

## Technical Appendix

### Definition

Research supports the notion that children learn more and teachers are more effective in smaller classes. As the size of a class or teaching group gets smaller it is suggested that the range of approaches a teacher can employ and the amount of attention each student will receive will increase, so learning and attainment will improve.

Search Terms: class size; size; reduction; reducing class size; increasing class size; smaller classes

### Evidence Rating

There are six meta-analyses, which consistently find academic benefits for reducing the size of a class. However, pooled effect sizes are generally small, from 0.12 to 0.34. Most meta-analyses include correlational data where the causal warrant is weaker. The strongest evidence comes from research into younger age groups (five to seven year-olds) in the USA, where the benefits appear to be sustained for three to four years when classes are reduced below 18. Evidence from Sweden based on smaller classes in the last three years of primary school (age 10 to 13) suggests effects persist, leading to improved achievement at age 16. There is some evidence that pupils in disadvantaged areas in the UK benefit from classes of fewer than 20 pupils in primary schools and that low-attaining pupils in particular may benefit from smaller classes at secondary level (classes of 15 as compared with 30 pupils). Overall, the evidence is rated as moderate.

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## Summary of effects

Meta-analyses	Effect size	FSM effect size
Glass, G.V. & Smith, M.L. , (1978)	0.20	-
Goldstein, H., Yang, M., Omar, R., Turner, R., & Thompson, S. , (2000)	0.20	-
McEwan, P. J. , (2015)	0.12	- (In developing countries)
McGiverin, J., Gilman, D., & Tillitski, C. , (1989)	0.34	-
Shin, I. S., & Chung, J. Y. , (2009)	0.20	-
Slavin, R.E. , (1989)	0.17	-
<b>Median Effect Size</b>	<b>0.19</b>	

The right hand column provides detail on the specific outcome measures or, if in brackets, details of the intervention or control group.

## Meta-analyses abstracts

### 7 Glass, G.V. & Smith, M.L. (1978)

Research on class size and achievement is a particularly complex body of findings to integrate and understand. The integration of this literature has required more sophisticated analysis than has previously been applied to the problem. The research on class size and its relationship to achievement falls into four stages: the pre-experimental era (1895- 1920); the primitive experimental era (1920-1940); the large-group technology era (1950-1970); and the individualization era (1970-present). The difference in achievement resulting from instruction in groups of 20 pupils and groups of 10 can be larger than 10 percentile ranks in the central regions of the distribution. There is little doubt that, other things equal, more is learned in smaller classes.

### 8 Goldstein, H., Yang, M., Omar, R., Turner, R., & Thompson, S. (2000)

Meta-analysis is formulated as a special case of a multilevel (hierarchical data) model in which the highest level is that of the study and the lowest level that of an observation on an individual respondent. Studies can be combined within a single model where the responses occur at different levels of the data hierarchy and efficient estimates are obtained. An example is given from studies of class sizes and achievement in schools, where study data are available at the aggregate level in terms of overall mean values for classes of different sizes, and also at the student level.

### 10 McEwan, P. J. (2015)

I gathered 77 randomized experiments (with 111 treatment arms) that evaluated the effects of school-based interventions on learning in developing country primary schools. On average, monetary grants and deworming treatments had mean effect sizes that were close to zero and not statistically significant. Nutritional treatments, treatments that disseminated information, and treatments that improved school management or supervision, had small mean effect sizes (0.04–0.06) that were not always robust to controls for study moderators. The largest mean effect sizes included treatments with computers or instructional technology (0.15); teacher training (0.12); smaller classes, smaller learning groups within classes, or ability grouping (0.12); contract or volunteer teachers (0.10); student and teacher performance incentives (0.09); and instructional materials (0.08). Meta-regressions suggested that the effects of contract teachers and materials were partly accounted for by composite treatments that included training and/or class size reduction. There are insufficient data to judge the relative cost-effectiveness of categories of interventions.

### 11 McGiverin, J., Gilman, D., & Tillitski, C. (1989)

The purpose of this investigation was to examine the effects of Indiana's project Prime Time on reading and math achievement test scores of second graders who had completed 2 years of a state supported reduced-class-size program. PRIME TIME reduced class sizes in grades K-3. The results of 10 studies yielding a total of 24 comparisons (3,967 scores) of PRIME TIME (small) and pre-Prime Time large) classes were combined using Fisher's inverse chi-square procedure. Large classes averaged 26.4 students and small classes averaged 19.1 students. The results of this meta-analysis were significant at the .001 level. 10 comparisons (1,148 scores) were combined in a second meta-analysis for a control group in which class size was not reduced, and these results were not significant. The effect size for the PRIME TIME group was .34 standard deviations. This suggests that Prime Time students had higher achievement in basic skills after 2 years than did their cohorts in larger classes and indicates that primary children learn more effectively in smaller classes.

13 *Shin, I. S., & Chung, J. Y. (2009)*

The purpose of this meta-analysis is to review the effect of class size on student achievement. Class size reduction (CSR) is one of the most important and interesting educational issues in the world, especially since it is one of the most expensive choices in educational policy. In this meta-analysis, 17 studies (8 published and 9 unpublished) were analyzed using the random-effects model. The results of this review suggest that student achievement in small classes is better than that of large classes by .20 standard deviations. A fixed-effects categorical analysis was also conducted to find the sources of variance and moderator variables that predict the effects of CSR. First, effect sizes were higher in published studies than in unpublished studies. Second, in terms of school subjects, the results of CSR were generally positive. Third, the effect of CSR on student achievement was larger in elementary schools than in secondary schools. Fourth, the results of CSR were generally positive, except in 10th grade. Fifth, the results of CSR are mixed, but generally positive by location of states.

15 *Slavin, R.E. (1989)*

Based on reviews by Glass, Cohen, Smith, and Filby (1982) and the Educational Research Service (1978), Cooper (this issue) concludes that substantial reductions in class size can have important effects on low-achieving students in the early grades. This article critiques these reviews and summarizes the findings of experimental studies that compared the achievement levels of elementary school students in larger classes to classes with no more than 20 students. Even in studies that made such substantial reductions, achievement differences were slight, averaging only 13% of a standard deviation. Not until class size approaches one is there evidence of meaningful effects. Based on this and other evidence, it is suggested that Chapter 1 programs provide one-to-one tutoring in reading rather than providing small-group pull-outs or reducing overall class size.