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Report  
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# How to improve student educational outcomes: New insights from data analytics

By Mona Mourshed, Marc Krawitz, and Emma Dorn

By applying advanced analytics and machine learning, we have identified factors that play a critical role in student achievement.

**A** **well-educated citizenry** is an economic and social necessity. Policy makers, educators, and parents all over the world want students to understand and be able to apply their knowledge of math, reading, and science. Yet improving educational

outcomes has proved elusive. Some countries, states and municipalities have made great strides, but many continue to struggle. Educators continue to debate what matters and what works.

In this series of reports, we take a data-driven approach to consider a few of the most active debates: Do mindsets matter? If so, to what extent? What teaching practices work best? Does technology help? Our data comes from the Program for International Student Assessment (PISA), administered by the Organisation for Economic Co-operation and Development (OECD). Broad in scale and scope, PISA covered more than half a million students in 72 countries in 2015. What makes PISA so powerful is that it goes beyond the numbers, asking students, principals, teachers, and parents a series of questions about their practice, attitudes, behaviors, and resources.

By applying advanced analytics and machine learning, we have identified factors that play a critical role in student achievement. We will be publishing five regional reports to share these findings: on Asia–Pacific; Europe; Latin America; the Middle East and North Africa (MENA); and North America. Here we summarize the findings that were most consistent across all five regions: on the topics of mindsets and teaching practices. [Download the full global discussion paper \(PDF–669KB\)](#).

## **Finding 1: Having the right mindsets matters much more than socioeconomic background.**

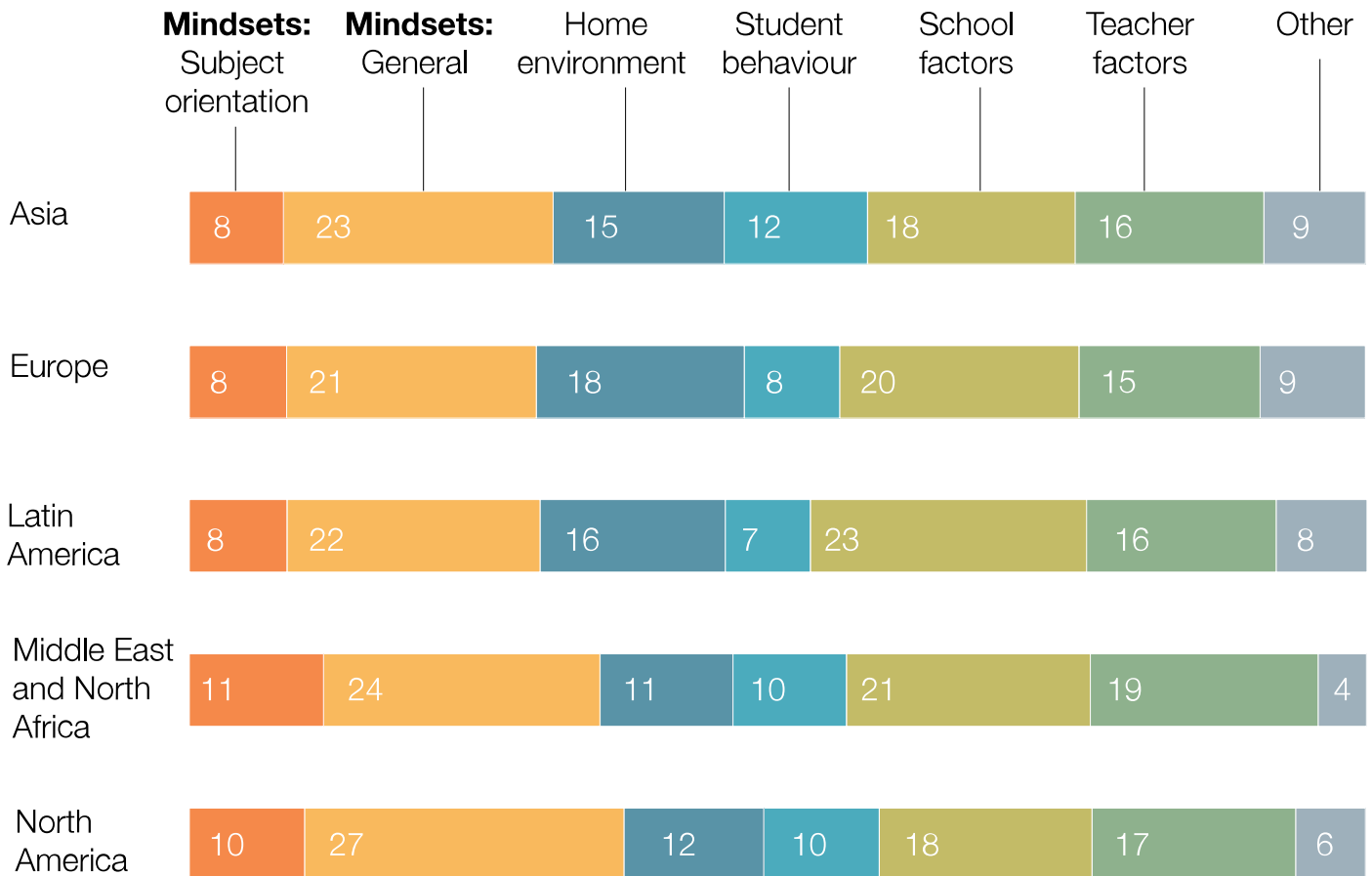
It is hardly news that students’ attitudes and beliefs—what we term their “mindsets”—influence their academic performance. But how much? To answer that question, we identified the 100 most predictive variables from the PISA survey (out of more than 1,000). We then sorted these into the following categories: home environment, school resources and leadership, teachers and teaching, and student mindsets and behaviors.

Our conclusion: after controlling for all other factors, student mindsets are twice as predictive of students’ PISA scores than even their home environment and demographics (Exhibit 1). This finding, and its magnitude, is consistent across all five regions, which amplifies its importance.

Exhibit 1

# Mindsets eclipse even home environment in predicting student achievement.

**Predictive power by category of variable by region, % share**



Note: Numbers may not sum to 100% due to rounding

McKinsey&Company | Source: *McKinsey Analysis*, OECD PISA 2015

Several mindsets emerged as highly predictive of performance. Top of the list was the ability to identify what motivation looks like in day-to-day life, what we call “motivation calibration.” Students who can recognize that motivated students prepare for class, do more than expected, and work to perfection outperform those who do not by between 12 and 15 percent depending on their region. Similarly, students with a “growth mindset”—those who believe they can succeed if they work hard—performed 9 to 17 percent better than those with a “fixed mindset”—those who believe their capabilities are static.

It was particularly striking that several of these mindsets made the most difference for students either in low performing schools or in lower socioeconomic quartiles. In fact, for students in schools with low outcomes, having a well-calibrated motivation mindset is equivalent to vaulting into a higher socioeconomic class. This result was consistent across all regions. (Exhibit 2 – North American example).

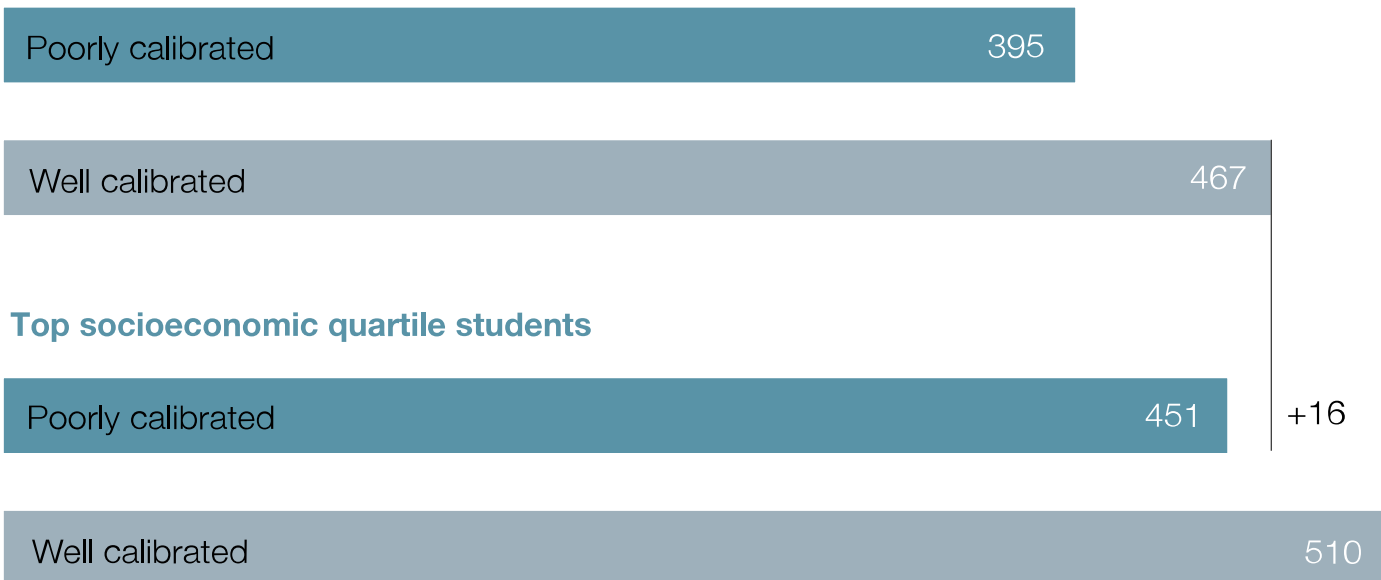
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## Exhibit 2

# Having a well-calibrated motivation mindset can be equivalent to leapfrogging into a higher socioeconomic quartile.

**North America low performing schools,<sup>1</sup> average PISA<sup>2</sup> science score 2015**

## Bottom socioeconomic quartile students



<sup>1</sup> Schools with average PISA score of less than 480 (serving 37% of North American students). Statistically significant controlling for socioeconomic status, school type and location.

<sup>2</sup> Programme for International Student Assessment.

McKinsey&Company | Source: *McKinsey Analysis*, OECD PISA 2015

Mindsets, of course, are not everything. They cannot compensate for all economic and social disparities, and, in general, being richer rather than poorer remains a great educational advantage. But the PISA evidence shows that mindsets matter a great deal, particularly for those living in the most challenging circumstances. So far, the research on this subject is both nascent and predominantly US-based. Considering its importance, establishing how mindsets can be shifted in a positive direction should be a priority globally.

## Finding 2: Students who receive a blend of teacher-directed and inquiry-based instruction have the best outcomes.

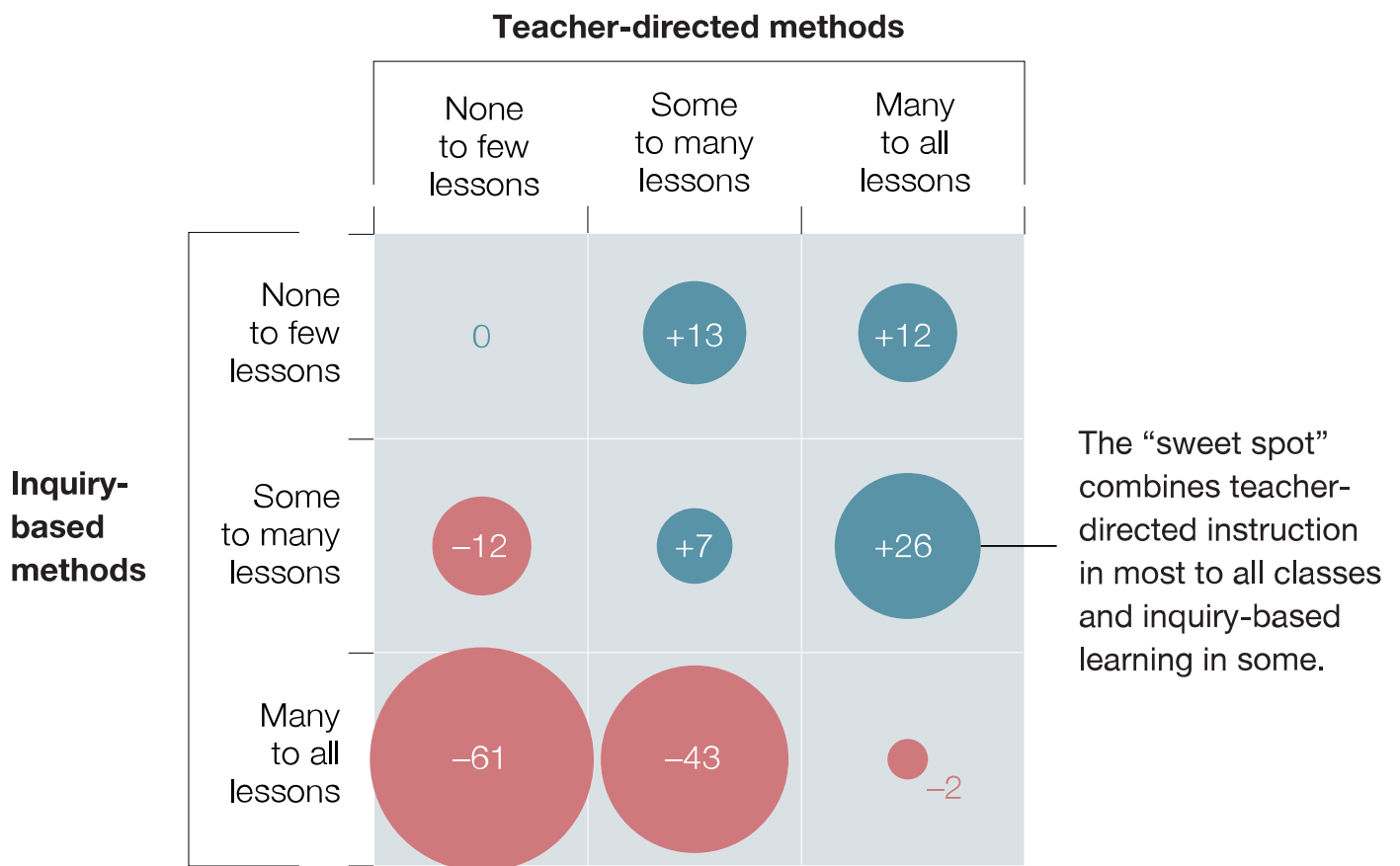
There are two dominant types of teaching practices. The first is “teacher-directed instruction,” in which the teacher explains and demonstrates ideas, considers questions, and leads classroom discussions. The second is “inquiry-based teaching,” in which students are given a more prominent role in their own learning—for example, by developing their own hypotheses and experiments.

We analyzed the PISA results to understand the relative impact of each of these practices. In all five regions, when teachers took the lead, scores were generally higher, and the more inquiry-based learning, the lower the scores. That sounds damning for inquiry-based learning at first glance, but by digging deeper into the data, a more interesting story is revealed: what works best is when the two styles work together—specifically, with teacher-directed instruction in most or almost all classes, and inquiry-based learning in some. This “sweet spot” is the same in all five regions, suggesting there is something akin to a universal learning style (Exhibit 3 - European Union example).

Exhibit 3

# Students who receive a blend of teacher-directed and inquiry-based instruction have the best outcomes.

**Point change in PISA<sup>1</sup> science score relative to baseline,<sup>2</sup>**  
 average score increase ● or decrease ●



<sup>1</sup> Programme for International Student Assessment.

<sup>2</sup> Statistically significant expected change in score controlling for PISA’s index for economic, social, and cultural status (ESCS), public/private schools, and urban/rural location for all quadrants except for teacher-directed and inquiry-based instruction in all classes (–2), which was not significant at 95% confidence level.

What differs across regions is the expected benefit from moving to the sweet spot from a purely teacher-directed approach. In developed school systems with strong performance on PISA overall, there is substantial benefit (for example, an increase of 14 PISA points in the EU, as shown in Exhibit 3). In developing school systems with weaker performance, the benefit is much smaller, and these systems may be better off initially focusing on consistent quality teacher-directed instruction.

Across all systems, we conclude that it is only when students master enough content—usually through teacher-led classes—that they can fully benefit from inquiry-based learning.

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Even a survey as large and rigorous as the PISA assessment provides only some of the answers. Nevertheless, we believe that our findings provide useful insights to guide policy makers as they make their way to their ultimate destination—improving the education and thus the lives of students all over the world.

[Download the full global discussion paper \(PDF-669KB\)](#).

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## *About the author(s)*

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