Chapter 8 School resources

Chapter outline

This chapter explores findings on teachers' working conditions; availability of computers for mathematics and science lessons; and views about limitations on teaching mathematics and science caused by resourcing. The chapter summarises findings for mathematics and science in Year 5 (Y5, ages 9 to 10) and Year 9 (Y9, ages 13 to 14) in 2011.

Findings for Y5 are presented first (for mathematics and science), followed by findings for Y9 (mathematics and science). Outcomes for England are compared with those of other countries where relevant.

Key findings

- Mathematics and science teachers in England rated their working conditions relatively positively compared to other countries.
- In England, all pupils had some level of computer availability.
- England had the highest computer availability of all participating countries in both mathematics and science. Other countries with high ratios of computer provision for pupils included the Slovak Republic, Northern Ireland, New Zealand and Australia.
- Internationally, in both subjects, at both age groups, pupils with no access to computers scored less well than those with computers available.
- Although the data for England appeared to show an association between the extent of computer availability and achievement for Year 5, this is unlikely to be significant.[112] Computer availability was too high for a similar comparison to be made at Year 9.
- According to their headteachers, no pupils in England attended schools in which Y5 or Y9 mathematics or science teaching was perceived as *Affected A Lot* by resource shortages.

112 Throughout this report, findings listed as 'significant' are statistically significant.

Interpreting the data: scaled data from teachers and headteachers

Most of the data presented in this chapter is reported by teachers and headteachers. Reported percentages refer to pupils and can usually (unless otherwise indicated) be interpreted as the percentage of pupils whose teacher or headteacher reported a particular practice or gave a particular response to a questionnaire item.

When interpreting the data from pupils, headteachers and teachers it is important to take account of the relative sample sizes. Participants are expected to sample a minimum of 150 schools in each year group and a minimum of 4,000 students for each target year group (these figures represent the numbers *drawn* in the sample; the achieved sample numbers may be less). The *achieved* ranges for participating schools internationally were 96 to 459 for Y5, and 95 to 501 for Y9[113]. These wide ranges reflected the fact that some participants had fewer than 150 schools available and some participants chose to over-sample schools. Just over half of participants sampled between 150 and 200 schools for each age group.

For TIMSS 2011 in England, the number of participating schools was 125 at Y5 and 118 at Y9. Numbers of participants within these schools were:

- 3,397 Y5 and 3,482 Y9 pupils.
- 125 and 118 headteachers respectively answered the Y5 and Y9 School Questionnaire.
- 194 Y5 class teachers completed a Teacher Questionnaire for mathematics and 199 for science.
- 213 Y9 teachers completed the Mathematics Teacher Questionnaire.
- 757 Y9 teachers completed the Science Teacher Questionnaire (the number of science teachers was greater as the Y9 pupils were sampled by mathematics class).

See Appendix A for more information about numbers of participants and sampling method.

8.1 Year 5

8.1.1 Teacher working conditions

Teachers were asked to rate the working conditions in their current school in terms of several potential problem areas. Pupils were scored according to their teachers' responses concerning five problem areas on the *Teacher Working Conditions* scale: buildings, workspace, hours, classrooms and materials. The questions and details of the scoring are shown in Table 8.1. In England, the average scale score for mathematics was 10.9, and for science it was 11.0; both scores were within the *Minor Problems* category overall.

113 These figures refer to countries and exclude benchmarking participants

Interpreting the data: indices and scales

In order to summarise data from a questionnaire, responses to several related items are sometimes combined to form an index or scale. The respondents to the questionnaire items are grouped according to their responses and the way in which responses have been categorised is shown for each index or scale. The data in an index or scale is often considered to be more valid and reliable than the responses to individual items.

Table 8.1 Teacher Working Conditions

Mathematics

Reported by Teachers

Students were scored according to their teachers' responses concerning five potential problem areas on the *Teacher Working Conditions* scale. Students whose teachers had **Hardly Any Problems** with their working conditions had a score on the scale of at least 11.3, which corresponds to their teachers reporting "not a problem" for three of five areas and "minor problem" for the other two, on average. Students whose teachers had **Moderate Problems** had a score no higher than 8.7, which corresponds to their teachers reporting "moderate problem" for three of five conditions and "minor problem" for the other two, on average. All other students had teachers that reported **Minor Problems** with their working conditions.

Country	Hardly Any Problems		Minor Problems		Moderate Problems		Average Scale Score
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	
England	40 (4.3)	541 (5.7)	51 (4.6)	548 (5.7)	9 (2.4)	540 (11.6)	10.9 (0.14)
International Avg.	26 (0.5)	498 (1.1)	47 (0.5)	491 (0.7)	27 (0.5)	487 (1.0)	

Centre point of scale set at 10.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

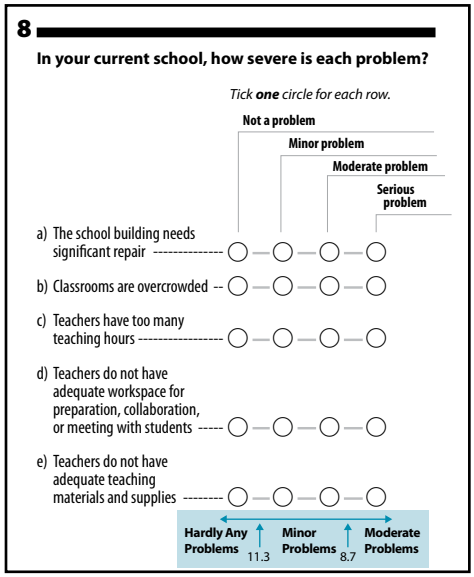
Science

Reported by Teachers

Students were scored according to their teachers' responses concerning five potential problem areas on the *Teacher Working Conditions* scale. Students whose teachers had **Hardly Any Problems** with their working conditions had a score on the scale of at least 11.7, which corresponds to their teachers reporting "not a problem" for three of five areas and "minor problem" for the other two, on average. Students whose teachers had **Moderate Problems** had a score no higher than 8.9, which corresponds to their teachers reporting "moderate problem" for three of five conditions and "minor problem" for the other two, on average. All other students had teachers that reported **Minor Problems** with their working conditions.

Country	Hardly Any Problems		Minor Problems		Moderate Problems		Average Scale Score
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	
England r	23 (3.0)	536 (9.5)	48 (3.5)	531 (7.3)	28 (3.3)	529 (9.9)	10.2 (0.14)
International Avg.	20 (0.4)	489 (1.5)	48 (0.5)	477 (0.8)	32 (0.5)	473 (1.1)	

Centre point of scale set at 10.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
An "r" indicates data are available for at least 70% but less than 85% of the students.



Sources: Exhibit 5.10, international mathematics report, and Exhibit 5.9, international science report; question adapted from the international version of the TIMSS 2011 Teacher Questionnaire[114]

Teachers of Y5 mathematics and science in England gave relatively high overall ratings about their working conditions. Around 40 per cent of pupils were taught by teachers who were categorised as having *Hardly Any Problems* with their working conditions (40 per cent for mathematics, and 41 per cent for science). Around half of Y5 pupils (51, and 52 per cent for mathematics and science respectively) were taught by teachers categorised as having *Minor Problems* with their working conditions, and fewer than 10 per cent of pupils (9, and 7 per cent for mathematics and science respectively) had teachers categorised as having *Moderate Problems* with their working conditions (see Table 8.1).

Several of the highest performing countries had relatively high percentages of pupils taught mathematics and/or science by teachers who were classified as having *Moderate Problems* with their working conditions. These countries included Chinese Taipei (23 per cent for mathematics, 22 per cent for science), Japan (40 per cent for mathematics, 43 per cent for science), Korea (36 per cent for mathematics, 33 per cent for science) and Hong Kong (33 per cent for mathematics, 34 per cent for science). These countries also had lower percentages than England of pupils in the highest category (being taught by teachers categorised as having *Hardly Any Problems* with their working conditions); for these countries the percentages of pupils in this high category ranged from 23 per cent to 14 per cent across the mathematics and science findings.

The TIMSS countries with the highest percentages of pupils taught mathematics or science by teachers who were classified as having *Hardly Any Problems* were Poland and the United States, both with around 50 per cent of pupils being taught by teachers who were classified as having *Hardly Any Problems* with their working conditions.

The international averages show that pupil achievement in mathematics and science at Y5 was highest among pupils taught by teachers who were classified as having *Hardly Any Problems* with their working conditions. However, although this is seen internationally, it does not necessarily apply in all individual countries. There is no clear trend for England, and based on the size of the standard errors, the differences seen for England are unlikely to be significant.

8.1.2 Availability of computers for lessons

In order to calculate the availability of computers for lessons, headteachers were asked to indicate the number of pupils in Y5 and the total number of computers available for teaching. The calculated ratios for England are shown in Table 8.2.

The data shows that in England, according to headteachers, the majority of Y5 pupils (90 per cent) were in schools providing one computer for every one to two pupils. The equivalent international average was 38 per cent. For the remaining 10 per cent of pupils in England, computers were reportedly available for every three to five pupils.

Table 8.2 Schools with computers available for teaching

Mathematics

Reported by Principals

Country	1 Computer for 1–2 Students		1 Computer for 3–5 Students		1 Computer for 6 or More Students		No Computers Available	
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement
England r	90 (2.8)	543 (4.2)	10 (2.8)	549 (16.6)	0 (0.0)	~ ~	0 (0.0)	~ ~
International Avg.	38 (0.5)	491 (1.1)	30 (0.5)	493 (1.2)	24 (0.5)	493 (1.3)	8 (0.3)	452 (2.9)

Science

Reported by Principals

Country	1 Computer for 1–2 Students		1 Computer for 3–5 Students		1 Computer for 6 or More Students		No Computers Available	
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement
England r	90 (2.8)	528 (3.6)	10 (2.8)	533 (15.2)	0 (0.0)	~ ~	0 (0.0)	~ ~
International Avg.	38 (0.5)	486 (1.2)	30 (0.5)	487 (1.3)	24 (0.5)	491 (1.4)	8 (0.3)	450 (2.8)

( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
A tilde (~) indicates insufficient data to report achievement.
An "r" indicates data are available for at least 70% but less than 85% of the students.

Mathematics

The number of students per computer was calculated by dividing the number of students by the number of computers.

1) **What is the total enrollment of fourth grade students in your school as of the first day of the month TIMSS 2011 testing begins?**

_____

2) **What is the number of computers that can be used for instructional purposes by fourth grade students?**

_____

Sources: Exhibit 5.14, international mathematics report, and Exhibit 5.13 international science report; question adapted from the international version of the TIMSS 2011 School Questionnaire[115]

England had the highest level of reported computer availability among all participating countries, followed by the Slovak Republic and Northern Ireland.

Internationally, there was considerable variation from country to country. Chinese Taipei and Korea both had much lower percentages of pupils in schools where a computer was available for every one to two pupils; these figures were 23 per cent in Chinese Taipei, and 22 per cent in Korea. Some of the other highest-achieving countries also had lower levels of computer availability.

Table 8.2 appears to show an association between achievement and extent of computer availability (in England and internationally), but based on the size of the standard errors, most of these observed differences are unlikely to be significant. The main exception is that pupils internationally with no access to computers scored less well in both subjects than those with computers available.[116]

It is important to note that the relationship between computer availability and average attainment is complex. In some countries computer availability is highly interrelated with socio-economic levels, in others computers are used widely for remedial purposes. In addition, teaching practice and the quality of software programs varies greatly between, and within, countries. Any association, or lack of association, between computer availability and achievement might be affected by these varying reasons for levels of computer availability and varying reasons for computer use.

115 http://timssandpirls.bc.edu/timss2011/index.html

116 It is likely that this difference is significant. There are some other potentially significant differences for science, but these are very small borderline differences.

8.1.3 Views about limitations on teaching caused by resourcing

In order to measure views about limitations on teaching caused by resourcing, headteachers were asked to rate the extent to which their school's capacity to teach mathematics and science was limited by a shortage of resources.

Questions were asked about general school resources (such as supplies, materials, teaching space and buildings), and questions were also asked about specific resources for teaching mathematics and science. These questions are shown in Table 8.3.[117]

Pupils were scored according to their headteachers' responses concerning the seven general school and classroom resources and five subject specific resources. In each case, the scale contained the general resources and the relevant subject-specific resources. The question was analysed as two separate scales, one for each subject. This resulted in the parallel *Mathematics Resource Shortages* and *Science Resource Shortages scales*; an explanation of how each scale was calculated is shown in Table 8.3.

In England, the average scale score was 11.1 for both mathematics and science; on the border of the *Not Affected* and *Somewhat Affected* categories for mathematics, and in the *Somewhat Affected* category for science overall.

Table 8.3 Teaching affected by resource shortages

Mathematics

Reported by Principals

Students were scored according to their principals' responses concerning twelve school and classroom resources on the *Mathematics Resource Shortages* scale. Students in schools where instruction was **Not Affected** by resource shortages had a score on the scale of at least 11.1, which corresponds to their principals reporting that shortages affected instruction "not at all" for six of the twelve resources and "a little" for the other six, on average. Students in schools where instruction was **Affected A Lot** had a score no higher than 6.8, which corresponds to their principals reporting that shortages affected instruction "a lot" for six of the twelve resources and "some" for the other six, on average. All other students attended schools where instruction was **Somewhat Affected** by resource shortages.

Country	Not Affected		Somewhat Affected		Affected A Lot		Average Scale Score
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	
England	42 (4.8)	545 (6.5)	58 (4.8)	540 (5.5)	0 (0.0)	~ ~	11.1 (0.18)
International Avg.	25 (0.5)	497 (1.2)	70 (0.5)	488 (0.6)	5 (0.2)	462 (3.5)	

Centerpoint of scale set at 10.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
A tilde (~) indicates insufficient data to report achievement.

Science

Reported by Principals

Students were scored according to their headteachers' responses concerning twelve school and classroom resources on the *Science Resource Shortages* scale. Students in schools where instruction was **Not Affected** by resource shortages had a score on the scale of at least 11.3, which corresponds to their headteachers reporting that shortages affected instruction "not at all" for six of the twelve resources and "a little" for the other six, on average. Students in schools where instruction was **Affected A Lot** had a score no higher than 7.1, which corresponds to their headteachers reporting that shortages affected instruction "a lot" for six of the twelve resources and "some" for the other six, on average. All other students attended schools where instruction was **Somewhat Affected** by resource shortages.

Country	Not Affected		Somewhat Affected		Affected A Lot		Average Scale Score
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	
England	37 (4.7)	527 (6.4)	63 (4.7)	529 (4.4)	0 (0.0)	~ ~	11.1 (0.17)
International Avg.	22 (0.4)	495 (1.3)	72 (0.5)	485 (0.6)	7 (0.3)	460 (4.0)	

Centrepoint of scale set at 10.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
A tilde (~) indicates insufficient data to report achievement.

117 As this is a new scale, the international analysis does not include trend data.

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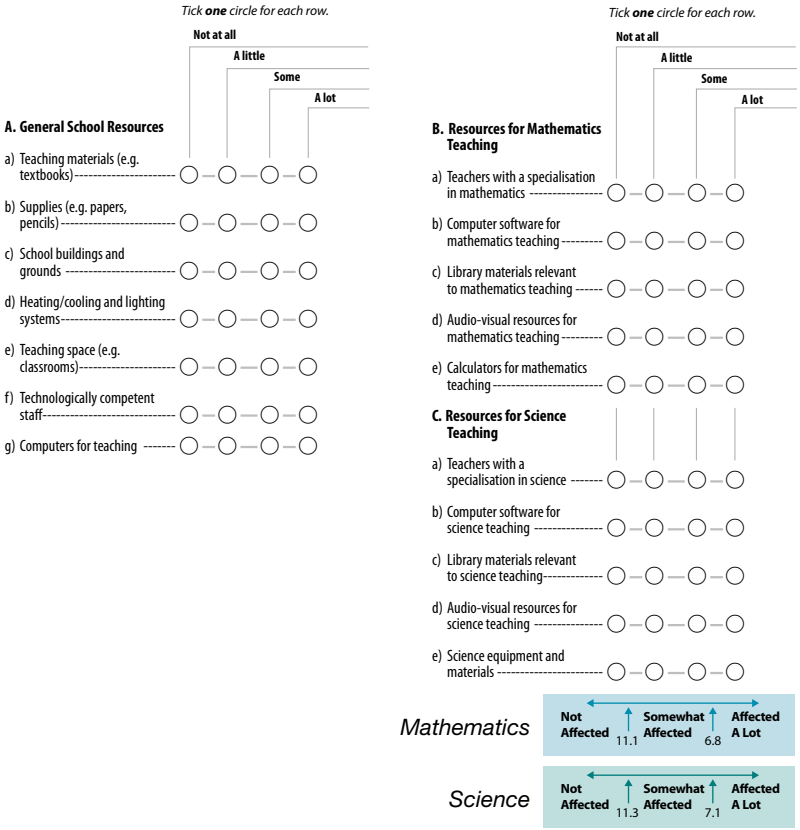
How much is your school's capacity to provide teaching affected by a shortage or inadequacy of the following?



Section B did not contribute to these scales.

Sources: Exhibit 5.8, international mathematics report, and Exhibit 5.7, international science report; questions adapted from the international version of the TIMSS 2011 School Questionnaire[118]

According to their headteachers' responses, over half of Y5 pupils in England (58 and 63 per cent respectively for mathematics and science) were in schools where mathematics and science teaching were perceived as *Somewhat Affected* by resource shortages. No pupils were in schools where teaching was perceived as *Affected A Lot* by resource shortages, and the remainder (42 and 37 per cent respectively) were in schools where teaching was perceived as *Not Affected* by resource shortages (see Table 8.3).

There are several examples of high performing countries which reported relatively small percentages of pupils attending schools where teaching was perceived as *Not Affected* by resource shortages. For example, the percentages of Y5 pupils in schools where teaching was perceived as *Not Affected* by resource shortages (as reported by headteachers) in Japan, Finland, and Chinese Taipei were relatively low (compared to England), at 28 and 23 per cent for mathematics and science respectively in Japan, 24 and 19 per cent in Finland, and 9 per cent for both subjects in Chinese Taipei. The percentages in Singapore were similar to England, at 37 and 36 per cent respectively.

118 http://timssandpirls.bc.edu/timss2011/index.html

In Hong Kong, a high performing country in mathematics at this age group, the vast majority of pupils were in schools where mathematics and science teaching were perceived as *Somewhat Affected* by resource shortages (over 90 per cent), with no pupils in schools where teaching was perceived as being *Not Affected* by resource shortages.

This illustrates the great variability among the highest performing countries in headteachers' perceptions of resource shortages affecting teaching in their schools.

Internationally, there was an association between resourcing and achievement for both subjects: as the perceived effect of resource shortages increases, achievement decreases on average. However, based on the size of the standard errors, the differences in England are unlikely to be statistically significant for either mathematics or science.

8.2 Year 9

8.2.1 Teacher working conditions

As for Y5, teachers were asked to rate the working conditions in their current school in terms of several potential problem areas. Pupils were scored according to their teachers' responses concerning five potential problem areas on the *Teacher Working Conditions* scale: buildings, workspace, hours, classrooms and materials. The questions and details of the scoring are shown in Table 8.4. In England, the average scale score for mathematics was 10.9, and for science it was 10.2; both scores were within the *Minor Problems* category overall.

Table 8.4 Teacher working conditions

Mathematics

Reported by Teachers

Students were scored according to their teachers' responses concerning five potential problem areas on the *Teacher Working Conditions* scale. Students whose teachers had **Hardly Any Problems** with their working conditions had a score on the scale of at least 11.7, which corresponds to their teachers reporting "not a problem" for three of five areas and "minor problem" for the other two, on average. Students whose teachers had **Moderate Problems** had a score no higher than 8.9, which corresponds to their teachers reporting "moderate problem" for three of five conditions and "minor problem" for the other two, on average. All other students had teachers that reported **Minor Problems** with their working conditions.

Country	Hardly Any Problems		Minor Problems		Moderate Problems		Average Scale Score
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	
England	30 (4.4)	500 (8.2)	55 (4.4)	516 (8.5)	14 (2.9)	479 (13.7)	10.9 (0.18)
International Avg.	21 (0.5)	479 (1.6)	49 (0.6)	467 (0.9)	31 (0.5)	464 (1.2)	

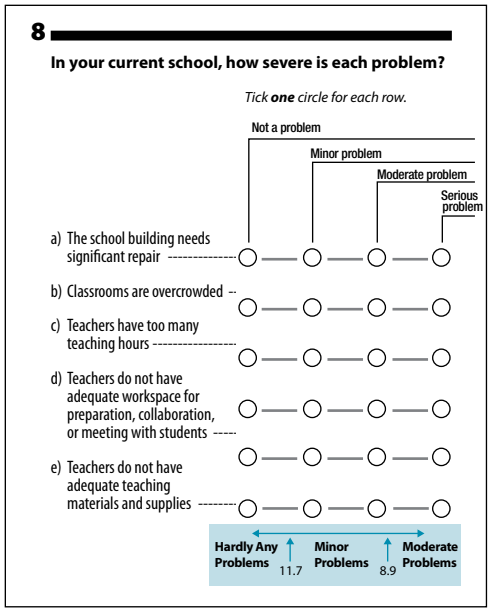
Centre point of scale set at 10.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Reported by Teachers

Students were scored according to their teachers' responses concerning five potential problem areas on the *Teacher Working Conditions* scale. Students whose teachers had **Hardly Any Problems** with their working conditions had a score on the scale of at least 11.7, which corresponds to their teachers reporting "not a problem" for three of five areas and "minor problem" for the other two, on average. Students whose teachers had **Moderate Problems** had a score no higher than 8.9, which corresponds to their teachers reporting "moderate problem" for three of five conditions and "minor problem" for the other two, on average. All other students had teachers that reported **Minor Problems** with their working conditions.

Country		Hardly Any Problems		Minor Problems		Moderate Problems		Average Scale Score
		Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	
England	r	23 (3.0)	536 (9.5)	48 (3.5)	531 (7.3)	28 (3.3)	529 (9.9)	10.2 (0.14)
International Avg.		20 (0.4)	489 (1.5)	48 (0.5)	477 (0.8)	32 (0.5)	473 (1.1)	

Centre point of scale set at 10.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
An "r" indicates data are available for at least 70% but less than 85% of the students.



Sources: Exhibit 5.11, international mathematics report, and Exhibit 5.10, international science report; questions adapted from the international version of the TIMSS 2011 Mathematics Teacher and Science Teacher Questionnaires[119]

119 http://timssandpirls.bc.edu/timss2011/index.html

Mathematics

In England, 30 per cent of pupils were taught by teachers who were classified as having *Hardly Any Problems* with their working conditions, 55 per cent were taught by teachers classified as having *Minor Problems*, and 14 per cent had teachers classified as having *Moderate Problems* with their working conditions (see Table 8.4). Teacher ratings of their working conditions were more positive among the Y5 teachers than the Y9 teachers.

Several of the highest performing countries had relatively high percentages of pupils with teachers who were placed in the lowest category of the *Teacher Working Conditions* scale (those whose teachers were classified as having *Moderate Problems* with their working conditions). These countries included Japan (38 per cent), Chinese Taipei (26 per cent), Hong Kong (23 per cent), and Korea (56 per cent). These countries also had lower percentages than England of pupils in the highest category (being taught by teachers classified as having *Hardly Any Problems*); for these countries the percentages of pupils in this high category ranged from 22 per cent to 8 per cent.

The TIMSS participants with the highest percentages of Y9 pupils taught mathematics by teachers who were classified as having *Hardly Any Problems* were the United States and Qatar, with 48 per cent and 47 per cent of pupils respectively.

Internationally, pupils taught by teachers classified as having *Hardly Any Problems* with their working conditions achieved higher average scores than their peers; while this international association is likely to be statistically significant, it does not necessarily apply in all individual countries. The apparent differences in achievement in England are unlikely to be significant across the three categories.

Science

At Y9 the teacher responses to questions about working conditions were less positive for science than for mathematics. In England, 23 per cent of Y9 pupils were taught by science teachers who were categorised as having *Hardly Any Problems* in their working conditions, 48 per cent were taught by teachers categorised as having *Minor Problems*, and 28 per cent of pupils had teachers classified as having *Moderate Problems* with their working conditions (see Table 8.4).

Several of the highest performing countries had relatively high percentages of pupils with teachers who were in the lowest category of the *Teacher Working Conditions scale* (classified as having *Moderate Problems* with their working conditions). These countries included Japan (40 per cent), Finland (24 per cent), Chinese Taipei (21 per cent), and Korea (53 per cent). These countries also had lower percentages than England of pupils in the highest category (being taught by teachers classified as having *Hardly Any Problems*); for these countries the percentages of pupils in this high category ranged from 18 per cent to 7 per cent.

The TIMSS countries with the highest percentages of Y9 pupils taught by teachers classified as having *Hardly Any Problems* were the same as for mathematics (Qatar and the United States, with 51 per cent and 40 per cent respectively).

For science, as for mathematics, there was an association internationally between perceptions of working conditions and pupil achievement. However, the differences in achievement in England are unlikely to be significant.

8.2.2 Availability of computers for lessons

As at Y5, in order to calculate the availability of computers for lessons, headteachers were asked to indicate the number of pupils in Y9 and the total number of computers available for teaching. The calculated ratios for England are shown in Table 8.5.

Table 8.5 Schools with Computers Available for Teaching

Mathematics

Reported by Principals

Country	1 Computer for 1–2 Students		1 Computer for 3–5 Students		1 Computer for 6 or More Students		No Computers Available	
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement
England	99 (0.9)	510 (5.8)	1 (0.9)	~ ~	0 (0.0)	~ ~	0 (0.0)	~ ~
International Avg.	40 (0.5)	472 (1.4)	28 (0.5)	472 (1.5)	28 (0.4)	467 (1.8)	4 (0.2)	396 (4.7)

( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
A tilde (~) indicates insufficient data to report achievement.

Science

Reported by Principals

Country	1 Computer for 1–2 Students		1 Computer for 3–5 Students		1 Computer for 6 or More Students		No Computers Available	
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement
England	99 (0.9)	537 (5.2)	1 (0.9)	~ ~	0 (0.0)	~ ~	0 (0.0)	~ ~
International Avg.	40 (0.5)	481 (1.2)	28 (0.5)	480 (1.4)	28 (0.4)	474 (1.7)	4 (0.2)	408 (5.6)

( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
A tilde (~) indicates insufficient data to report achievement.

The number of students per computer was calculated by dividing the number of students by the number of computers.

1) **What is the total enrollment of fourth grade students in your school as of the first day of the month TIMSS 2011 testing begins?**

_____

2) **What is the number of computers that can be used for instructional purposes by fourth grade students?**

_____

Sources: Exhibit 5.15, international mathematics report, and Exhibit 5.14, international science report; question adapted from the international version of the TIMSS 2011 School Questionnaire[120]

Again, at this age group, England had the highest level of reported computer provision among all participating countries; nearly all pupils in England (99 per cent) were in schools where a computer was available for every one to two pupils. The equivalent international average was 40 per cent (see Table 8.5), although there was considerable variation from country to country.

Other TIMSS countries with a particularly high percentage of pupils in schools where a computer was available for every one to two pupils included Australia at 89 per cent, and New Zealand at 88 per cent.

Three of the highest scoring countries (Japan, Chinese Taipei and Korea) each had lower percentages of pupils in schools where a computer was available for every

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one to two pupils; these figures were 31 per cent in Japan, and 6 per cent in each of Chinese Taipei and Korea.

Internationally, the differences in achievement scores between those pupils in schools with *No Computers Available*, and pupils in any one of the categories of some computer availability, are likely to be statistically significant for both subjects. This is also true of the differences in achievement related to having one computer for six or more pupils, compared with each category of higher computer availability.[121] Other comparisons across the categories of computer availability are unlikely to be statistically significant (based on the size of the standard errors).

Differences in achievement could not be calculated for England because of the high level of computer provision in Y9. As noted for Y5, the relationship between computer availability and achievement is complex. See section 8.1.2 for more information.

8.2.3 Views about limitations on teaching caused by resourcing

As with Y5, headteachers of Y9 pupils were asked to rate the extent to which their school's capacity to teach mathematics and science was limited by a shortage of resources. Headteachers were asked about general school resources as well as specific resources for teaching mathematics and science; the questions can be seen in Table 8.6.

Pupils were scored according to their headteachers' responses concerning the seven general school and classroom resources and five subject specific resources. In each case, the scale contained the general resources and the relevant subject-specific resources. The question was analysed as two separate scales, one for each subject. This resulted in the parallel *Mathematics Resource Shortages* and *Science Resource Shortages scales*; an explanation of how each scale was calculated is shown in Table 8.3.[122]

In England, the average scale score was 11.3 for both mathematics and science; within the *Not Affected* category overall for each subject.

121 Although the findings for both subjects are likely to be significant, the difference is potentially borderline for mathematics and very small.

122 As this is a new scale, the international analysis does not include trend data.

Table 8.6 Teaching Affected by Resource Shortages

Mathematics

Reported by Principals

Students were scored according to their headteachers' responses concerning twelve school and classroom resources on the *Mathematics Resource Shortages* scale. Students in schools where instruction was **Not Affected** by resource shortages had a score on the scale of at least 11.1, which corresponds to their headteachers reporting that shortages affected instruction "not at all" for six of the twelve resources and "a little" for the other six, on average. Students in schools where instruction was **Affected A Lot** had a score no higher than 7.3, which corresponds to their headteachers reporting that shortages affected instruction "a lot" for six of the twelve resources and "some" for the other six, on average. All other students attended schools where instruction was **Somewhat Affected** by resource shortages.

Country	Not Affected		Somewhat Affected		Affected A Lot		Average Scale Score
	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	Per cent of Students	Average Achievement	
England	48 (4.2)	498 (8.1)	52 (4.2)	516 (8.2)	0 (0.0)	~ ~	11.3 (0.16)
International Avg.	25 (0.5)	488 (2.2)	69 (0.5)	464 (0.7)	6 (0.3)	453 (2.9)	

Centre point of scale set at 10.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
A tilde (~) indicates insufficient data to report achievement.

Science

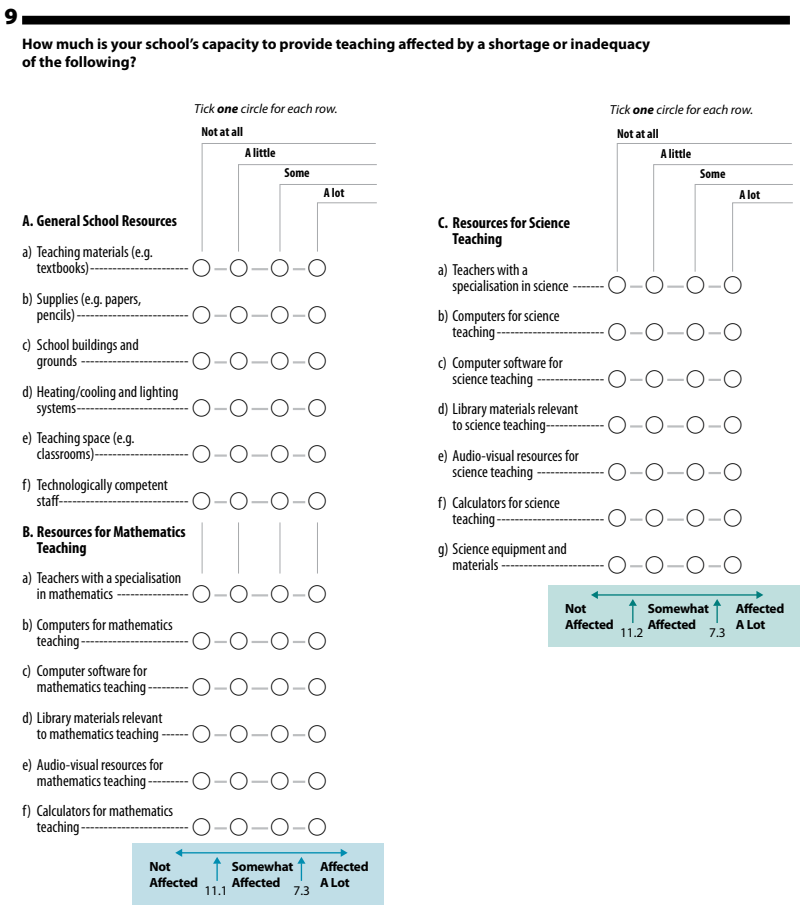
Reported by headteachers

Students were scored according to their principals' responses concerning thirteen school and classroom resources on the *Science Resource Shortages* scale. Students in schools where instruction was **Not Affected** by resource shortages had a score on the scale of at least 11.2, which corresponds to their principals reporting that shortages affected instruction "not at all" for seven of the thirteen resources and "a little" for the other six, on average. Students in schools where instruction was **Affected A Lot** had a score no higher than 7.3, which corresponds to their principals reporting that shortages affected instruction "a lot" for seven of the thirteen resources and "some" for the other six, on average. All other students attended schools where instruction was **Somewhat Affected** by resource shortages.

Country	Not Affected		Somewhat Affected		Affected A Lot		Average Scale Score
	Per cent of pupils	Average Achievement	Per cent of pupils	Average Achievement	Per cent of pupils	Average Achievement	
England	47 (4.0)	525 (7.8)	53 (4.0)	542 (7.3)	0 (0.0)	~ ~	11.3 (0.16)
International Avg.	22 (0.4)	494 (1.9)	71 (0.5)	474 (0.7)	7 (0.3)	464 (3.3)	

Centre point of scale set at 10.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
A tilde (~) indicates insufficient data to report achievement.

Source: Exhibit 5.9, international mathematics report, and Exhibit 5.8, international science report



Source: question adapted from the international version of the TIMSS 2011 School Questionnaire[123]

Mathematics

The data show that just over half of Y9 pupils studying mathematics in England (52 per cent) were in schools where mathematics teaching was perceived by their headteachers as *Somewhat Affected* by resource shortages. No pupils were in schools where teaching was perceived as *Affected A Lot* by resource shortages, and 48 per cent of pupils were in schools where teaching was perceived as *Not Affected* by resource shortages (see Table 8.6).

The three countries with the highest percentages of pupils in schools where teaching was perceived to be *Not Affected* by resource shortages, based on their headteachers' responses, were Slovenia, Singapore and Korea, with between 71 and 58 per cent respectively.

The pattern seen in Hong Kong for Y5 mathematics is not mirrored for Y9 mathematics. In Hong Kong (one of the highest performing countries in mathematics), none of the 9–10 year old pupils were in schools where the teaching of mathematics was perceived as *Not Affected* by resource shortages, but at ages 13–14 a higher percentage of 41 per cent of pupils in Hong Kong attended schools where teaching was perceived as *Not Affected* by resource shortages.

Internationally, there is an association between perceived resource shortages and pupils' mathematics achievement. However, the differences in achievement in England are unlikely to be significant.

123 http://timssandpirls.bc.edu/timss2011/index.html

Science

Just over half of Y9 pupils in England (53 per cent) were in schools where science teaching was perceived as *Somewhat Affected* by resource shortages. No pupils were in schools where teaching was perceived as *Affected A Lot* by resource shortages, and 47 per cent of pupils were in schools where teaching was perceived as *Not Affected* by resource shortages. These findings are very similar to the findings for Y9 mathematics (see Table 8.6), despite being based on a set of parallel-but-different questions answered by headteachers.

The countries with the highest percentages of pupils in schools where teaching science was perceived as *Not Affected* by resource shortages were similar to those for mathematics: Singapore, Slovenia and Korea, with percentages between 64 and 57 per cent respectively.

As for mathematics, there is an international association between headteachers' perceptions of resource shortages and pupils' science achievement. However, the observed differences in science achievement in England are unlikely to be significant.