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COMMENTARY

Changing Students' Lives Through the De-tracking of Urban Mathematics Classrooms

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When schools and other education institutions move to de-track mathematics classrooms, opportunities for student learning increase. Evidence for this fact comes from a number of different research studies that show that high-achieving students achieve at the same levels in tracked and untracked groups but that middle- and low-achieving students score at significantly higher levels when they are not working in tracks (Boaler, 2002, 2008a; Burris, Heubert, & Levin, 2006; Nunes, Bryant, Sylva, & Barros, 2009). But when schools de-track, mathematics classrooms changes are not only evident in test scores. Teaching environments that encourage high achievement from all students provide a range of possibilities for student learning that go well beyond content knowledge. Heterogeneous classrooms that are based upon co-operation among students change student perceptions of who they are and who they can be (Boaler, 2005), they change perceptions of the nature of mathematics, they teach students about the different qualities and contributions of students who are different from themselves (Boaler, 2008a, b) and they challenge the racial segregation that continues in schools. Despite the role that de-tracking plays in promoting equitable and high achievement, schools across the United States continue to divide students by perceptions of "ability" and communicate to students the idea that only some people—particularly white, middle class people—can be good at mathematics.

The question of the ways students' learning opportunities vary in tracked and de-tracked mathematics classrooms is one that has been close to my heart for many years. My first teaching job was in an urban inner London comprehensive school, with extensive racial diversity—some 45 different languages were spoken there. I arrived in my first classroom, fresh and eager to implement ideas from my teacher education courses at London University, with a group of students who had recently been placed into the bottom track. Their first words to me were, "Why should we bother?" I found it hard to answer that question, particularly as I knew that their placement into the bottom track meant that they had severely limited opportunity to achieve highly on the national examination in 2 years time. By my

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second year in the school, I had worked with the other teachers in the department to de-track all of the mathematics classes, and they remain de-tracked to this day. This meant that students who would previously have been placed in a low track with limited learning opportunities were able to achieve at the highest levels in the school in the following year, with focused encouragement and teaching.

When I became a researcher, I was given the opportunity to investigate the impact of tracking and de-tracking more systematically and I have now conducted two different longitudinal research studies in which students in heterogeneous urban mathematics classrooms achieved at significantly higher levels than students who worked in tracked groups (Boaler, 2002, 2008a; Boaler & Staples, 2008). In both cases, the teaching in the de-tracked groups was *designed* for heterogeneous classes; I review the essential features of such teaching environments later in this commentary. While much of my career has been spent studying and understanding the opportunities provided by de-tracked classrooms, I have also come to understand the challenges faced by teachers of such classes, particularly in urban schools, and realize that it is important to understand these challenges if we are to help more teachers teach heterogeneous classrooms effectively.

In the first part of this commentary, I review some of the findings from research on de-tracked classrooms, highlighting the advantages and possibilities provided by de-tracking. In the second part, I outline some of the features of the teaching that is necessary to provide positive work experiences for all students in de-tracked groups.

Benefits of De-Tracked Mathematics Classes

The first reason to de-track mathematics classrooms is that they offer increased opportunities for student learning and for high achievement. In my own studies, I have followed hundreds of students through tracked and untracked groups, collecting quantitative data on student achievement as well as qualitative, focused data on the work of teachers and students. In England, I followed 300 students through two schools, one of which was untracked and the other tracked (Boaler, 2002). In the United States, I followed hundreds of students through three schools, with one of them being untracked (Boaler, 2008a; Boaler & Staples, 2008). In close, detailed studies of the teaching and learning in these schools, I was able to show the impact of tracking. In England, students from middle and low groups in the tracked school effectively gave up and became unmotivated when they were placed into their middle and low groups. At the end of 3 years, students in the untracked school scored at significantly higher levels on the national examination (Boaler, 2002). This study confirmed others in showing that tracking significantly reduced the achievement of middle- and low-achieving students. It also showed that students in the highest group, particularly girls, dis-

liked their fast, high-pressure work environments and dis-identified with mathematics when they were placed into the highest group (Boaler, 1997). In the untracked school, all students were given the opportunity to achieve, and this resulted in significantly higher achievement than students who worked in tracked groups.

Critics of studies of small numbers of schools argue that the schools could have achieved success for other reasons, such as exceptional teachers. This reoccurring critique makes a recent study all the more interesting as researchers at Oxford University recently followed 16,000 students through schools considering (among other things) the impact of tracking for students in grades 4 and 6 (see Nunes, Bryant, Sylva, & Barros, 2009). Their conclusions, even across many schools with different teaching styles, were clear: the achievement at the schools without tracking was significantly higher and the reason for this was that tracking diminished the achievement of students in middle and low groups.

In the United States, there have been a number of studies examining achievement differences for students in tracked and untracked mathematics groups. For example, Burris, Heubert, and Levin (2006) conducted an interesting study of a de-tracking innovation in mathematics that compared six annual cohorts of students in a diverse middle school in suburban New York. The student cohorts attending the school in 1995, 1996, and 1997 were taught in tracked classes with only high-track students being taught the advanced curriculum. But in 1998, 1999, and 2000 all students in grades 7 through 9 were taught advanced curriculum in mixed-ability classes and all of the ninth graders were taught an accelerated algebra course. Burris and colleagues explored the impact of these different middle school experiences upon the students' completion of high school courses and their achievement, using four achievement measures, including scores on the advanced placement calculus examinations. They found that the students from de-tracked classes took more advanced classes, passed courses at significantly higher rates, and passed exams a year earlier than the average in the state of New York. The scores of the students were also significantly higher on various achievement tests, and the increased success from de-tracking applied to students across the achievement range, from the highest to the lowest achievers.

In my own study of 800 students who went through three different U.S. high schools, I was able to observe an unusual and highly effective teaching approach, called "complex instruction" (Cohen & Lotan, 1997). In the urban school, which I called "Railside," there was a very wide spread of student achievement, and teachers spent a lot of time and attention teaching students to work in groups and to listen to and respect each other (Boaler, 2008b; Boaler & Staples, 2008). The results were impressive, with students at the school achieving at significantly higher levels than students in tracked groups, as in other studies—but interestingly, the students who were most advantaged in the de-tracked school were the

highest achieving students. It was these students whose achievement increased the most over 3 years and who achieved significantly higher than those in high-track groups. The reason for their high achievement was that they spent time explaining work, which strengthened their own understanding, and they were encouraged to broaden their mathematical ways of working. Whereas the high-achieving students came into the school able to execute procedures quickly, the teachers encouraged the students to be broader: to consider different ways to solve problems, to view different mathematical perspectives, and to reason and interpret situations. At the beginning of this study, some of the high achievers complained about always having to help others, but by the second year they had changed their minds as they realized that the explanations and the depth of their work was helping their own achievement. In the following excerpt, a senior reflects upon working in a group with lower achieving students who might need her help:

> I think people look at it as a responsibility, I think it's something they've grown to do like since we've taken so many math classes. So maybe in ninth grade it's like Oh my God I don't feel like helping them, I just wanna get my work done, why do we have to take a group test? But once you get to AP Calc you're like Oh I need a group test before I take a test. So like the more math you take and the more you learn you grow to appreciate, like Oh Thank God I'm in a group! (Imelda, Railside, Year 4)

When considering the achievement opportunities provided to students in tracked and de-tracked groups the evidence is clear: students who work in de-tracked groups are given opportunities to learn (Porter, 1994), opportunities that are not always afforded to students in low groups. But recently, I was given the opportunity to consider the longer-term impact of ability grouping on students' achievement in the years after they attended school. I managed to track down the students who had progressed through the two different schools I had researched in England, some 8 years after they had left the schools. By that time, they were adults of about 24 years of age. I administered surveys to determine the jobs of these young adults, which allowed me to categorize their social class, revealing something very interesting. It revealed that students who had worked in untracked groups had significantly moved up the social-class scale, compared to their parents; whereas, those who had worked in tracked groups had stayed at the same social-class levels. In interviews, the students gave clear reasons for this lack of social mobility, telling me that the tracking they had experienced in school had constrained their achievement and made them feel that they were in "psychological prisons," which impacted their lives well beyond school (Boaler, 2005).

The benefits of good, heterogeneous grouping, enacted by skilled teachers, are many, ranging from high achievement, enhanced respect for other students (Boaler, 2008b), and even social mobility. But research also tells us that teaching

de-tracked mathematics classes is challenging—specifically, in a culture such as the United States where parents (and other stakeholders) hold strong beliefs about the need for tracking in schools. Inside the classroom, further challenges exist for teachers—in particular, providing materials that are appropriate for all of the different achievement levels, and encouraging students to work well together, especially when they have developed deficit ideas about students with lower achievement. These challenges are considered in the following section.

Successful Teaching Methods in De-Tracked Groups

I have been fortunate to conduct two different longitudinal research studies in which I was able to observe highly successful teachers working with heterogeneous groups. In a third study, my graduate students and I taught four mixed-ability classes of sixth and seventh graders in order to put into practice some of the teaching practices that we had studied (Boaler, Sengupta-Irving, Dieckmann, & Fiori, in preparation). In all three cases, the teachers used different teaching methods—one being to give open-ended projects, one to give less open problems but more careful teaching on students working together, and one that combined the other two approaches. But in all cases, teachers used a number of particular practices that I have come to regard as critical in the teaching of de-tracked groups:

1. *Students worked on mathematics tasks that were appropriate for many different achievement levels.* In England, the teachers achieved this by giving open, exploratory tasks that students could take in different directions. Different students used different mathematics, depending on where they chose to take the tasks. In the United States, the students worked on the same problems and worked together to agree upon answers, but the problems were chosen to be "multi-dimensional"—requiring different ways of being mathematical, such as asking questions, seeing problems in different ways, and drawing and representing. By broadening the mathematics that students worked on, teachers found that all students could offer important contributions. The mantra of the U.S. approach was, "Nobody is good at all of these ways of working but everyone is good at some of them." Whether teachers differentiate by task or by outcome, it is critical that students gain opportunities to work *at the right level for them*, that all students can contribute their thinking, and that all are challenged appropriately. These opportunities cannot occur when students are given the same narrow procedural questions.

2. *Students were taught to respect each other and to work well together.* In the English study, students were allowed to choose whether they worked alone or in pairs or groups and they were left to choose their work partners. Teachers always gave messages about all students being capable and I did not ever witness students being disrespectful or putting each other down during the 3 years I observed lessons. In the U.S. study, the grouping was much more deliberate and teachers arranged mixed-achievement groups, which changed every few weeks. The teachers also spent a lot of time teaching students how to listen to each other, work together, and be respectful, which included spending the first 6 weeks of freshman year teaching students how to work well together. The teachers also enacted the methods of complex instruction, a pedagogical approach that has been designed to help make group work equal (Cohen & Lotan, 1997).

3. *Teachers gave messages about learning and smartness that are consistent with what Dweck (2006) has termed a "growth mindset."* This means that teachers always emphasized learning as a process, and stressed that high achievement was a reflection of effort not of innate "ability" and that all students could reach the highest levels. Teachers also found value in all students' thinking. In the complex instruction approach, they also used specific pedagogical practices to raise the status of "low status" students, such as publicly praising their contributions.

The different teaching methods that are used in successful de-tracked classes are methods that are completely in line with research on effective mathematics teaching and learning more generally. Unfortunately, few teachers in the United States have received careful, sustained opportunities to learn these teaching methods (Lampert & Ball, 1998), which is why many teachers are daunted by the idea of working with de-tracked groups. In my current work, I am working with teachers in England who have de-tracked their urban classrooms for the first time. They are finding the teaching a challenge but they have also been encouraged by the responses of students, particularly those who would have been placed in a low track. As one of the teachers reported to me, "It was my low ability children who had the greatest ideas!" Despite the use of "fixed mindset"—labeling suggesting that students have a particular "ability"—the teachers are clearly changing their perceptions of what students can do, increasing their expectations for previously low achieving students, which is absolutely critical.

Concluding Thoughts

In other countries such as Finland and Japan—countries that top the world in achievement and where all classes are untracked—teachers expect students of different achievement levels to work together and help each other, and they view different achievement levels as a resource rather than a challenge. As one teacher from Japan reflected:

> Japanese education emphasizes group education, not individual education. Because we want everyone to improve, promote and achieve goals together, rather than individually. That's why we want students to help each other, to learn from each other…to get along and grow together—mentally, physically and intellectually. (as cited in Boaler, 2008a, p. 108)

When heterogeneous teaching is done well, students also come to appreciate working with students from different levels, as one of the students at Railside reflected:

> Everybody in there is at a different level. But what makes the class good is that everybody's at different levels so everybody's constantly teaching each other and helping each other out. (Zane, Railside, Year 2)

As we move into a new era in which teachers are using more reasonable content standards that broaden the definition of mathematics, and give more students opportunities to contribute positively, it is my greatest hope that many more teachers will learn the value of working with de-tracked groups and of giving students from across the achievement spectrum the opportunity to work at their own highest potential. Such changes are central to a United States in which racial segregation, low and inequitable achievement, and widespread fear and hatred of mathematics are a thing of the past.

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