

Smarter Teachers Produce Smarter Students. This (Partly) Explains the Country Rankings in PISA.

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The OECD's Programme for International Student Assessment (PISA) continually illustrates how the reading, science and mathematics performance of 15-year-olds differs across countries. Differences in teacher quality are commonly cited as a key determinant of these huge differences. In a recent study, my co-authors Eric A. Hanushek (Stanford University), Simon Wiederhold (KU Eichstätt-Ingolstadt), and I use internationally comparable data on teacher cognitive skills – one important dimension of teacher quality – to investigate this claim.

Teacher skills differ strongly across developed countries

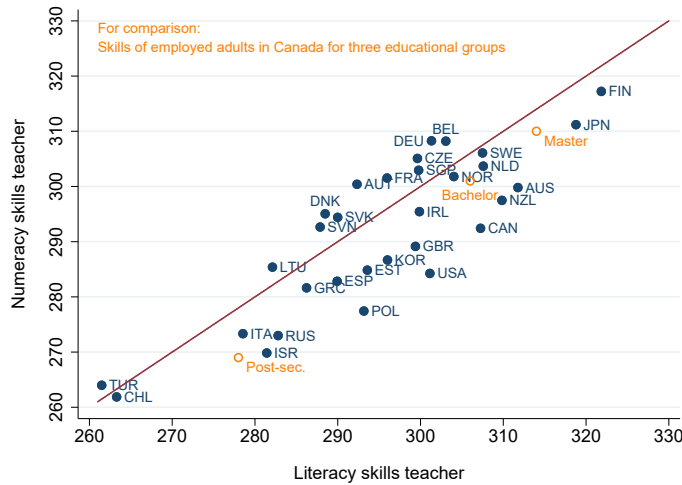
We use unique data from the OECD's Programme for International Assessment of Adult Competencies (PIAAC) to compute - for the first time - consistent measures of teachers' skills in numeracy and literacy across 31 countries. Figure 1 shows that teachers' skills differ widely. For example, average numeracy and literacy skills of teachers in countries with the lowest measured skills in our sample (Chile and Turkey) are well below the skills of employed adults with just vocational education in Canada. In contrast, the skills of teachers in countries with the highest measured skills (Japan and Finland) exceed the skills of adults with a master's or PhD degree in Canada.

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Teacher skills partly explain differences in student performance across countries

We relate these country-level teacher skill measures to individual-level data on student performance in math and reading from PISA. Figure 2 shows that the cross-country differences in teacher cognitive skills partly explain international differences in student performance. For instance, students in Italy and Russia would experience an increase in math performance equivalent to the learning progress of an entire school year if their teachers were brought up to the skill level of teachers in the highest-performing country (Finland); students in Spain, the United Kingdom, and the United States would experience an improvement of about three-quarters of a school year. Bringing teachers in each country to the Finnish level would reduce the international gap in PISA scores by about one quarter.

Fig. 1 Teacher Cognitive Skills Across Countries (Compared to Canadian Workers)



Note. Solid dots indicate country-specific median teacher skills in numeracy and literacy. Hollow orange circles indicate the median cognitive skills for three educational groups of employed adults aged 25–65 years in Canada: Post-sec. includes individuals with vocational education (postsecondary, nontertiary) as their highest qualification, Bachelor includes individuals with a bachelor degree, while Master includes individuals with a master or doctoral degree. Data sources: PIAAC (2012, 2015).

Can other country factors explain the relationship between student performance and teacher skills?

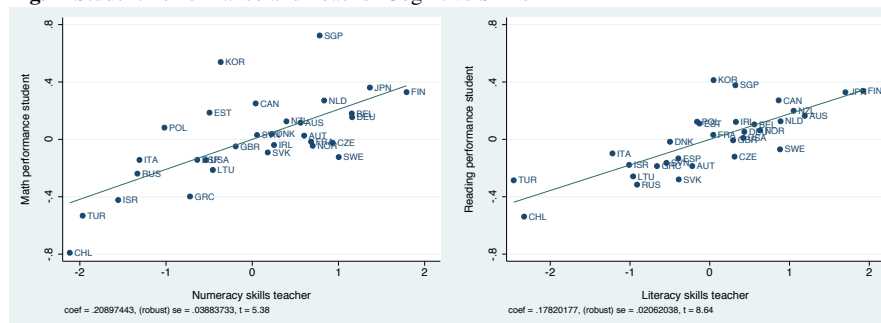
Critically, our analysis controls for a wide array of other factors to rule out alternative explanations for our results. Most importantly, we account for all differences between countries that are constant across subjects (e.g., educational spending, average cognitive skills of the population, and general cultural background such as importance of education) by relating differences in teachers' cognitive skills between numeracy and literacy to differences in students' performance between the same two subjects. This method yields similar results as when relating teachers' numeracy skills to students' math performance, or teachers' literacy skills to students' reading performance separately.

Additional analyses strongly support the interpretation that our findings indeed reflect the impact of teachers' skills. When we relate student performance to the cognitive skill levels in other broad occupations assessed in PIAAC (e.g. managers, scientists and engineers, health professionals, and business professionals), we find no systematic relationship. Only the skills of teachers are found to be consistently related to students' performance in PISA.

What can policymakers do to improve the cognitive skills of teachers?

Our international data also allow us to investigate how policy choices affect the skills of the teacher workforce and ultimately, student outcomes. Importantly, we find that international differences in wage premiums paid to teachers (given their gender, work experience, and cognitive skills) are directly related to teachers' cognitive skills. These results speak to the potential value of increasing teacher pay.

Fig. 2 Student Performance and Teacher Cognitive Skills



Note. Each circle indicates a country, and the solid line indicates the best linear fit. Data sources: OECD, PIAAC (2012, 2015), and PISA (2009, 2012)

However, policymakers will need to do more than raise the pay of teachers across the board to ensure positive results. They must ensure that higher salaries go to the most effective teachers.

This text has been posted on the blog international-education.blog and it is available in different languages on international-education.blog

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