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Class Size: What's the Best Fit?

by W. Steven Barnett, Karen Schulman and Rima Shore

Is class size an important influence on the quality and educational effectiveness of preschool programs? Teachers and parents generally believe so. Common sense suggests that smaller classes and higher staff-child ratios are better for young children, allowing more individual attention, reducing the time and effort devoted to classroom management, and reducing the number of stressful interactions. Yet, some states do not set limits on class size in their prekindergarten programs, and some researchers have suggested there is no causal link between class size and educational effectiveness. Of course, no one really believes that it doesn't matter how many preschool children are packed into a classroom. Thus, it is useful to consider what research has discovered about the relationship of class size to preschool children's experiences and outcomes.

The relationship between class size and cost also deserves consideration. Just as smaller classes benefit young children, smaller classes also cost more. Therefore policy makers and parents face a tradeoff. They must weigh the value of the gains to children from reducing class size against the costs. This is a difficult task, made more difficult by the fact that the costs are easily measured while the benefits may be hard to see and measure without rigorous research. This brief provides information on costs and guidance on comparing the benefits from smaller classes to those costs.

What We Know:

- **Class size reduction is a policy that can increase educational effectiveness.**
- **Small class size and better staff-child ratios offer health and safety benefits.**
- **Most state preschool programs and the federal Head Start program do not require the small class sizes found to produce the large educational gains desired for disadvantaged students.**
- **Some state preschool programs set no limits on class size.**
- **Costs of class size reduction depend on the starting point, opportunities for more efficient allocation of staff, and the extent of cost-savings from lower administrative costs (from reduced turnover, for example).**

Policy Recommendations:

- **All states should set research-based program standards that jointly address class size, ratios, teacher qualifications and teaching practices.**
- **Reductions in class size can be phased in gradually and should be accompanied by adequate financial support so as to avoid unintended consequences.**
- **Policies that support teachers in adapting their teaching to smaller class sizes may maximize the benefits of class size reduction.**
- **Given the potential benefits and costs of class size reduction, the federal and state governments should conduct experiments with different class sizes to identify the optimal class size for classrooms with various mixes of children with economic and other disadvantages, including special education needs.**

Policy and Research Effects on Class Size *(continued)*

Studies show that class size and staff-child ratios not only have an impact on the quality of the environment but also on children's outcomes. Data from The National Institute for Child Health and Human Development (NICHD) Study of Early Child Care involved a sample of 1,364 children from diverse backgrounds in nine states. These data were used to examine the relationship between standards in the areas of staff-child ratios, group sizes, caregiver training, caregiver education, and children's development. Children in classrooms that met more of the recommended standards displayed greater school readiness and language comprehension and fewer behavior problems at 36 months old.⁹

The National Day Care Study, which involved randomly assigning 3- and 4-year-olds to preschool classrooms with different child-staff ratios and levels of staff education, also demonstrated the beneficial outcomes from higher staff-child ratios. Children in smaller classes had greater gains in receptive language, general knowledge, cooperative behavior, and verbal initiative, and showed less hostility and conflict in their interactions with others.¹⁰

Expert reviews of research have reached similar conclusions. For example, *From Neurons to Neighborhoods: The Science of Early Childhood Development*, an exhaustive review of the research by the National Research Council, affirms

the positive impact of small groups on caregiver behavior and child outcomes.¹¹ They conclude that research shows the importance of regulated class sizes and higher ratios for preschoolers (ages 3 through 5) as well as for younger children.

In addition to studies involving child care centers and preschools, studies involving the early elementary grades, especially kindergarten, strengthen the case for smaller class sizes. Project STAR (Student/Teacher Achievement Ratio) in Tennessee offers by far the most compelling evidence to date regarding the effects of class size on learning and other education outcomes.¹² STAR was a true experiment

Table 1 Notes:

Four states—New Jersey, New York, Ohio, and Wisconsin—have two state-financed prekindergarten programs each. An abbreviation of the name of each individual program is provided in parentheses. In all cases, these states have different class size and/or staff-child ratio requirements for each program. In addition, Louisiana has three distinct prekindergarten programs, but they all have the same requirements, so they are not shown separately in the table.

The listed program standards for class size and staff-child ratio in Arizona's state pre-k initiative represent NAEYC requirements. All programs receiving state pre-k funds must be accredited.

Class size in California's state pre-k program is typically limited to 24, for both 3- and 4-year-olds.

Kansas does not mandate class size or ratios for state pre-k, but programs are encouraged to follow NAEYC recommendations and limit class size to 15 students with two teachers present.

In Michigan's state pre-k program, a qualified teacher plus an associate teacher must be present in rooms with 9 to 16 children. If more than 16 students are in a class, then a third adult (who does not have to meet any specified qualifications) must be present.

State pre-k programs in Nevada must provide a rationale for class size and ratio. The state recommends NAEYC guidelines.

In Texas, most state-funded pre-k classes do not exceed 18 children and a teacher and an aide are present in most classrooms, but there are no class size or ratio requirements.

Program standards in Washington's state pre-k program are targeted for 4-year-olds, but since 3-year-olds are in blended classrooms, standards apply to the educational setting for both ages. In classes of 24 students, the staff-child ratio must be 1:6.

The staff-child ratio requirement in West Virginia's state-funded pre-k changed to 1:10 as of the 2003-2004 program year, with one certified teacher mandated in each classroom.

Abbreviations Used in this Table:

NA — not applicable (state pre-k program does not serve 3-year-olds)

NR — data were not reported

Data Sources:

State pre-k data are from the 2002-2003 program year and were gathered for NIEER's *The State of Preschool: 2004 State Preschool Yearbook*. Data are not presented for Alaska, Florida, Idaho, Indiana, Mississippi, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota, Utah, and Wyoming, as these states did not offer state-funded pre-k in 2002-2003.

Child care data are from Lemoine, S. (2004). Compiled from licensing regulations posted on the National Resource Center for Health and Safety in Child Care web site at <http://nrc.uchsc.edu>.

in which children from a large statewide sample were randomly assigned to smaller (13-17 students) or larger (22-26 students) classes from kindergarten through grade three. Students assigned to smaller classes performed better than students in larger classes on all achievement tests in all subject areas in every grade.

Minority students and students attending inner-city schools benefited most. For all children, the magnitude of effects was modest — 0.5 months increase in reading achievement and 1.6 months increase in math achievement in kindergarten. Gains increased every year the children were in a smaller sized class, and the study found that “the earlier small classes are introduced, the greater the potential for a strong impact on academic achievement.”¹³ Smaller class size also reduced grade retention. Some achievement gains were found to persist at least through grade 8.

Several quasi-experimental studies on class size reduction in the early grades, while not as rigorous in their methodology, have findings that are consistent with those of the Tennessee’s Project STAR.¹⁴ Wisconsin’s Project SAGE (Student Achievement Guarantee in Education) found positive impacts of small classes on student achievement, especially for minority students, and these impacts were consistent for the four years from kindergarten to third grade.

Children attending smaller classes in Burke County, North Carolina, did better in math and reading at the end of first, second, and third grades and continued to outpace their peers after returning to regular classes in fourth and seventh grades. An evaluation of a large-scale effort to reduce class size in California that looked at effects in third

grade found small but significant gains in reading, language, and math achievement levels.

By contrast, a statistical analysis of data from the Early Childhood Longitudinal Study—Kindergarten Cohort (ECLS-K) found kindergarten class size to have small effects on reading and no effects on math.¹⁵ Such studies employing large national data sets and sophisticated statistical analyses with multiple controls for child and school characteristics can provide useful estimates. However, they are methodologically weaker than experimental (and even quasi-experimental studies) in which class size has been altered for research purposes and there is a good match between the teachers and children experiencing different class sizes. The lack of random assignment or other procedures to ensure that children in different size classes are truly comparable and that class size is not confounded with other aspects of the environment (e.g., differences among communities and schools) reduces the confidence that can be placed in the results of the ECLS-K analysis.

Finally, students are likely to have health and safety benefits in addition to benefits for learning and development with smaller preschool classes and more teachers relative to number of students. A number of studies have found larger groups to be associated with higher rates of infection for children, greater

risk of injury due to dangerous situations (e.g., children climbing on furniture and equipment not designed for this purpose), and increased teacher stress that may even result in child abuse.¹⁶

In sum, preschool research strongly indicates that smaller class sizes are associated with greater educational effectiveness and other benefits. Even within studies that focus only on preschool children, the effects of class size have been found to be larger for younger children.¹⁷ Moreover, only those programs with small effective class sizes (15 or fewer) and high ratios of teachers to children have been found to produce very large educational benefits.

The preschool research is bolstered by research on class size for children in K-12 education, which finds that smaller classes are most productive for younger and more disadvantaged children, and “the major benefits from reduced class size are obtained as the size is reduced below 20 pupils.”¹⁸ If anything, class size recommendations based on studies of children in kindergarten and the early grades may be too large, given the characteristics and educational needs of younger preschool children. The research is consistent with the recommendations of professional organizations such as NAEYC and APHA that smaller class sizes are needed for younger children.



Understanding Why Smaller Classes Make a Difference

It is important to examine why smaller classes appear to produce better results for young children. Intuitively, the reasons seem clear. Teaching young children requires immense energy and relentless attention. When there are fewer children in the room, the teacher has more time to devote to each child, and managing the group requires less teacher time. As a result, teachers have opportunities to have longer conversations with each child. Teachers also have more time to observe each child's interests and activities so they can develop lesson plans that respond to individual children's learning styles, strengths and weaknesses. The STAR experiment provides supporting evidence since teachers in small classes spent more time on instruction and less on managerial and organizational tasks.¹⁹

The increased interaction and communication made possible in smaller classes have been shown to affect children's outcomes. An analysis of data from the NICHD Study of Early Child Care determined that responsive, sensitive caregiving was related to cognitive and language outcomes throughout the first three years of life and that frequency of language stimulation by caregivers was a particularly important factor in this link.²⁰

In addition, it seems likely that child behavior is directly affected by class size. In smaller classes, children are more likely to be engaged in learning activities and less likely to disrupt class. Children's behavior may be affected this way because smaller classes make it harder for them to escape the teachers' notice. Children may be more primed to participate, knowing they will not be able to avoid responding to the teacher's questions, and may be less likely to make trouble, knowing the teacher will catch them if they do.²¹

STAR found that children in the smaller classes took greater initiative in class, exerted more effort in learning activities, and displayed less disruptive, inattentive, and withdrawn behavior.²²

Although the STAR data are from kindergarten and the first grades of school, it seems reasonable to extrapolate from these findings to 3- and 4-year-olds. As noted earlier, theory and evidence indicate that preschool children should benefit from small class size even more than do kindergarten children. The kinds of teacher and child behaviors that were affected by the STAR class size reduction present the greatest potential for producing educationally effective preschool programs.

Eager to Learn, a report by the National Research Council on preschool education, offers further insight into the link between class size and child outcomes. The report found that, in smaller groups, child-initiated activities are

more common, with teachers more likely to follow children's leads rather than directing or scheduling all activities.²³ This echoes the STAR findings and is a particularly important benefit, since self-initiated learning is a crucial feature of sound early education curricula. A report by NIEER, *High-Quality Preschool: Why We Need It and What It Looks Like*, analyzing the features of effective preschool programs emphasized this point, documenting adverse effects when all activities are teacher-directed.²⁴

Eager to Learn also noted that small classes allow teachers to spend more time supporting children's exploration and problem-solving. With more time for each child, they are better able to work on extending children's language experiences. In addition, when there are fewer children in the room, teachers can more closely mediate children's social interaction.²⁵



Costs and Benefits of Smaller Class Sizes *(continued)*

However, it is sometimes possible to reorganize teacher responsibilities so that class size reduction can be accomplished at little or no cost. For example, Burke County's early elementary grades class size reduction was actually accomplished without any increase in costs per child. The district was able to reallocate existing resources, such as reassigning qualified staff members who had not been teaching their own classes all day.

The cost of class size reduction depends on the current size of the classes and the target size. For example, reducing class size from 25 to 20 in a program with 300 students requires the addition of 3 teachers and classrooms as the number of classes goes from 12 to 15. Reducing class size from 20 to 15 in a program of 300 students requires the addition of 5 teachers and classrooms as the number of classes goes from 15 to 20. (*Figure 1*)

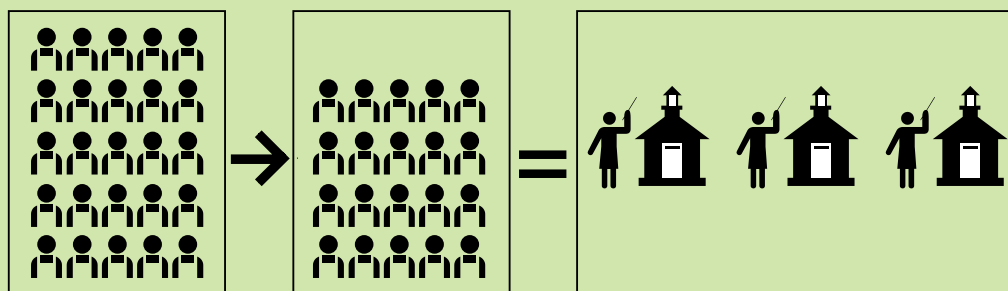
It seems likely that some of the added staffing costs from reducing class size are offset by other savings produced indirectly. For example, if smaller classes are more manageable and make teaching more rewarding, then teachers should find smaller classes more attractive. This should decrease teacher turnover, resulting in reduced costs for hiring and training. Teachers in smaller classes may also require less supervision. In addition, preschool programs with smaller class sizes may be able to attract teachers of the same quality but at somewhat lower salaries and benefits, thereby lowering costs.

The available evidence is not so precise as to permit definitive statements about the optimal class size, given the tradeoffs between costs and benefits. What is clear, though, is that preschool programs with much smaller class sizes (and higher ratios) than are commonplace today have produced

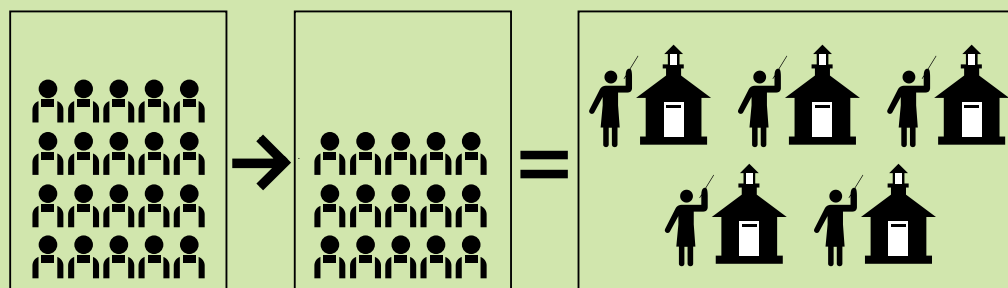
much larger educational gains than are commonly experienced. Moreover, they have done so while generating economic benefits that exceeded their costs.

Many states' regulations for prekindergarten programs and child care class size (and ratio) and federal Head Start regulations may cost the nation more in lost educational effectiveness than they save through lower expenditures since they are insufficiently strict to achieve desired outcomes. The best experimental evidence available in which class size was varied is from the STAR study of kindergarten class size effects. A comparison of the size of the STAR effects to the size of the total effects of large-scale preschool programs today suggests that class size reduction to around 15 students in preschool programs for disadvantaged children could increase outcomes by as much as 50 percent.²⁹

Figure 1. In a program with 300 students, decreasing class size from 25 to 20 requires the addition of three teachers and classrooms.



In a program with 300 students, decreasing class size from 20 to 15 requires the addition of five teachers and classrooms.



Making the Most of Small Classes

Several studies have attempted to isolate the impact of class size and weigh its importance relative to other factors that may contribute to quality such as teacher education and training. However, it may not be useful to focus on possible tradeoffs between class size and teacher training or other classroom characteristics, or on whether it is better to have highly qualified teachers in larger classes or teachers with lower education levels in smaller classes. Most preschool classrooms today are only marginally effective and do not produce the large gains in children's abilities that we know are possible and cost-effective. To change this, emphasis should be placed on examining how small classes can be combined with other factors that contribute to quality in order to produce the results policy makers want for preschool children.³⁰

Careful implementation of policy changes is required to avoid unintended consequences. Rapid increases in demand for classroom space and teachers can lead to a reduction in the quality of new teachers and facilities and to higher costs for both. Gradual change that gives labor (teacher), real estate and construction markets time to adjust may result in higher quality and lower cost. Also, reducing class size or improving ratios without attending to other aspects of quality and public subsidies has the potential to reduce other contributors to quality and increase fees to parents.³¹ Fee increases can lead parents to switch to unregulated alternatives or not enroll their children at all. Where programs are publicly funded, cost increases that are not fully reimbursed can lead providers to decide not to participate, close down, or reduce costs in other areas related

to quality. Class size, ratio, and teacher qualification standards must be set (and enforced) together, since changes in one have been found to alter the others and to affect fees.

Because program characteristics like class size, which are easy to regulate, do impact quality, it doesn't mean that policymakers and administrators can ignore program characteristics that are harder to regulate, such as the relationships between children and their teachers and encouragement of child-initiated activities. It does mean, however, that establishing smaller classes and addressing other core features through regulation can be first steps in fostering quality in prekindergarten programs. It is important that these measures be followed by more complex strategies that take full advantage of the smaller classes, such as providing training for teachers on teaching strategies.

Policymakers may have to simultaneously address the entire range of factors – from class size and teacher qualifications to teacher interactions with their students to program leadership – to see that full potential impacts are realized. While this may be more costly, it may also be the only way to reap the benefits that ultimately make a prekindergarten program pay off, in terms of increased achievement, lower rates of special education placements and grade retention, and higher graduation rates. There is much to be done. Closing even half the gap in skills and abilities at school entry between children in poverty and the middle class, would require a combination of supervision, teacher quality and class size reduction that lies beyond what Head Start and most state preschool programs currently require.

Remaining Research Questions

Although class size and ratios have been studied extensively, policy makers could benefit from more precise guidance. There are still many areas for further exploration. Important questions worthy of future research include:

- *Are there threshold levels at which lowering class size has a particularly large effect, or at which class size is so small that reducing it further has little impact?*
- *What are the costs of reducing class size (from specific high levels to other specific low levels)?*
- *What types of training help teachers take full advantage of smaller classes and the resultant increased opportunities for interaction with their students?*
- *Are there important interdependencies in program standards – for example, are gains from increasing teacher quality much larger with small classes?*
- *When it is not feasible to reduce class sizes to the desired level, are there other steps that can be taken to compensate until it is possible to reduce class sizes?*
- *Given that much of the research on class size involves child care centers serving infants, toddlers, and preschoolers, or the early elementary school grades, shouldn't consideration be given to whether the effects of class size differ appreciably for state prekindergarten program settings or Head Start compared to these other programs?*

Additional research could help shed light on these unresolved questions and enable policymakers to determine when and how it is best to modify class size. Strong preference should be given to true experiments (or strong quasi-experiments where class size is actively changed) over purely statistical studies that depend on "natural" variation.

Policy Recommendations

Although not all questions have been settled about class size, there is enough evidence for several policy recommendations:

Set and enforce program standards.

All states should set, implement, and enforce program standards for early childhood programs based on research covering teacher behaviors, child outcomes, and health and safety. The standards should jointly address teacher qualifications, class size, and staff-child ratios so as to prevent unintended consequences for one aspect of program structure relating to quality when another is targeted for improvement.

Review class size and ratio requirements.

Many states permit class sizes so large that they may jeopardize much of the potential educational benefit of preschool education. This is particularly

true when class sizes exceed those recommended by professional organizations, but even these recommended class sizes seem too large for children in poverty or with special needs.

Ensure that a focus on class size and ratios is complemented by attention to more difficult-to-regulate components of quality.

Any reduction in class size should be accompanied by other efforts, such as training for staff on teaching techniques, that take full advantage of the increased student-teacher interaction that is possible in smaller classes.

Provide resources needed when implementing smaller class sizes.

Smaller classes mean higher costs per student, so any effort to reduce class size must be accompanied by the resources to achieve this goal without reducing the number of children able to participate. States should also closely monitor the degree to which class size

reduction affects costs. Gradual implementation of class size change is likely to produce better outcomes and minimize cost increases.

Support new research on class size issues.

Research is needed to provide more precise information on the relationship of specific class sizes to child outcomes, the impacts of class size on subgroups of preschoolers, and whether there are threshold levels at which class size reduction has a particularly large impact or, conversely, at which making the class size any smaller has minimal or no effect. Research offers reasons to believe that reducing class size to 15 (or fewer) students, at least for disadvantaged children, could substantially improve educational outcomes. Given the costs and potential benefits, experiments with Head Start and state preschool programs to measure the costs and benefits of class size reductions would be extremely valuable.

Endnotes:

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