

Communications

Does class size reduction necessarily lead to improvement in student achievement?

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Efforts to improve student achievement in mathematics have led to the contention that the quality of classroom instruction matters (*e.g.*, United States Department of Education, 2000). Class size reduction, as an apparent and quick improvement in condition for classroom instruction, is often taken as a policy option that bears much promise for improving student achievement. Yet, positive effects of class size reduction on student achievement improvement are supported by some studies but not by others (*e.g.*, Hattie, 2005). In fact, large size class does not necessarily mean low achievement as it commonly exists in high-achieving education systems (particularly in mathematics) in East Asia, such as China and Japan. What class size reduction can achieve in Western contexts thus calls for a better understanding of possible changes in classroom instruction. We briefly review relevant studies on the effect of class size reduction on student achievement and classroom instruction, East Asian teachers' practices in classroom management, and provide suggestions for future educational research and practice.

Findings on class size effects

Positive effects of small class size on student achievement were generally evidenced through a sequence of studies from the Student/Teacher Achievement Ratio project (STAR). Compared to other studies on class size change in which confounding variables were not well controlled, Project STAR was a well-designed 4-year randomized class-size reduction experiment in Tennessee that involved approximately 11,600 students and 1,300 teachers in 76 schools (Nye, Hedges, & Konstantopoulos, 2000). The experiment was designed to compare student achievement in mathematics and reading between small classes (average of 15 students) and regular-sized classes (average of 22 students) across grades K-3. The results suggested that students in small classes had significantly higher mean achievement than those in regular-size classes (Nye *et al.*, 2000). Zurawsky (2003) reviewed relevant research and concluded that students would benefit even more if they could enroll in small classes early, especially starting from full-day kindergarten or first grade. Yet, the positive effect of class size change would become evident only when the class size is reduced substantially to an ideal range of 13 to 17 students. Zurawsky further pointed out that minority students and students in inner-city schools can benefit even more than white students.

However, Konstantopoulos (2008) recently used the data from project STAR and found that although small class size benefited all kinds of students, higher-achieving students benefited more than low-achieving students. Contrasting to previous studies that focused on average differences of student achievement, Konstantopoulos examined the differences in achievement variability between students in small classes and those in regular-size classes at various quantiles. It was found that achievement gains at the upper tail (75th and 90th quantiles) for small class students were consistently much larger than those at the middle or the lower tails across grades K-3. The result suggested that small class size in fact would not narrow (if not enlarge) the achievement gap that was already in place.

Class size reduction effect becomes even less straightforward when taking into account many other studies that showed only slightly positive or mixed effects of small class size on student achievement. For example, Hattie (2005) synthesized over 500 meta-analyses with regard to the effects of 46 different educational interventions including class size reduction. As a result, class size was found to be the 40th influential factor on student achievement (out of 46, ranked in terms of their effect sizes) with the mean effect size of 0.13 from a total of 2559 studies related to class size. Mixed findings from existing studies suggest that class size reduction is not a magic bullet that can surely lead to major improvements in student achievement. Similar to the case of developing and using new curriculum materials for improving student mathematics achievement (National Research Council, 2004), class size reduction may be only one factor that can possibly contribute to the improvement of students' learning. A causal link between class size reduction and student achievement improvement would overlook various factors that come into play in the process of classroom instruction with class size reduction. The question becomes: what differences may class size reduction bring to classroom teaching and learning?

Possible effects on classrooms

Although numerous studies have been conducted to examine class size effect, very few have been undertaken to examine why the class size effect is so small (Hattie, 2005). A possible and often discussed aspect for understanding whether small classes work or not is teacher and student classroom behavior (*e.g.*, Konstantopoulos, 2008; Zurawsky, 2003). With fewer students in a classroom, it is reasonable to expect less students' misbehavior that should make the teacher's job easier in classroom management. However, the reduced work in classroom management does not automatically lead to the teacher's increased efforts in engaging students and improving content instruction. Nor is it clear that a smaller class size will benefit students in their learning. Especially for the case of school mathematics, when students' learning of mathematics is happening at different paces, increased teacher's attention to individual students' learning is commonly valued. Yet, such possible increase in the teacher's attention to individual students cannot be assumed for an automatic improvement of teacher-student interaction quality and an enrichment of mathematical thinking in classrooms. Just as what is often assumed about the

superiority of a student-centered instructional approach, the U.S. National Mathematics Advisory Panel (2008) pointed out that no solid evidence is available to support this assumption in comparison to a teacher-centered approach for improving student achievement. What becomes important is to understand what quality changes the class size reduction may potentially bring to classroom teaching and learning.

At a time when we do not know much about the type of quality changes needed, we turn our attention to instructional practices in some high-achieving education systems where large class size is the norm. In particular, East Asian large class size and student high achievement in mathematics present a contrasting case to the West, such as Canada and the United States. It becomes interesting to understand why large size classes do not impede the development of high quality teaching and learning in Asian classrooms.

East Asian practices

Although large size class is common in many East Asian education systems, it is generally perceived that East Asian classes present a positive learning environment. We have found that East Asian teachers seemingly do not take large class size as a concern in carrying out classroom instruction (Ding, Li, Li, & Kulm, 2008). Nevertheless, possible negative impacts, such as more classroom misbehaviors likely caused by larger class size, will not automatically go away simply because the teachers do not worry about the large class size. It is generally believed that East Asian students are easy to manage due to the influence of Confucian culture (e.g., Jin & Cortazzi, 1998). However, this is not the complete picture. Researchers found that Asian teachers use many effective strategies to manage their large size classes and engage students, in addition to possible cultural influence. These strategies include "the use of student's autonomy," "proper grouping," and "random questioning" (e.g., Jin & Cortazzi, 1998; Lewis, 1988). For example, Lewis (1988) described how Japanese teachers used students' autonomy in classroom management. One teacher indicated, "I do not want to create children who obey because I'm here. I want children who know what to do themselves, and who learn to judge things themselves" (p. 164). A typical example of the strategy use in a classroom is that, at the first class meeting of a semester, the teacher let the class head (selected from students in the class) take 17 minutes to make the class quiet. The teacher explained that the class needed to learn how to manage themselves even though she could give an order to keep the whole class quiet rather than waiting for 17 minutes. Together with the use of such strategies, we argue that the fundamental idea of classroom management for East Asian teachers is to transfer the authority from the teacher to students and to engage students in learning.

East Asian practices in regulating students' classroom behavior and mentally engaging students likely present a contrasting picture to what Western practices aim to achieve with class size reduction. We believe that class size reduction alone does not necessarily lead to the improvement of student achievement or even their classroom behavior such as engagement. One key factor is what teachers can and should do differently in managing their classrooms and in developing high-quality content instruction. Many questions

related to class size reduction remain to be answered in a Western context: How does the class size reduction benefit the teacher and students in the classroom? What may the teacher do differently with a smaller class? What advantages and disadvantages may students get with fewer peers in the classroom? What supporting factors may be important to consider together with class size change for improving classroom teaching and learning?

Although East Asian practices have been informative, it is important to realize that American students are a different student body in comparison to their Asian counterparts. Existing research has already informed us that different cultures hold different values for what can be counted as 'good students' (e.g., Jin & Cortazzi, 1998) and 'good lessons' (e.g., Li, Kulm, Huang, & Ding, 2009). Thus, further research is needed to investigate what possible strategies can be developed and used in smaller classes in the West and how to help teachers develop their professional capability. Moreover, similar to the use of Japanese lesson study in the U.S., research can also be carried out to investigate the possibility of adapting effective Asian practices in Western contexts. With class size reduction as a policy option with some potential for improving student achievement but at a great cost, it is very important to ensure that *quality changes* in classroom teaching and learning take place.

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