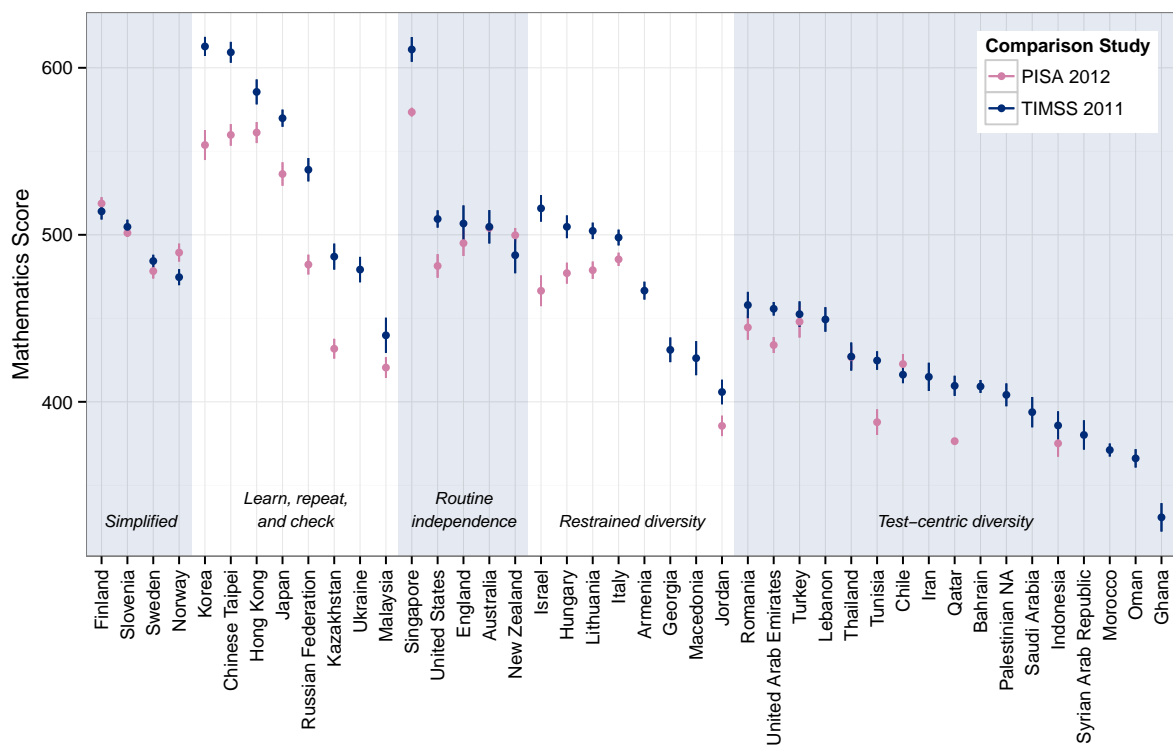


The role of teaching styles in Mathematics achievement

Summary

A number of articles have recently appeared in the national press on the study of Mathematics in primary and secondary education. Mathematics achievement is widely seen as an indicator of the quality of a country’s education system and the subject features prominently in international comparative assessments. However Mathematics can be taught in many ways and here we investigate how national teaching styles shape the performance of students in two international comparisons of Mathematics achievement. The results show that teaching style has an important, but complex, influence on Mathematics achievement, suggesting that the methods at use in high-performing jurisdictions may not work as well elsewhere.



What does the chart show?

The chart shows the Mathematics score (mean and 95% confidence interval) from 42 countries on two major international comparisons: TIMSS (Trends in International Mathematics and Science Study, 2011) and, if the country participated, PISA (Programme for International Study Assessment, 2012). These assessments were completed by 14-year-olds (TIMSS) and 15-year-olds (PISA), and both surveys are designed so that the overall mean score is 500 with a standard deviation of 100.

The TIMSS project also distributed a questionnaire to teachers asking about the types of methods that they use to teach Mathematics and the types of resources used by students. Cambridge Assessment researchers used this information to cluster the countries into five major teaching styles:

- **Simplified** Teachers in this group tend to use a limited number of teaching techniques in their daily lessons. Mainly Nordic countries.
- **Learn, repeat, and check** The dominant method is listening to the teacher and then having the students work independently to apply the principles learned. Moderate frequency of testing. East Asian and Former Soviet countries.
- **Routine independence** Students often work independently or in small groups, with less emphasis on the use of textbooks or listening to teachers. Time is largely spent on solving routine, not complex, problems. English-speaking countries.
- **Restrained diversity** Similar to the *Test-centric diversity* category but with greater reliance on textbooks and less use of quizzes and tests. Mainly other European countries.
- **Test-centric diversity** Teachers incorporate a range of techniques in nearly every lesson. More than a third of teachers use written tests or quizzes in “every or almost every lesson”. Textbooks are less likely to be used as the basis of instruction. Countries in this group represent many different regions.

These categories are shown by the labelled bands on the plot above and do not imply that each country limits itself to one dominant teaching style.

Why is the chart interesting?

The chart shows that a range of Mathematics achievement is possible within a given teaching style and that some categories, like *Test-centric diversity*, do appear to perform worse than others (even after controlling for national per capita GDP and student-level background factors). There are no teaching styles with consistently high scores across all countries and international comparisons. For example some *Learn, repeat, and check* countries show good performance on TIMSS (which assesses commonly taught international Mathematics curriculum) but significantly lower performance on PISA (which evaluates the application of knowledge in unfamiliar settings). A further complication is that many of the countries within a teaching style group are geographically or culturally similar. In a further analysis reported below, Cambridge Assessment researchers investigated some of these factors but concluded that the findings “should be seen as interesting results for reflection rather than definitive proof that particular styles of teaching can boost achievement.”

The study also considered the impact of curriculum, i.e. the topics taught within each country. No significant difference was found in the average performance of different curriculum groups.

For more information

A version of this figure was originally published in [Research Matters](#), the in-house research journal of Cambridge Assessment. Full details of the study can be found in:

Zanini, N. and Benton, T. (2015). The roles of teaching styles and curriculum in Mathematics achievement: Analysis of TIMSS 2011. *Research Matters: A Cambridge Assessment Publication*, 20, 35-44.