

Centre for Education Statistics and Evaluation

Teaching quality: effective teaching practices for improving student achievement

Research tells us that teaching has the largest in-school influence on student achievement, explaining about 30 per cent of the variation in student outcomes.

This publication uses data from two major international assessments to explore the link between students' experience of particular teaching practices and their test scores.

Key findings

- Some specific teaching practices are associated with significantly higher levels of student achievement.
- These practices are core, basic practices, not specialist approaches.
- These practices can make a difference of up to one school year's learning.
- Overall, the practices most strongly associated with success are frequently used in classrooms, but they are more common in some types of schools than in others.



Looking at reading literacy

The most recent available data set from Programme of International Student Assessment (PISA) includes a special focus on the teaching of reading literacy. This shows that students achieve significantly higher average scores in reading literacy when their teachers challenge them to develop deep understandings of texts – that is, understandings of the implicit as well as explicit meanings, and how language is used to convey these.

Students also do better when their teachers are explicit about their expectations and the criteria for success. Having clear expectations and intentions for learning means being clear about what skills, knowledge, attitudes and values students should learn within a unit or lesson. Research shows that learning is stronger when teachers and students have a clear understanding of how the learning objectives are going to be achieved.

The chart below shows the difference between mean (average) reading literacy scores for those students who report that the particular teaching practice happens in most or all lessons compared with those students who report that it happens hardly ever or only in some cases.

The four teaching practices associated with the biggest differences in reading literacy mean scores are:

- asking students to explain the meaning of a text
- giving students the chance to ask questions about reading assignments
- asking questions that challenge students to get a better understanding of a text, and
- telling students in advance how their work is going to be judged.

Students who experienced these teaching practices in most or all lessons achieved mean scores equivalent to more than a whole school year ahead of students who rarely experienced these teaching practices.

For example, students who report that their teachers always or mostly explain to them in advance how their work will be judged, score on average 530.9, compared with 491.8 for students whose teachers didn't explain very often.

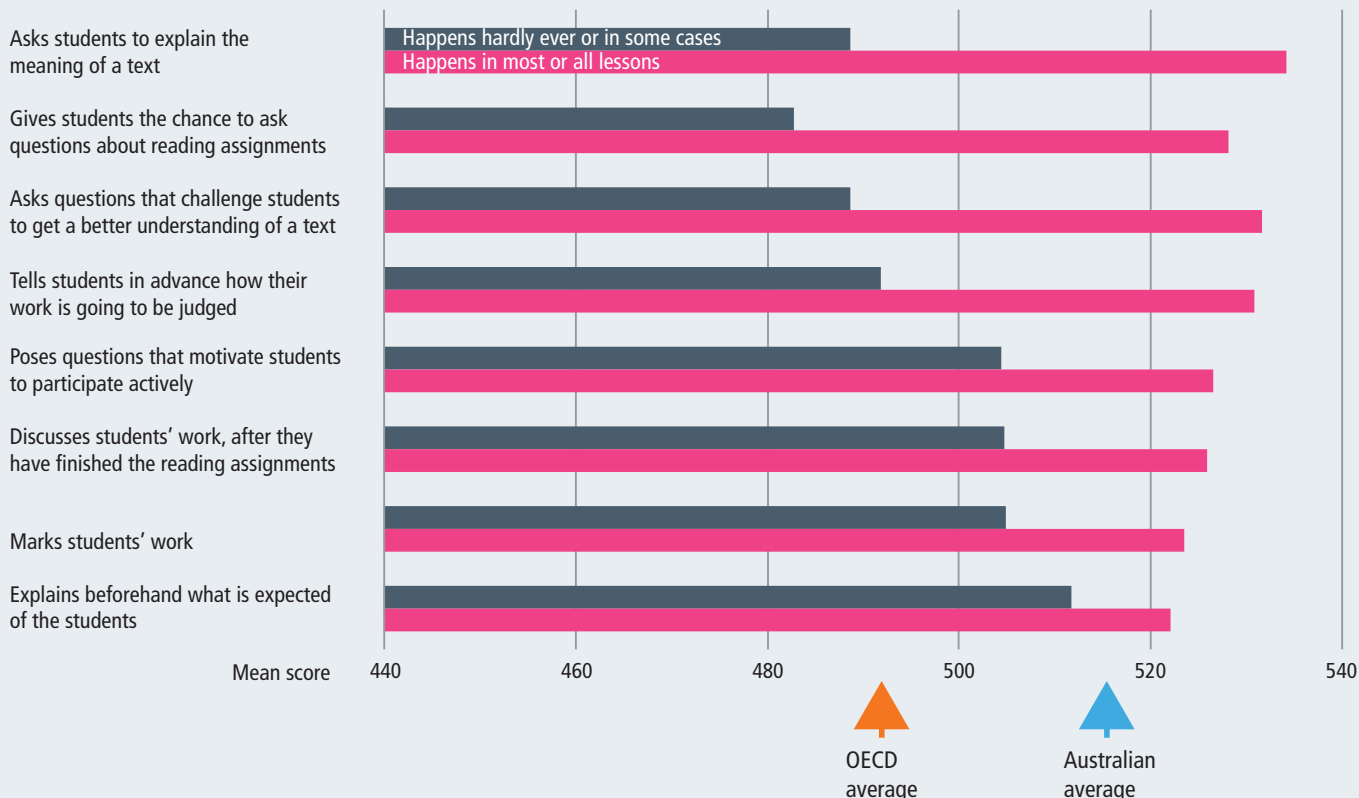
Students whose teachers rarely ask challenging questions are likely to perform below the OECD average, while students who report that their teachers frequently ask challenging questions, are likely to score well above the already high Australian average.

This is consistent with research demonstrating the effectiveness of difficult goals, compared with 'do your best' goals. Challenging goals, when based on clear understandings of students' abilities and combined with appropriately structured lessons, have large effects on the development of students' self-efficacy, confidence and learning outcomes.

Overall, these findings are consistent with findings from other research, such as John Hattie's extensive analysis of 'what works'¹, which highlights the value of:

- mastery learning (the provision of explanations of what it means to 'master' the material being taught)
- feedback that is clear, purposeful, meaningful and compatible with students' prior knowledge
- structuring class sessions to entice, teach, and listen to students, and
- questioning of students.

PISA reading literacy scores by frequency of teaching practice (Australia)



Looking at mathematics and science

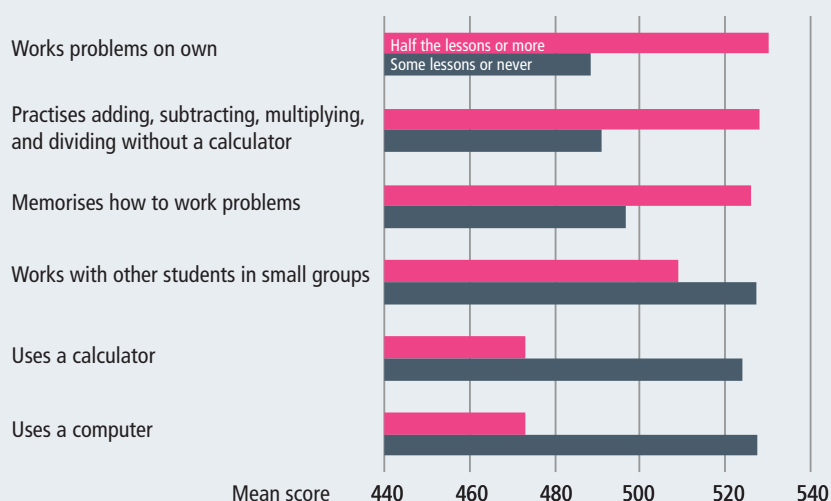
The most recently available data set from Trends in International Mathematics and Science Study (TIMSS) shows that, for students in Years 4 and 8, working on problems on their own is associated with higher average results in mathematics and for Year 8 science as well.

It also shows that, in both mathematics and science, more frequent memorising of facts and procedures is associated with higher average student results for students in Years 4 and 8. Being able to remember things is clearly an important tool of learning. Memorising

(which is practised in classrooms when teachers routinely review content and check students' retention of it) is critical to embed information. Students who have attained a level of instant recall of basic facts and information will be better able to pursue higher-order thinking. Internalising the basic building blocks of mathematics enables students to be more self-confident learners and gives them the basis for developing their logical reasoning skills. Students who can draw on a bank of learned information are able to be better listeners and more self-disciplined in their approach to learning – and they are freed to become more agile and creative thinkers.

This is consistent with research pointing to the value of teaching study skills (for example, organising and transforming learning materials, rehearsing and memorising). It is also consistent – as are the PISA findings – with the long history of evidence in favour of direct instruction techniques. Direct instruction involves having a clear understanding of what students should be able to do and understand as a result of the teaching; what successful performance looks like; checking student understanding; and guided and then independent practice to ensure the learning is not forgotten, and can be transferred to other contexts.

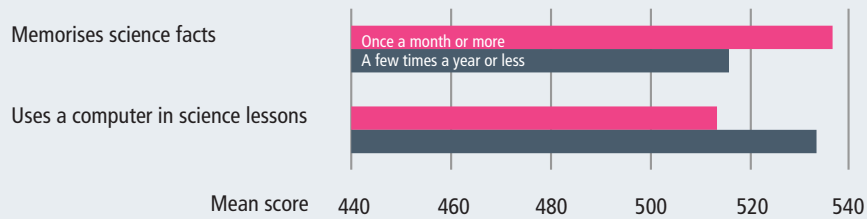
TIMSS Year 4 mathematics scores by frequency of teaching practice (Australia)



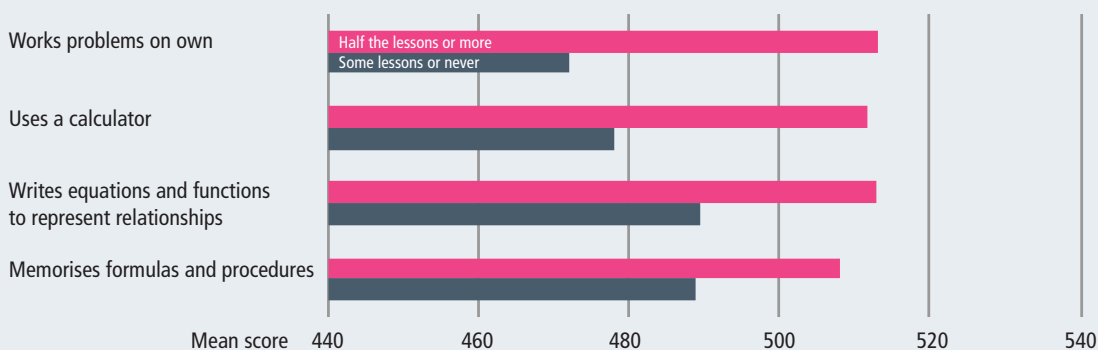
Interestingly, in Year 4 science and mathematics classrooms frequent use of a computer is associated with lower achievement.



TIMSS Year 4 science scores by frequency of teaching practice (Australia)

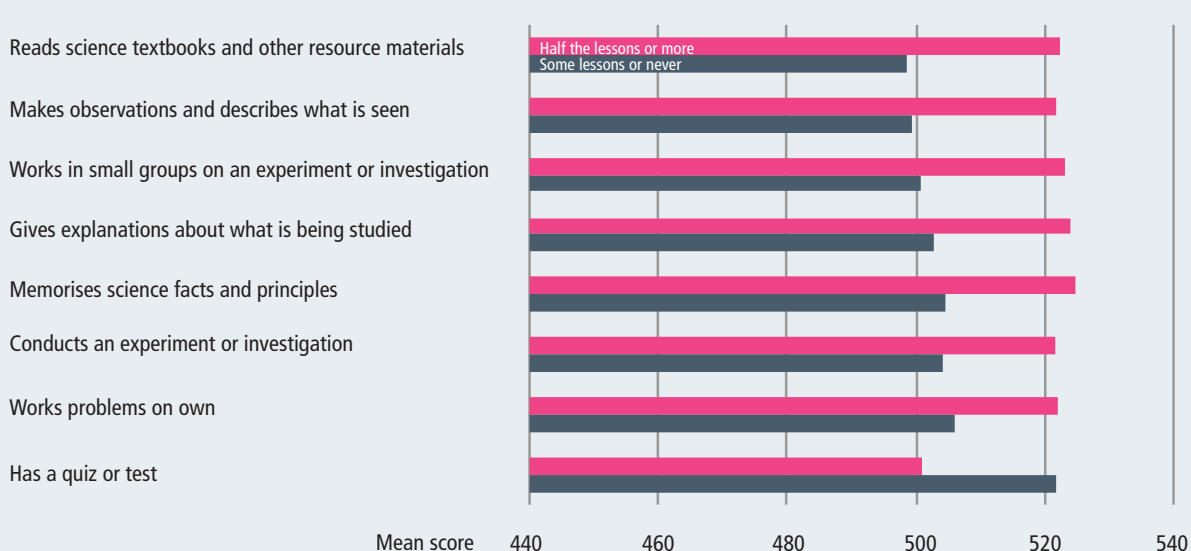


TIMSS Year 8 mathematics scores by frequency of teaching practice (Australia)



For Year 8 science students, conducting experiments more frequently is associated with higher average performance levels, whereas more frequent teacher demonstration of experiments is not.

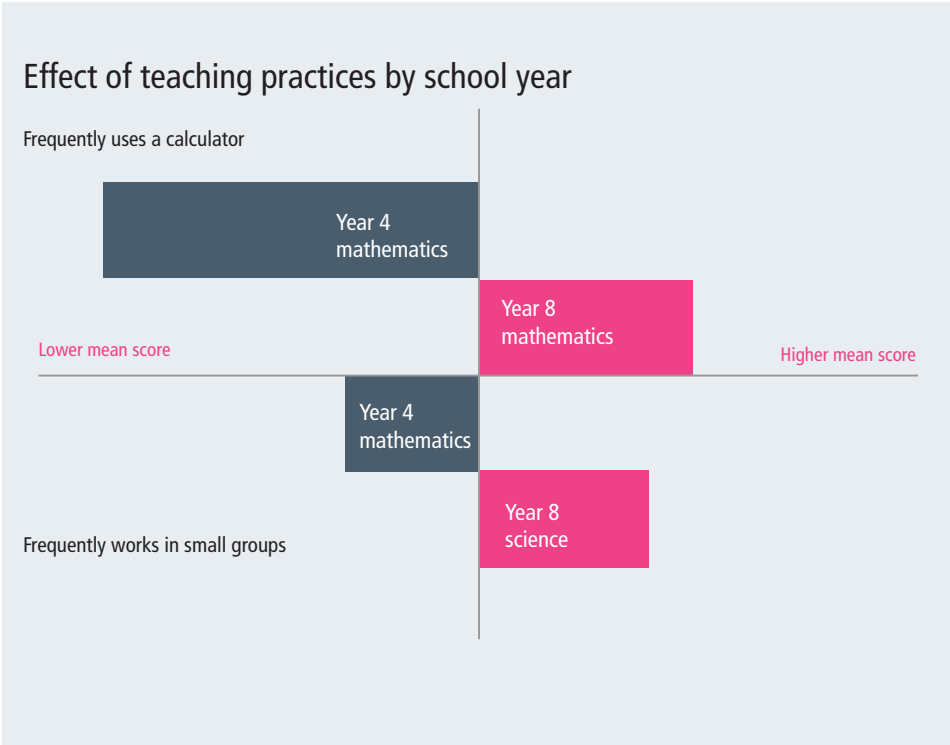
TIMSS Year 8 science scores by frequency of teaching practice (Australia)



Students need different teaching practices at different ages

In Year 4 mathematics, more frequent use of calculators is associated with significantly lower average results, while the practice of mental arithmetic is associated with higher scores. In Year 8 science however, use of calculators is associated with higher average scores, reflecting the different mathematical skills being developed.

Similarly, working in small groups does not appear to assist Year 4 students in mathematics, though it appears to help in Year 8 science, reflecting the different learning needs and capacities of younger and older students.



Which students experience the most effective teaching practices?

Encouragingly, data from PISA and TIMSS show that the teaching practices associated with higher scores are more frequently used in classrooms.

For example, TIMSS data shows that in Year 4 mathematics, around three-quarters of students work problems on their own or practise mental arithmetic in at least half their lessons. Only around 13 per cent are using calculators most

of the time. In Year 8 mathematics, around 70 per cent of students are working problems on their own or using a calculator in half their lessons or more.

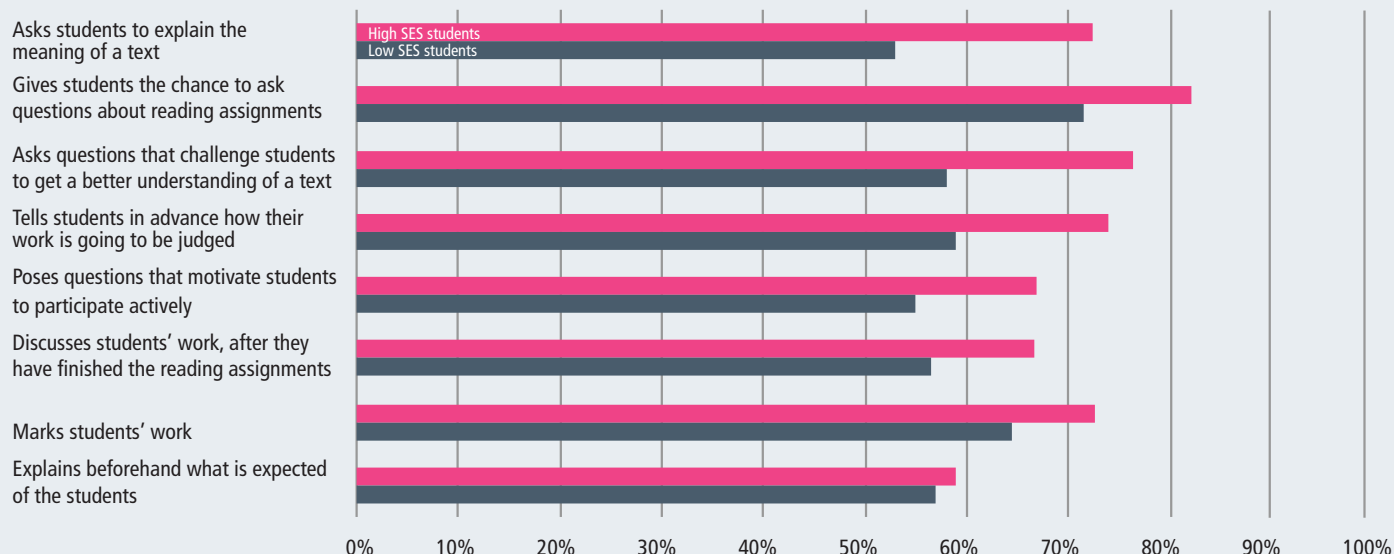
On the other hand, nearly half of Year 4 mathematics students are working with other students in small groups, despite the fact that this is shown to be associated with lower mean scores for this age group. In Year 8 mathematics, only just over half the students are writing equations and functions, although this is associated with higher levels of achievement.

Not all students have an equal chance of experiencing the teaching practices

most associated with higher student performance. PISA data shows that students from high-socioeconomic backgrounds report the frequent use of these teaching practices more often than students from lower SES backgrounds.

For example, high-SES students are close to 20 percentage points more likely to be asked to explain the meaning of a text, or to be asked questions that challenge students to get a better understanding of a text, than their low-SES peers.

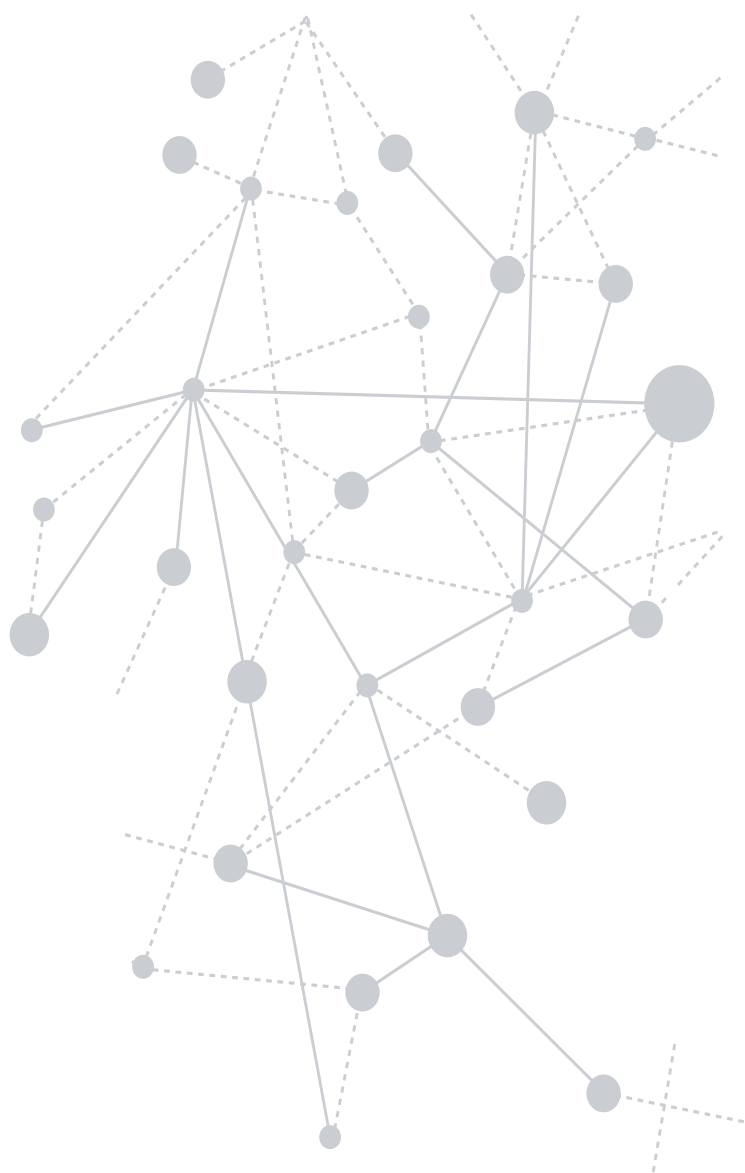
Percentage of PISA students experiencing teaching practices in most or all literacy lessons



Where to next?

Future analysis of these data sets will attempt to control for factors also known to influence student outcomes (for example, student background characteristics). This will help us identify the unique contribution of particular teaching practices to student outcomes.

The release of the next round of TIMSS data is due in December 2012 and the results of the 2012 PISA assessments are anticipated by late 2013. These new data sets will allow further exploration of factors associated with higher levels of student performance.



Notes about the assessments

International assessments such as the Programme of International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) provide rich data on how our students are performing in various content areas.

PISA assesses the reading, mathematical and scientific literacy of a sample of 15 year-olds. PISA is conducted every three years in over 30 countries world-wide.

TIMSS assesses the mathematical and scientific knowledge of a sample of students in Years 4 and 8. TIMSS is conducted every four years.

The PISA and TIMSS programs also collect survey data from the students about a range of teaching practices, and other factors that may affect their learning. In addition, TIMSS collects survey data from teachers about their academic and professional backgrounds, attitudes toward teaching mathematics and science, and teaching practices.

Where teaching practices are said to be associated with higher performance results, these differences are statistically significant at the 95 per cent confidence level, consistent with the confidence levels reported in the PISA and TIMSS national reports.

While rich and valuable, these data sets have certain limitations. Analysis is based on students' self-reported responses to a questionnaire. Student perceptions of the frequency of certain practices do not always match with teacher perceptions.

The association of more frequent use of certain teaching practices with higher scores does not necessarily mean those teaching practices directly improved student results. Student performance is driven by a number of factors, many of them outside the control of teachers and school leaders. More detailed analysis is required to demonstrate causality.

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1 Hattie, J. A. 2009, *Visible learning: a synthesis of over 800 meta-analyses relating to achievement*, Routledge, London and New York.



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