

# REDUCING CLASS SIZE: DOES THE EVIDENCE SUPPORT THE SCOTTISH EXECUTIVE'S POLICY?

VALERIE WILSON

---

## ABSTRACT

For a number of years the size of Primary 1-3 classes in Scottish primary schools has been limited to 30 pupils (Scottish Executive, 2006a). The Labour/Liberal Democrat Partnership, that formed the first Executive in Scotland's devolved Parliament, recommended a class size reduction to a maximum of 25 pupils in Primary 1 and 20 pupils in Secondary 1 and 2 in English and Maths by August 2007. This article presents the evidence from a systematic review, commissioned by the Scottish Executive in 2006 of published literature on the effect of class size on pupil attainment. One hundred and ninety-one references were identified, from which 46 were included in the review. The author concludes that the proposed policy of selective reduction of class size is only partly supported by research evidence and important considerations regarding within-class grouping, the use of classroom assistants and the allocation of available resources remain unresolved.

## INTRODUCTION

The impact of class size on pupils' attainment is probably the most written about, but least researched, topic in educational research. The continuing debate on the topic is a reflection not only of the perceived centrality of the issue but also of the lack of a consensus to emerge from the research findings. What exactly does the research evidence tell us? How extensive and reliable is that evidence? And can the findings be applied to Scottish education to support the actions proposed by the first Scottish Executive? These were the themes that ran throughout a systematic review of published literature on class size, which the Scottish Executive Education Department (SEED) asked the Scottish Council for Research in Education to undertake in 2001. In 2006, the Scottish Executive commissioned an update of the original review, which is a sign that interest amongst policy makers and practitioners regarding the possible effects of class size on both pupils and teachers has not diminished in the intervening years. The updated review was intended as a resource primarily for use by the *Class Sizes, Staffing and Resources Working Group* (Scottish Executive, 2006b). The Working Group was composed of representatives from the Scottish Executive Education Department (SEED), the Convention of Scottish Local Authorities (CoSLA) the General Teaching Council Scotland (GTCS), various teachers' associations, the Scottish Parent Teacher Council (SPTC) and Her Majesty's Inspectors of Education (HMIe). It was established in June 2005 with a remit to consider the impact of class size and the use of resources to maximise attainment. The purpose of this article is twofold: first, to present a synopsis of the evidence of the effects of class size on pupil attainment, and second, to consider whether that evidence supports the policy of selective class size reduction proposed by the Scottish Executive.

## AIMS

The overall aim of the original review was to report on literature published during a 20-year period (i.e. 1981–2001) in the UK and abroad related to class size and its impact on a range of pedagogical and related factors (SCRE, 2001). The updating process replicated the same research aim but focused on key texts published in English during the past five years (i.e. 2001–2006). Extensive evidence emerged

related to the impact of class size on pupil attainment, behaviour, motivation, and also on learning and teaching practices. This has been reported in full elsewhere (Wilson, 2006). Given the volume of literature identified (over 1000 references in 2001 and an additional 191 in 2006), this article focuses exclusively on the evidence to emerge, related to the impact of class size on pupils' academic attainment.

#### METHODS

Many policy-makers now seek to ground their decisions on an evidential-base, but what constitutes high quality evidence is far from obvious. As in previous SCRE reviews (e.g. Harlen & Malcolm, 1997), the aim was to search for research articles using agreed key words and reduce the number by utilising the concept of 'best evidence synthesis' which Slavin (1987; 1990) applied to reviewing educational research and which has been developed further by the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI Centre, 2001). It requires the reviewer to identify criteria for determining good quality research and to place more emphasis on those studies which match the criteria. In 2001, over a thousand items were identified in four electronic databases (ERIC, BEI, AEI and PsychoInfo), using a combination of 'class size' and 'teacher-pupil/student ratio' key words, and an additional 191 articles in 2006, using the same key words plus the individual years from 2001 to 2006 inclusive. These were reduced by a series of steps by applying the following inclusion criteria:

- Studies concerned with primary and secondary school-aged pupils.
- Studies concerned with class size but not school size.
- Reports of well-designed experimental interventions into class size.
- Reports of analysis and reanalysis of statistical evidence relating to class size.
- Preference was given to reports which had been published in peer-reviewed journals.
- All studies reported were conducted during the twenty-six years from 1980 to 2006, with the exception of earlier work of enduring significance (e.g. Glass & Smith, 1978).

Both reviews come with a 'health warning'. In the English-speaking countries encompassed by this review, education systems differ, the reliability of research methods vary, as do measures of pupil attainment and definitions of class size. As a consequence, generalisability is limited.

#### DEFINITIONS

To aid interpretation, the following definitions of class size were adapted from Day *et al* (1996).

**Pupil-teacher ratio (PTR)** is a ratio which is determined by dividing the full-time equivalent number of pupils on a school roll by the full-time equivalent number of qualified teaching staff, including the headteacher, but excluding short-term cover. These ratios must be used with caution because they include teacher non-contact time.

**Pupil-adult ratio (PAR)** is the ratio of full-time equivalent number of pupils on a school roll to the full-time equivalent number of adults in the school. These ratios may be extremely misleading as they include not only teacher non-contact time, but also non-teaching staff.

**Class size (CS)** is the total number of pupils allocated to a teacher for all or some of his/her teaching timetable. The average class size in a school is the total number of children in the school divided by the number of classes.

**Pupil experienced teaching unit (PETU)** is the size of unit in which pupils experience learning during their timetabled day. This will rarely equal the average class size for the school or the pupil-teacher ratio and may also vary as the day/week progresses with use of across and within-class groupings, and the presence of other adults in the classroom.

#### DOES CLASS SIZE AFFECT PUPIL ATTAINMENT?

Despite the widespread interest in class size, most studies have been undertaken in the USA, often with state aid. The reasons are not hard to detect: class size research is both difficult to undertake and costly to initiate and to sustain. Some also suggest that it is unethical and politically unwise to conduct experimental and control studies by assigning children to different sized classes. An earlier meta-analysis of published research studies (Glass & Smith, 1978) concluded that smaller classes can increase pupil performance but these findings were not universally accepted. Glass and Smith were criticised for comparing the results from uncontrolled with controlled class size experiments and for combining results from kindergarten to college levels to determine effect size. To overcome these problems, Robinson (1990) reanalysed the studies and confirmed that there are benefits from being taught in smaller classes, especially during children's formative years. Experimental evidence to corroborate this general conclusion comes primarily from two projects: the Indiana Prime Time project and the Tennessee Student-Teacher Achievement Ratio (STAR) study. Both were state-funded.

#### *The Indiana Prime Time experiment*

In 1981 the Indiana General Assembly approved an initial \$300,000 to reduce student-teacher ratios to 14:1 in 24 kindergarten, first and second grade classes across the state. Robert Orr, the State Governor explained the underlying rationale as: 'Children spend their first few school years learning to read, and the rest of their lives reading to learn' (Pate-Bain & Achilles, 1986: 663). The two-year project yielded three important outcomes:

- Students in classes with pupil/teacher ratios of 14:1 scored higher on standardised tests than those in larger classes (i.e. over 22 students).
- Students in smaller classes had fewer behavioural problems.
- Teachers of smaller classes felt that they themselves were more productive.

This evidence was accepted by the state legislature which in 1984 assigned an additional \$19 million. Unfortunately insufficient funds were available to achieve the desired ratio of 14:1 but nevertheless, classes were reduced to 18:1.

#### *The Tennessee STAR experiment*

The Tennessee STAR project is probably the most significant experimental study of class size in terms of its size, scope and the number of citations to it in the research literature. Following a small-scale study of class size manipulation in one Nashville school, Pate-Bain (Nye *et al*, 1992) persuaded the Tennessee state legislature to commit more than \$12 million to a major study of class size in Kindergarten to Grade 3. This project was implemented in 1985 and involved approximately 7,000 children in 79 schools throughout the State. Children and teachers were randomly assigned to three types of class:

- small, i.e. 13 to 17 pupils
- regular, i.e. one teacher for 22 to 25 students; and
- regular with aide, i.e. one teacher for 22 to 25 students with a full-time teacher aide.

The reported results are impressive (Nye *et al*, 1992). In both reading and mathematics pupils in small classes performed significantly better than pupils in regular or regular-with-teaching-aide classes and the benefits of having been taught in smaller classes were still evident at high school level (Pate-Bain *et al*, 1999). By the 1990s, similar class size manipulation experiments were underway in California (Stecher & Bohrnstedt (undated); Wisconsin (Molnar *et al*, 1999), and Florida (Florida Department of Education, 1998) and in the city of Edmonton (Edmonton Public Schools and University of Alabama, 2001). Although these projects were of varying sizes, all seem to have been initiated with significant amounts of public funding in an attempt to raise pupils' achievement. For example, the state of California made \$1.5 billion available annually to the Class Size Reduction programme. The overall aim was to reduce class sizes in Kindergarten to Grade 3 from 30 to 20 pupils or less. By 1998 approximately 1.6 million students were being taught in smaller classes. By Grade 3 the percentage of students whose standard achievement tests scores were above the 50th national percentile had increased by 2–4 percentage points in reduced classes. Overall, there seems little doubt that consistent results have been achieved from experimental class reduction projects in North America.

**WHICH GROUP BENEFITS MOST?**

Although researchers from the STAR project report raised achievement for all pupils taught in small classes from Kindergarten to Grade 3, an examination of evidence shows that some groups benefited more than others. As we can see from Table 1 below, the percentage increase for children from minority ethnic backgrounds in small classes was far greater than for non-minority ethnic children – an average percentage of 17% compared to 7%.

*Table 1: Average percentage of pupils passing Basic Skills First Test (BSF) Reading: Grade 1, STAR*

Pupil status	Grade	Small	Regular	Difference
		%	%	
Minority*	1	65.4	48	17.4
Non-minority	1	69.5	62.3	7.2
Difference		4.1	14.3	—

Source: Nye *et al*, 1992, p. 20.

\* The researchers' definition is: 'minority group students (Blacks and Hispanics) and majority group (White) students'.

Nye *et al* (1992) seem to show unequivocally that the class size effect on children from minority ethnic backgrounds who participated in the experiment was far greater than for majority white pupils. However, later publications from the same team based upon their reanalysis of output data from the STAR project present a much less persuasive picture. (For example, compare Nye *et al*, 1992 with Nye *et al*, 2002; 2004 and Finn *et al*, 2001; 2005). **By comparing the achievement data from low achievement pupils (i.e. those who fall below the average for their class and are in the lowest 25%) the team found that although smaller classes in the early years led to higher academic achievement (for all), small classes had had a differential advantage for low achievers in *reading* but *not in maths*.** In reading, the small class effect for lower achieving students is larger than for higher achieving students at every grade level, but in maths the small-class effect for lower achieving students is smaller than for higher achieving students at every grade. They conclude that: ‘while there is strong evidence that small classes benefit all students, the evidence of differential benefits for lower achieving students is both weak and contradictory’ (Nye *et al* 1992: 215).

Part of the explanation may lie with the method of analysis used. The researchers explain that they had been ‘pooling’ data on different tests over different grades over the four-year period of the original STAR experiment. Standardising test scores within grades before combining data across grades does not entirely solve the problem of making data from different grades comparable. In addition, evidence of lasting benefits for students was compromised by the attrition rate from the study which was as high as 60% of those in small classes who were tested in K–3. The researchers (Nye *et al*, 2004) also point out what they perceive to be the most disappointing aspect of the STAR data set – that it sheds little light on the mechanism by which class-size reduction affects achievement. Because little evidence was collected about classroom processes or instruction, the experiment cannot indicate how instruction might have changed in small classes to increase achievement or why there were differential effects for minority students.

#### DO THE FINDINGS APPLY TO A BRITISH CONTEXT?

Compared with the volume and scale of the research studies generated from the USA, by 2001 very little work has been undertaken by British researchers (Day *et al*, 1996). To what extent then are the findings from the USA applicable to schools and pupils in Britain? This is the question which researchers at the London University Institute of Education explored first by reanalysing STAR data (Blatchford & Mortimore, 1994; Goldstein & Blatchford, 1997); and second, by undertaking the largest class size project in Britain to date (Blatchford *et al*, 2005). From their re-analysis of STAR data, Goldstein and Blatchford (1997) agreed that STAR’s researchers have demonstrated differences between the achievement levels of pupils in small and larger classes. Their reanalysis confirmed that:

- Those pupils in small Kindergarten and Grade 1 classes have higher scores in mathematics and reading than those children who were taught in regular or regular-plus-full-time-teaching-aide classes; and
- Although both minority ethnic and white children in small classes score higher than those in larger classes, the biggest effect is for minority ethnic children in small classes.

However, Goldstein and Blatchford also raise a note of caution. They point out that even randomised control trials, such as used in STAR and generally viewed as the gold standard of class size research, do not necessarily guarantee valid or generalisable findings. A compositional effect in which more low or high ability children may have been assigned to some classes will influence outcomes. In

addition, children, their parents and teachers will all know the group compositions and anticipated expectations of each may affect their progress. They also point out the narrowness of the outcome measures used by STAR and affirm their belief that education should be judged by more than children's performance on a series of cognitive tests. But by far the most serious criticism is reserved for the assumption embedded in STAR that children and classes can function, and their progress be assessed, independently of the complex education systems of which they are part. They argue that the predictive value of the findings for British schools is limited and that a valid British-based experiment would require:

- Good initial pupil achievement data.
- Ways of measuring processes within the classroom, including teachers' expectations.
- Multi-level modelling to show the effects of different variables on pupils' achievements.
- More detailed qualitative and case study research to generate specific theories about the effect of changes in class size on children's cognitive and affective attributes; and
- A cost-benefit analysis of various ways of distributing resources.

Most of these conditions have been met in the Institute of Education's own class size study (Blatchford *et al*, 2005), which adopted a multi-method longitudinal naturalistic approach, including classroom observations to study actual classrooms without any class size manipulation. The study was also sufficiently large to match some of the state-funded American projects. Approximately 9,330 children in 368 classes within 220 primary schools were involved. Initially, eight different local education authorities in England agreed to participate. The first cohort of children joined the study in 1996 upon their entry to Reception class at age four. A second cohort and an additional five LEAs were recruited in 1997 and ultimately a total of 15 LEAs and over 11,000 children in over 300 schools were included. On joining the project, children were assessed by their teachers using the Avon Reception Entry Assessment for literacy and mathematics, and again at the end of the first year using the Reading Progress Test. Teachers from participating classes provided information each term on the registered and experienced class sizes which the children experienced. Pupils' entitlement to free schools meals and further information, which could affect their performance, was collected for all pupils, and all the information was analysed using a sophisticated multi-level model.

In general, the findings accord with American evidence regarding raised attainment in smaller classes, but they also provide further insight into classroom processes. In 2001, the team reported that there is a significant effect of class size differences on children's educational progress in Reception class. The researchers (Blatchford *et al* 2002a, 2002b; 2003) report that for Reception class literacy they found a strong and statistically significant increase in attainment in all three groups of pupils, i.e. low, middle and high attainers on baseline tests. (Specifically, a reduction in class size from 30 to 20 pupils resulted in an increase in attainment of approximately 0.35 standard deviations for low attainers; 0.2 SD for middle attainers, and 0.15 SD for high attainers.) In contrast for Reception class maths, they found no evidence that the effects of class size varied between different baseline attainment groups. It was a roughly linear (straight line) relationship between the two variables, i.e. class size and attainment in maths, such that a reduction in class size from 30–20 resulted in an increase in attainment of approximately 0.25 SD.

These results show that for literacy there is a decreasing test score with increasing class size, with little apparent change between class sizes of about 18 and 25. What

is also evident is that for the highest and middle achievers on the baseline tests, there is a continuing decrease in expected achievement with increasing class size up to a class size of 28. Below about 28, the gain from a reduction in class size of 10 is about 0.5 standardised score points for the lowest achieving group, but only 0.2 for the other pupils – thus demonstrating that low achieving pupils (i.e. those below the year group average) have the most to gain from a class size reduction. As with literacy, there is only a small amount of change for maths for class sizes from 20 to 25, with a clearer relationship emerging after adjusting for baseline achievement. Like literacy, it is the low achievers at the baseline, who appear to gain the most from being in small classes. For middle and high baseline pupils there is little change above a class size of about 22. The researchers concluded that:

The effect of class size on children's educational progress over the first year of school is impressive, even after adjusting for possible confounding factors. The effect is comparable to that reported by the experimental STAR project and this trend is therefore confirmed by both experimental and non-experimental research designs (Blatchford et al, 2003: 724).

However, the question remains: are these benefits lasting? The researchers report that there was no clear statistical evidence of an effect of class size upon progress in literacy and maths at Year 1 or Year 2. Class size in each year was **not found** to be related to progress in either. However, the researchers detect what they call a 'disruption effect'. Although pupils, who move to smaller or similar sized classes in Year 1 maintain the progress they made in Reception class, moving to a larger class between the two years results in a loss of the benefit of experiencing small Reception classes. There was, however, less change between Year 1 and Year 2 and no effect on attainment of moving to a different size class in Year 2. (Presumably by the third year of schooling, most children were used to school and, therefore, any change was likely to be less disruptive.) Specifically, the gains in literacy attainment in Reception that had been maintained by pupils who had not moved to larger classes between Reception and Year 1 were lost in Year 2, but the gains had been lost in maths by the end of Year 1.

The researchers conclude that the effects of class size are more obvious in the first year of school, i.e. on younger children. This is consistent with other research. Small classes work best for literacy for children who are most in need academically, and have the most ground to make up. Blatchford suggests that there is support for using small classes immediately after entry to school, but little evidence of longer-term effects of class size differences on maths achievement. The biggest change, i.e. a disruption effect, occurred between Reception and Year 1, especially when that move involved going to a larger class.

The message is very clear: class size does affect children's academic attainment in literacy and maths during their first year in school. Those most affected are the ones who enter school with the lowest levels of skill and knowledge. However, for those low achieving children, class size must be reduced to below 20 if they are to benefit from the reduction. Evidence of a lasting impact of small classes on pupils' attainment is also limited. The researchers suggest that it would be advisable not only to offer smaller classes in reception, but also ensure stability of class sizes across primary school years to avoid a possible disruption effect. None of this evidence relates to secondary school pupils' attainment, nor is the pupils' voice heard regarding their experiences of being educated in different size classes. In addition, the evidence presented in this article refers only to pupil attainment. There is also a growing body of research (e.g. Blatchford *et al*, 2005; Finn *et al*, 2003), some of it contested, that class size impacts on pupils' attitudes, behaviour and motivation, and also on teaching practices. This is not explored here, as the focus of this article is pupil attainment.

#### IS THERE ANY SCOTTISH EVIDENCE?

In 2001 only one reference to class size in Scottish schools was identified in the search of published literature (Watt, 1996). Referring to her research with disadvantaged pre-school children, Watt argues that if children from disadvantaged backgrounds are to succeed in school their teachers need to know them. As she puts it:

Class size is not, of course, an end-in-itself: it is what happens within the class that matters and what is made possible by smaller numbers. (1996: 145)

A second source of Scottish evidence arose from the Assessment of Achievement of Pupils (AAP) surveys undertaken throughout the 1990s. From these, Thorpe (1997) reports that the highest performing pupils in the 1995 English and 1996 Science surveys were to be found in very small composite classes of fewer than 20 pupils. Unfortunately this particular result is unreliable because it conflates information about small classes with small composite classes and small schools. All 97 pupils in the smallest composite Primary 4 classes taking part in the survey were from 24 schools which lay outside the survey's confidence level, thus making it unsafe to generalise. What is certain is that in the intervening years, little new evidence on the impact of class size on pupils in Scottish schools has emerged.

There are, however, other potential sources of information about class size in Scottish schools. The School Census (Scottish Executive, 2006a) provides average pupil-teacher ratios by educational sector, but these may give a misleading picture of the teaching units which children experience within schools. Although the definition of a class adopted by the School Census is 'a group of pupils normally supervised by one teacher' (ibid [Note 6.3]: p.7) it is not clear whether teachers without a class teaching commitment have been included in the school returns. By 2007, more Scottish-based research should be available when the Class Size Working Group publishes the final results of its deliberations including the research it has commissioned on pupil attainment, and decision-making on class size by local authorities (Scottish Executive, 2006b).

#### DOES THE EVIDENCE SUPPORT THE SCOTTISH EXECUTIVE'S PROPOSED POLICY?

##### *Class size in Scottish schools*

For a number of years regulations have specified that maximum class sizes in primary schools in Scotland should be:

- 30 for a single stage class P1-P3
- 33 for a single stage class P4-7
- 25 for a composite stage class

However, the latest results from the School Census (Scottish Executive, 2006a) show that average class sizes in publicly funded primary schools in Scotland are falling. Over the period 1998–2005 (with the exception of 2004) the trend was downwards for all primary classes. The average fell from 23.9 in 2004 to 23.6 pupils in 2005. Composite classes had an average of 19.9 pupils, which was down from 20.2 in 2004. Primary 1 classes had the smallest average size of any single stage with 23.1 pupils, down from 23.2 in 2004. In addition, pupil numbers, particularly in primary schools, have been reducing since 1996 in line with the decline in the population. It is, therefore, clear that in many Scottish primary school classes the number of pupils is already below the maximum allowed. However, the average class size hides variations across stages, size of school and education authorities. For example, while the average is 23.1 pupils in P1, P5 classes have an average of 26.3. As might be expected average class size was highest in larger schools, i.e. 28 for schools of 400–599 and 600 or more, and it also ranged from 13.7 in Eilean Siar to 26.1 in

East Renfrewshire. These are the existing circumstances that any proposed class size policy changes must take into account.

There is also continuing political interest in class size reduction. Not only did the first Scottish Executive establish a Working Group on Class Size (Scottish Executive, 2006b), but the Scottish Parliament Information Centre (SPICe) has produced two briefing papers for Members of the Scottish Parliament (Scottish Parliament Information Centre, 2002; Kidner & Berry, 2006). The Education Institute of Scotland would also like to see further reductions and points out that this should be possible if the teaching force reaches 53,000 FTEs by 2007. It proposes that ultimately a class size maximum of 20 pupils in all primary and secondary school classes, with a maximum of 15 for composite classes, should be the aim (Smith, 2006). This ratio would be in line with the point at which the STAR project found that the maximum effect of class size reduction occurs.

#### *The strength of the evidence*

Overall there has been an enormous amount of evidence published on the effects of class size on pupils' attainment. It has, however, tended to polarise researchers into those who think that the available evidence, especially from the USA, is strong and others who see it as at best confusing, sometimes even contradictory. In addition, researchers question the appropriateness of the methods employed. The findings from the STAR project emerged from a statewide experimental study in which pupils were randomly assigned to classes of different sizes in which they were supposed to remain from Kindergarten to Grade 3. However, attrition rates were high. In contrast, the large English study (Blatchford *et al*, 2005) adopted a naturalistic design in which pupils moved from small to larger classes as they progressed through primary school. Both have their limitations, which may affect the findings. However in sum from the review of the available evidence, we conclude that:

- There is evidence to show a relationship between class size and pupil attainment, especially for younger children. (However, it should be noted that associations are not explanations.)
- Even though some of the evidence is very good, it has to be accepted that none is perfect and questions remain about the research designs and the statistical analyses employed, and also the generalisability of the findings.
- Benefits in most studies were measured by a narrow range of outcome measures, i.e. progress in reading and mathematics. In addition, some scores from different tests across different classes and year groups were 'pooled'. Few had baseline assessments for the participating children and the attrition rate for follow-up studies was often high.

Unfortunately, there are no relevant studies relating to the effects of class size reduction on attainment in Scottish schools. This presents a problem for policy-makers in Scottish education. Not only do they require valid and reliable evidence of the possible impact of small classes on pupil attainment, but also confidence in its transferability, applicability and value-for-money in Scottish schools and classes. Despite this lack of evidence, a policy for class size reduction has already been announced. The Partnership Agreement (Scottish Labour Party and Scottish Liberal Democrats, 2003) indicated its aims to reduce class sizes to a maximum of 25 pupils in Primary 1, and a maximum of 20 pupils in Secondary 1 and 2 in English and Maths by 2007. In addition, various on-going initiatives have increased the number of classroom assistants and additional support staff in Scottish schools (Wilson *et al*, 2002; Wilson & Davidson, 2006) for which there is even less evidence of an association with pupils' attainment.

Most of the research studies identified in this review demonstrate an association

between class size reduction and pupil attainment, although how or why this happens is still debateable. Most agree that the effects are most marked on younger and less able children. However, the evidence of any lasting benefits is questionable and there is some disagreement about how much class size must be reduced to achieve significant improvement in pupil performance: some argue that benefits are most marked in classes of fewer than 15 (Achilles *et al*, 1993), while others (Glass & Smith, 1978) report major benefits from reductions to below 20 pupils, but little apparent change in performance between class sizes of about 18 and 25. In addition, the evidence of lasting benefits from class size reduction is weak. The STAR Lasting Benefits study identified that the initial advantages gained from early exposure to small classes was still evident for pupils at Grade 10 (age 16 years), but this finding is not confirmed by English research which found no evidence of small class effects at Key Stage 2 for pupils who had been in small classes at Key Stage 1 (Blatchford *et al*, 2005). Evidence of improved performance from pupils in classes with teachers and classroom assistants is also absent.

At best, the Scottish policy on class size reduction appears to have been partly informed by research. The available evidence does suggest that it is sensible to reduce the size of P1 classes, but not the proposed reduction of S1 and 2 English and maths. As with all policies, one suspects that 'How much will it cost?' was an important consideration to policy makers, especially as most researchers agree that it would be extremely expensive to implement an across the board class size reduction policy. **The Working Group on Class Size** gives some indication of the likely resources required to reduce class sizes in Scotland (Scottish Executive, 2006b). It estimates that an additional 417fte primary teachers will be required to reduce P1 to 25 pupils – the option suggested by the policy makers, but over 4000 additional teachers would be required to reduce P1-3 to 20 pupils. (The salary costs of 100 teachers at Point 1 of the pay scale is £2.8 million or £3.7 million at Point 6, compared with the cost of 100 Classroom Assistants at £1.5 million.)

Would this money be well spent? Opinions are divided. At least one Scottish local authority has already intimated that it would struggle to meet the Scottish Executive's promises and estimates a shortfall of £800,000 if it reduces class size from August 2007. Of significance to the debate, American economists (Maasoumi *et al*, 2005) point out first that rarely does class size reduction have a uniform impact across test score distribution, which implies that simply reducing existing classes by one or two pupils will not have the desired impact on student achievement; and second that the most beneficial impact of class size reduction arises because of what the researchers call 'the productivity-enhancing effect' it has on other educational inputs, such as teacher quality and parental involvement. As it is difficult to put a quantitative or monetary value on these, these inputs have usually been excluded from previous research studies. More serious criticism of incremental class size reduction has been made by Hanushek (1998; 2003; 2004), an economist based at Stanford University. Using an econometric analysis, he points out that between 1960 and 2000 the resources invested in education in the USA had risen dramatically against four key resource measures:

- Pupil-teacher ratio has improved from 25.8:1 to 16:1
- The proportion of teachers with master's degrees or more (an indicator of teacher quality) has increased from 23.5% to 56.2%.
- The average years of teacher experience has risen from 11 to 15 years.
- Real expenditure has risen from \$2,235 to \$7,591 per pupil.

And yet student performance has remained stubbornly flat for three decades on the National Assessment of Educational Progress (NAEP), which tests a random

sample of 17 year-olds. Hanushek (1998) argues that programmes that appear to be efficacious in one setting do not generalise to other settings and that the debate about class size assumes that class size has a linear effect on achievement that is independent of other factors such as teacher quality. He suggests that in policy terms, fiscal realities put a natural limit on what it is feasible to spend on class size reduction and this results in marginal reductions rather than full-scale implementation. He asks us to consider that to reduce class sizes from 26 to 23 (the range in which the Scottish policy sits) represents an increase in teacher costs alone of over 10%. Would teachers notice such changes in class numbers and alter their approach? He believes that on current evidence the answer is 'no' and that marginal changes are less likely to lead to changes in the behaviour of teachers. To achieve the results reported by the STAR experiment, teacher numbers increased by one third. The aim for politicians, aware of budgetary limitations, appears to be to try to determine the point at which the marginal cost of reducing class size is balanced against the resultant marginal benefits, thus achieving the so-called 'critical effect size' (Krueger, 2003). However, in practice it is extremely difficult to quantify a stream of possible marginal benefits and/or compare these with the likely marginal costs and benefits, of alternative policy options, such as increasing the quality of teaching or exploring within-class groupings.

#### CONCLUSION

In conclusion, it is heartening to researchers that the Scottish Executive has established a Working Group on Class Size that is committed to commissioning research to aid its deliberations. Unfortunately, in the case of class size, the research evidence is not unambiguous. Although most researchers agree that there is a relationship between small classes especially in the early years and pupil attainment, many accept that this is only part of a complex picture. The evidence is also incomplete. Classroom processes, alternative approaches to organising within-class and across-year groupings, more one-to-one tuition from teachers and classroom assistants during the working day, peer tutoring, the quality and experience of teachers, the socio-economic background of the child and parental background, are all likely to contribute. Other researchers, while accepting that class sizes should be reduced, claim that there are more cost-effective ways of allocating available resources to provide young children with individualised attention when they most need it. Scottish policy makers have opted for a selective class size reduction policy. This is partly supported by research evidence and may be considered to be a step in the right direction in that it focuses resources on younger children, who have most to gain from it. From the policy makers' point of view it is an attractive option because it maintains the existing structure of schools while simply adding more resources to certain stages. This may be a necessary step, but there is no strong evidence that in the long-term it will be sufficient to raise the attainment of all pupils in Scotland.

#### NOTE

The review was conducted in 2006 and the article written in early 2007. By May 2007, the Scottish National Party (SNP) had formed a minority executive in the Scottish Parliament and renamed the Scottish Executive the Scottish Government. Prior to the election, one of its manifesto promises had been to reduce class sizes, starting with a reduction in the first three years of primary school to 18 or less ([www.snp.org/policies/priorities](http://www.snp.org/policies/priorities)). This is clearly more in line with the research evidence than the policy adopted by the previous administration, however whether the SNP has the support or the resources to implement this promise remains to be seen.

## REFERENCES

- Achilles, C.M., Nye, B.A., Bain, H.P., Zaharias, J. & Fulton, D. (1993) *The Teacher Aide Puzzle: Student Achievement Issues*. Paper presented at the Annual Meeting of the Mid-South Educational Research Association, New Orleans, LA, November
- Blatchford, P. & Mortimore, P. (1994) The issue of class size for young children in schools: what can we learn from research?, *Oxford Review of Education*, 20(4), 411-428
- Blatchford, P., Martin, C., Moriarty, V., Bassett, P. Goldstein, H. (2002a) *Pupil Adult Ratio Differences and Educational Progress Over Reception and Key Stage 1*. Research Brief No. 335, London: Department for Education and Skills
- Blatchford, P., Goldstein, H, Martin, C & Brown, W. (2002b) A Study of Class Size Effects in English Reception Year Classes. *British Educational Research Journal*, 28(2): 169–185
- Blatchford, P., Bassett, P., Goldstein, H., & Martin, C. (2003) Are Class Size Differences Related to Pupils' Educational Progress and Classroom Processes? Findings from the Institute of Education Class Size Study of Children Aged 5–7 Years, *British Educational Research Journal*, 29(5), 709–730
- Blatchford, P., Bassett, P. & Brown, P. (2005) Teachers' and Pupils' Behaviour in Large and Small Classes: A Systematic Observation Study of Pupils Aged 10 and 11 Years, *Journal of Educational Psychology*, 97, 454–467
- Day, C., Tolley, H., Hadfield, M., Parkin, E. & Watling, G.R. (1996) *Class Size Research and the Quality of Education: A critical survey of the literature related to class size and the quality of teaching and learning*, Haywards Heath, West Sussex: National Association of Head Teachers
- Edmonton Public Schools and University of Alabama (2001) *Small Class Size Project: Final Report*, Canada, Edmonton: Edmonton Public School
- EPPI Centre (2001) *Review Group Manual: Version 1.1*, London: University of London Institute of Education, EPPI-centre
- Finn, J.D., Gerber, S.B., Achilles, C.M & Boyd-Zaharias, J. (2001) The Enduring Effects of Small Classes, *Teachers College Record*, 103(2), 145–183
- Finn, J.D., Pannozzo, G.M. & Achilles, C.M. (2003) The “Why’s” of Class Size: Student Behaviour in Small Classes, *Review of Educational Research*, 73(3): 321-368
- Finn, J.D., Gerber, S.B. & Boyd-Zaharias, J. (2005) Small Classes in the Early Grades, Academic Achievement, and Graduating from High School, *Journal of Educational Psychology*, 97(2), 214–223
- Florida Department of Education (1998) *The Relationship of School and Class Size with Student Achievement in Florida: An Analysis of Statewide Data*, Florida: Office of Policy Research, Florida, Department of Education
- Glass, G.V. & Smith, M.L.(1978) *Meta-analysis of Research on the Relationship of Class Size and Achievement*, Colorado: Laboratory of Educational Research, University of Colorado
- Goldstein, H. & Blatchford, P. (1997) *Class Size and Educational Achievement: A Methodological Review*, London: University of London Institute of Education
- Hanushek, E. (1998) *The Evidence on Class Size*, Rochester, NY: W.Allen Wallis Institute of Political Economy, University of Rochester
- Hanushek, E. (2003) The Failure of Input-based Schooling Policies, *The Economic Journal*, 113, 64–97
- Hanushek, E. (2004) What if there are no “Best Practices”?, *Scottish Journal of Political Economy*, 51(2), 156–172
- Harlen, W. & Malcolm, H (1999) *Setting and Streaming: A Research Review*. Edinburgh: SCRE
- Kidner, C. & Berry, K. (2006) *School Education Policy: Subject Profile (Updated)*, SPICe Briefing 06/12, Edinburgh: Scottish Parliament Information Centre (SPICe)
- Krueger, A. B. (2003) Economic Consideration and Class Size, *The Economic Journal*, 113, 34–63
- Masounmi, E., Millimet, D.L. & Rangaprasad, V. (2005) Class Size and Educational Policy: Who Benefits from Smaller Classes?, *Econometric Reviews*, 24(4), 33–368
- Molnar, A. Smith, P., Zahorik, J. & Palmer, A. (1999) Evaluating the SAGE Program: A Pilot Program in Targeted Pupil-Teacher Reduction in Wisconsin, *Educational Evaluation and Policy Analysis*, 21(2), 165-177
- Nye, B.A., Boyd-Zaharias, J., Fulton, D. & Wallenhorst, M.P. (1992) Smaller classes really are better, *The American School Board Journal*, May, 31-33
- Nye, B., Hedges, L.V. & Konstantopoulos, S. (2002) Do Low-Achieving Students Benefit More from Small Classes? Evidence from the Tennessee Class Size Experiment, *Educational Evaluation and Policy Analysis*, 24(3), 201–217
- Nye, B., Hedges, L.V. & Konstantopoulos, S. (2004) Do Minorities Experience Larger Lasting Benefits From Small Classes, *The Journal of Educational Research*, 98(2), 94–100
- Pate-Bain, H. & Achilles, C.M. (1986) Interesting Developments on Class Size. *Phi Delta Kappan*,

67, 9, 662-665

- Pate-Bain, H., Fulton, B.D., & Boyd-Zaharias, J. (1999) *Effects of Class-size Reduction in the Early Grades (K-3) on High School Performance: Preliminary Results (1999) from Project STAR, Tennessee's Longitudinal Class-size Study*, USA: Health and Education Research Operatives Services (HEROS) Inc
- Robinson, G.E. (1990) Synthesis of research on the effects of class size. *Educational Leadership*, April, 80-90
- Slavin, R.E. (1987) Ability grouping and student achievement in elementary schools: a best-evidence synthesis. *Review of Educational Research*, 57, 3, 293-336
- Slavin, R.E. (1990) Student Achievement effects of ability grouping in secondary schools: a best-evidence synthesis. *Review of Educational Research*, 60, 3, 471-499
- Scottish Executive (2006a) *Pupils in Scotland, 2005*. Statistical Bulletin Edn/B1/2006/1. Edinburgh: Scottish Executive
- Scottish Executive (2006b) *Class Sizes, Staffing and Resources Working Group – Interim Report*. Online at <http://www.Scotland.gov.uk/Publications/2006/06/26102419/0>
- Scottish Parliament Information Centre (2002) *Class Size and Pupil Attainment*, SPICe Briefing 02/16, Edinburgh: SPICe
- Scottish Labour Party & Scottish Liberal Democrats (2003) *A Partnership for a Better Scotland: Partnership Agreement*, Edinburgh: Scottish Labour Party & Scottish Liberal Democrats
- Smith, R. (2006) Over the limit?, *Scottish Education Journal*, 12–13
- Stecher, B.M. & Bohrnstedt, G.W. (undated) *Class Size Reduction in California: Early Evaluation Findings, 1996-98*. Online at <http://www.classsize-org/aboutcon/index-00.htm>
- Thorpe, G. (1997) *CSU Additional Analysis 1995 English and 1996 Science: Class Size and Composition*, Edinburgh: SCORE
- Times Educational Supplement Scotland (2007) Money troubles lie ahead, *TESS*, 19 January, 1
- Watt, J. (1996) Educational Disadvantage in a Culture of Achievement: Research Priorities for the Early Years, *Scottish Educational Review*, 28(2), 139-149
- Wilson, V., Schlapp, U. & Davidson, J. (2002) *More than 'an extra pair of hands'? Evaluation of the Classroom Assistants Initiative*, Edinburgh: SCORE
- Wilson, V. & Davidson, J. (2006) *The Impact of Additional Support Staff Provided by the Teachers' Agreement*, Edinburgh: Scottish Negotiating Committee for Teachers. Online at <http://www.snct.org.uk/library/284Support%20Staff%20Report%20to%20SNCT%20170106.pdf>
- Wilson, V. (2006) *Does Small Really Make A Difference? An Update. A review of the literature on the effects of class size on teaching practice and pupils' behaviour and attainment*, Edinburgh: Scottish Executive. Online at <http://www.scotland.gov.uk/Publications/2006/06/26102419/0>

#### ACKNOWLEDGEMENTS

The researcher is grateful to the Working Group on Class Size and the Scottish Executive for funding this review. The views expressed are those of the researchers.