan and William A. Owings, 'The politics of teacher quality: Implications for principals', *National Association of Secondary School Principals Bulletin* 86: 633 (2002), 22-41.
- <sup>31</sup> Ken Rowe, 'The importance of teacher quality', *Issue Analysis* 22 (Sydney: The Centre for Independent Studies, 2001).
- <sup>32</sup> Gregor Ramsay, 'Quality matters: Revitalising teaching: Critical times, critical choices', *Report of the Review of Teacher Education* (Sydney: NSW Department of Education & Training, 2000).
- <sup>33</sup> Linda Darling-Hammond, 'Teacher quality and student achievement: A review of state policy evidence', *Education Policy Analysis Archives* 8 : 1 (2000), (<http://epaa.asu.edu/epaa/v8n1>); Kati Haycock, 'Good teaching matters', *Thinking K-16* 3:2 (1998) Susan S. Goldsmith, 'The pedagogy of the subject and professional development', in *A Consumer's Guide to Teacher Quality: Opportunity and Challenge in the No Child Left Behind Act of 2001* (Washington D.C: National Council on Teacher Quality, 2002).
- <sup>34</sup> Geoffrey Partington, *Teacher Education and Training in New Zealand* (Auckland: Education Forum, October 1997).
- <sup>35</sup> Education Review Office, *Pre-Employment Training for School Teachers* (Wellington: Education Review Office, October 1999).
- <sup>36</sup> See 35, p.153.
- <sup>37</sup> Education Review Office, *In-Service Training for Teachers in New Zealand Schools* (Wellington, New Zealand: Education Review Office, Autumn 2000).
- <sup>38</sup> Education Forum, *Policy Directions For Teacher Education And Training In New Zealand: A Submission On The Government Green Paper 'Quality Teachers For Quality Learning: A Review Of Teacher Education'* (Auckland: Education Forum, April 1998).

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