The home learning environment in Ireland: Insights from TIMSS 2015

Aidan Clerkin
Rachel Perkins
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Educational Research Centre
2020

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Foras Taighde ar Oideachas
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- Aedín Ní Thuathail (Irish Primary Principals' Network).
- Aidan Clerkin (Educational Research Centre).
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Chapter 1: Overview of TIMSS 2015

TIMSS (**T**rends in **I**nternational **M**athematics and **S**cience **S**tudy) is among the largest and most in-depth studies of educational achievement in the world. Fifty-six countries, including Ireland, took part in TIMSS in 2015. This chapter provides a brief introduction to the study and its implementation in Ireland.

What is TIMSS?

TIMSS assesses the mathematics and science skills of students in Fourth grade (equivalent to Fourth Class in Ireland) and Eighth grade (Second Year) in participating countries, thereby providing national and cross-national comparative information for policy-makers and educators. The study is organised under the auspices of the International Association for the Evaluation of Educational Achievement (IEA), a non-profit consortium of research institutes. The Educational Research Centre (ERC) managed Ireland's participation in TIMSS 2015 on behalf of the Department of Education and Skills (DES). TIMSS takes place every four years. The first implementation of TIMSS was in 1995. Ireland has participated on four occasions – in 2011 (at primary level only) and in 1995, 2015, and 2019 (at both primary and post-primary levels). The findings of the 2019 study will be available from December 2020.

An initial report for TIMSS 2015 in Ireland was published in November 2016 (Clerkin, Perkins & Cunningham, 2016), timed to coincide with the international launch of the results (Martin, Mullis, Foy & Hooper, 2016; Mullis, Martin, Foy & Hooper, 2016). The initial report focused on describing the achievement of Irish students in Fourth Class and Second Year on the TIMSS mathematics and science assessments and also included a comparison of the Irish curriculum, together with teachers' coverage of various topics in class, relative to the TIMSS assessment frameworks.

Which countries participated in TIMSS 2015?

As noted above, 56 countries participated in the study in at least one grade level (49 at Fourth grade, including two countries that also participated in TIMSS Numeracy,[1] and 39 at Eighth grade).[2] However, in order to facilitate a clear presentation of findings, international comparisons that are presented in tables or graphics in this report will be limited to a small group of countries that are of particular interest as comparators, rather than the full set of countries that took part in the study. This set of countries were selected as a result of high average performance on TIMSS 2015 (and, usually, other recent international assessments) or due to their cultural and/or linguistic similarities to Ireland. The selected countries are given in Table 1.1, in alphabetical order.[3]

1 TIMSS Numeracy was a less difficult version of the main TIMSS assessment, designed for countries with lower average levels of student achievement in mathematics and reported on the main scale. South Africa and Jordan took part in TIMSS Numeracy only. Bahrain, Indonesia, Iran, Kuwait, and Morocco participated in both TIMSS Numeracy and TIMSS; their data for both assessments were combined and reported as a whole.

2 Seven benchmarking participants also took part. Benchmarking participants must follow the same procedures and meet the same data quality standards as countries, and can use the resulting (equivalent) data to benchmark their performance against national and international comparators.

3 Note that Finland and Northern Ireland participated at Fourth grade only. As a result, they are omitted from any tables that present Eighth grade data throughout this report.

These countries provide the main focus for comparison alongside Ireland and the TIMSS (international) average. Maintaining a consistent group of comparison countries in this manner provides a coherent and stable basis for comparison across differing national and thematic contexts. Other countries may also be referred to in text where especially noteworthy findings are observed.

Table 1.1: Selected comparison countries

	Grade levels	Primary reason for inclusion
Australia	4 and 8	Cultural/linguistic similarity
England	4 and 8	Cultural/linguistic similarity
Finland	4	High performance (science)
Hong Kong SAR	4 and 8	High performance
New Zealand	4 and 8	Cultural/linguistic similarity
Northern Ireland	4	Cultural/linguistic similarity
Rep. of Korea	4 and 8	High performance
Russian Fed.	4 and 8	High performance
Singapore	4 and 8	High performance
Slovenia	4 and 8	High performance (science)
United States	4 and 8	Cultural/linguistic similarity

Readers should note that, when making reference to other countries, the internationally-comparable terms 'Fourth grade' and 'Eighth grade' are used. 'Fourth Class' and 'Second Year' are only ever used to refer specifically to students in Ireland.

TIMSS average

Reference is made to the TIMSS *average* or *international average* throughout this report. This refers to the average of all 49 countries at Fourth grade or all 39 countries at Eighth grade for which data were available.

How did Irish students perform?

Prior to considering the contextual results in subsequent chapters, it is helpful to consider students' achievement in TIMSS 2015 (and previously) more generally. Students' performance on each domain is reported on a scale that is set to an international 'centrepoint' of 500. This centrepoint has been maintained since the first TIMSS, in 1995, as a constant point of reference against which countries can monitor changes in their students' performance over time. It does not change with each cycle, unlike an international average, which would be expected to vary between cycles due to changes in performance within countries and different sets of countries taking part in each assessment year.

In general, Irish students achieved at a reasonably high level in TIMSS 2015, relative to other countries. At both grade levels, Irish students achieved mean mathematics and science scores that were significantly above both the centrepoint and the international average. Fourth Class pupils achieved a mathematics score that was significantly lower than pupils in seven countries, similar to pupils in four countries, and significantly higher than pupils in 37 countries. Performance in science was more moderate, with Fourth Class pupils achieving a score that was significantly lower than pupils in 15 countries, similar to nine countries, and significantly higher than 22 countries. Second Year students achieved a mean mathematics score that was significantly lower than students in

six countries, similar to five countries, and significantly higher than 27 countries. Their science performance was significantly lower than seven countries, similar to six countries, and significantly higher than 25 countries.

Table 1.2 presents a summary of the differences in performance between students in Ireland and those in our selected comparison countries, along with the TIMSS average, for both domains at both grade levels. Statistically significant differences in scores are noted, where present, along with the difference from the mean score in Ireland for each country.

Students in four countries – Hong Kong, the Republic of Korea, the Russian Federation and Singapore – achieved higher mean scores than Irish students on both domains and at both grade levels. In some other countries, students achieved a higher score than Irish students in one domain but a lower score in the other domain, either at Fourth grade (Finland, Northern Ireland, the United States) or at both grade levels (Slovenia).

Table 1.2: Differences in performance between Ireland and comparison countries

	Fourth grade				Eighth grade			
	Maths		Science		Maths		Science	
	Sig?	Difference from IRL	Sig.?	Difference from IRL	Sig.?	Difference from IRL	Sig.?	Difference from IRL
Australia	↓	-30	↔	-5	↓	-19	↓	-18
England	↔	-1	↑	7	↔	-5	↔	7
Finland	↓	-12	↑	25	n/a	n/a	n/a	n/a
Hong Kong	↑	67	↑	28	↑	71	↑	16
Ireland		**547**		**529**		**523**		**530**
New Zealand	↓	-57	↓	-23	↓	-31	↓	-17
Northern Ireland	↑	23	↓	-9	n/a	n/a	n/a	n/a
Rep. of Korea	↑	61	↑	60	↑	82	↑	25
Russian Fed.	↑	17	↑	38	↑	15	↑	14
Singapore	↑	70	↑	62	↑	97	↑	67
Slovenia	↓	-27	↑	14	↓	-7	↑	21
United States	↓	-8	↑	17	↔	-5	↔	0
TIMSS average	↓	-38	↓	-23	↓	-42	↓	-44

Countries are ordered alphabetically.

↑ indicates a significantly higher mean score than Ireland.

↓ indicates a significantly lower mean score than Ireland.

↔ indicates that the score is not significantly different from Ireland's.

The strong focus on trend data in TIMSS also allows us to look beyond within-cycle comparisons. Significant improvements in both mathematics and science were found among Fourth Class pupils between 1995 and 2015, with most of this improvement occurring since 2011. At Second Year, significant improvements since 1995 were found for science performance, but not for mathematics. It was particularly notable that, at both grade levels, performance in both domains has increased since 1995 (and since 2011 for Fourth Class pupils) among lower- and medium-performing students, but not among the highest-achieving students. For a more detailed discussion of mathematics and science achievement, and for details on the administration of the survey, readers are referred to the initial report (Clerkin et al., 2016).

Contextual information for Ireland: Research series

This report is one of several TIMSS thematic reports that have been released as part of our ERC Research Report Series. TIMSS 2015 provides detailed information on students' personal experiences and attitudes; their home environment; their classroom environment and the teaching practices they experience; the school-level policies and practice that influence their daily lives; as well as national-level policies and the curricula for both grade levels. The study is designed to allow us to generalise these data to the national populations of Fourth Class and Second Year students, delivering robust information on their educational experiences.

In order to present this wealth of contextual data in the clearest fashion, each thematic report focuses on a particular topic in detail. Several short reports have been published to date, describing some of the structural characteristics of the Irish education system (Eivers & Chubb, 2017), the teaching of mathematics and science in Fourth Class (Clerkin, Perkins & Chubb, 2017), and the teaching of mathematics and science in Second Year (Clerkin, Perkins & Chubb, 2018). A further report focusing on student attitudes and engagement at school (Perkins, Clerkin & Chubb, in press) is forthcoming. All reports are made available for download from www.erc.ie/timss as they are published.[4]

The current report focuses on the home environment, drawing on information provided by students and teachers at both grade levels and, for Fourth Class pupils only, from parents or guardians. A brief introduction to the topic is provided in the next chapter. The following chapters present information on particular areas of interest, including a description of parents' background and home languages, parents' perspectives on their child's education, educational resources and technology in the home, early childhood educational activities, nutrition and sleep, engagement in homework, and participation in 'shadow' (out-of-school) education.

A note on statistical significance

In the current report, tests of *statistical significance* are conducted to establish if differences between mean scale scores for achievement are large enough and reliable enough that we can be confident that the difference reported here is unlikely to have occurred by chance. For each comparison, a reference category is selected for each variable and comparisons are made between the mean score for this group and each remaining group. Statistical significance tests are reported at the 95% confidence level and measurement and sampling error are accounted for in the statistical comparisons.

Where reference is made to a significant difference (i.e., significantly lower or higher) in this report, a test of statistical significance has been conducted.

Readers should note that statistical significance refers to the probability of an observed difference occurring by chance if no true difference exists. It does not necessarily imply that a difference is substantive or meaningful in terms of its implications for policy or practice: statistically significant differences can sometimes be very small in practical terms. Informed judgement should therefore be used in interpreting the results of the statistical tests presented here.

4 An e-appendix accompanying each report will also be available from www.erc.ie/timss, where relevant. These will contain additional statistical information (e.g., standard errors) that may be omitted from the main reports in order to facilitate a concise presentation of findings.

Chapter 2: Introduction to the home environment

This report describes the home environments of the Fourth and Eighth grade students who took part in TIMSS 2015. Many aspects of the home environment are considered to be influential in shaping outcomes related to school success. The home can facilitate students' access to certain materials and learning resources, and it is an important context for learning which takes place outside of school (Gilleece, 2015; LeFevre, Skwarchuk, Smith-Chant, Fast, Kamawar, & Bisanz, 2009; Bus, Van Ijzendoorn, & Pellegrini, 1995). The purpose of this chapter is to provide a context for the data presented in the remainder of the report. This is done by outlining findings from previous research which has highlighted the importance of the home environment in relation to children's education.

There has been longstanding interest in the relationship between the presence of home resources for learning and educational outcomes. In TIMSS, 'home resources for learning' refers to intangible family background characteristics such as parental education and occupation, as well as the availability of more tangible resources that are seen to cultivate a supportive learning environment, such as books (including children's books) and a connection to the internet (Mullis & Martin, 2013).

In particular, many studies have highlighted the association between the number of books in the home and student achievement. Several cycles of the National Assessments of primary schools in Ireland have shown that a greater numbers of books in the home is strongly associated with higher levels of achievement in mathematics and, even more so, in reading (Kavanagh, Shiel, Gilleece & Kiniry, 2015; Eivers et al., 2010). Cosgrove and Creaven (2013) analysed PIRLS[5] and TIMSS[6] 2011 data for Ireland and found that this association was stronger for boys than it was for girls at Fourth Class. The association between books in the home and achievement has also previously been established for post-primary students. For example, in PISA[7] 2015, the Home Possessions index (a composite measure based on home educational resources, cultural possessions, family wealth, and average number of books in the home) was positively associated with science, mathematics, and reading achievement. Among the variables composing the Home Possessions index, the number of books in the home had the strongest correlation to student achievement in all three areas (Shiel, Kelleher, McKeown & Denner, 2016).

It should be noted that these associations do not imply a direct causal effect from an increased number of books to higher achievement, but the consistency and robustness of the association supports a view of the number of books in the home as a good proxy indicator for broader educational resources at home (including parental attitudes and practices promoting reading and learning more generally). Gorard, See, and Davies (2012), in a literature review focusing on attitudes and behaviours outside school and their relationship to educational achievement, note that "parental involvement in a child's education is a strong and plausible candidate for a causal model of improvement" (p. 35). This

5 Progress in International Reading Literacy Study, a survey of reading achievement among Fourth grade (Fourth Class) students. It is organised by the IEA (International Association for the Evaluation of Educational Achievement).
6 Trends in International Mathematics and Science Study, a survey of mathematics and science achievement among Fourth grade (Fourth Class) and Eighth grade (Second Year) students. TIMSS is a sister study to PIRLS, and is organised by the IEA.
7 Programme for International Student Assessment, a survey of reading, mathematical and scientific literacy among 15-year-old students. It is organised by the OECD (Organisation for Economic Cooperation and Development).

was, in fact, one of few potentially causal pathways supported by their review of the current literature. They suggest two relevant mechanisms contributing to this pathway: (i) 'parent as teacher', in which parents' instructional behaviours can be seen as a resource with a direct pedagogic and cognitive impact; and (ii) 'parent-school alignment', in which norms of communication and behaviour at home that are closer to those at school may be expected to facilitate children's transition to school and their ease of interaction at school.

Previous studies have also highlighted associations with home access to digital technology. The relationship between technology use and educational outcomes varies depending on the technologies students with which engage, as well as the time spent using such devices. For example, Kavanagh et al. (2015) found that access to the internet was positively associated with reading and mathematics achievement for Second and Sixth Class pupils, while access to electronic books was related to reading achievement. However, findings from Eivers et al. (2010) suggest that excessive engagement with technology is negatively associated with reading and mathematics achievement. In their analysis, pupils classified as 'high users of technology' (those who spent a minimum of two hours per school day on the internet or playing video games) had significantly lower achievement than those with moderate usage and those who spent no time on the internet or playing computer games on school days. However, the research in this area is complex and nuanced. Current evidence points to the conclusion that, in general, the content delivered through digital devices and the behaviours associated with use of digital technology (both students' and teachers' behaviour) appear to be more relevant factors for educational outcomes than the mere fact of access to a tablet or laptop, or measures of screen time (Chaia, Child, Dorn, Frank, Krawitz & Mourshed, 2017; Marcus-Quinn, Hourigan & McCoy, 2019).

The language(s) students speak in the home is another important aspect of their home environment, with many studies in Ireland and internationally showing that proficiency in the language of instruction is related to the educational success of students. The Central Statistics Office (CSO) has estimated that in April 2018, around 12.2% of Ireland's total population were non-Irish nationals. When those from the United Kingdom were excluded, the percentage of non-Irish nationals was 9.9% (CSO, 2018). However, in PIRLS and TIMSS 2011, Eivers (2013) found that despite these changes to Ireland's population, Irish primary school classrooms remained less linguistically diverse than those in most other participating countries. For example, 84% of pupils in Ireland reported always speaking the language of the test at home, compared to a study average of 74%.

Previous studies have consistently shown that the language of the home is related to student achievement and is a more educationally-relevant variable than nationality or immigration status. In the 2014 National Assessments, both Second and Sixth Class pupils who mostly spoke English at home scored significantly higher on English reading assessments than those who spoke another language, while Second Class pupils also performed better in mathematics (Kavanagh et al., 2015). Similar findings were reported by Eivers (2013), where differences were found in mathematics, science, and reading achievement between those who always spoke the language of the test at home and those who only did so sometimes. This was the case within Ireland, and also within other countries across the study. Drawing on PISA 2015 data for Ireland, Shiel et al. (2016) found no significant differences in science or mathematics achievement based on immigrant or language backgrounds. However, native students outperformed immigrants who spoke a language other than English or Irish at home when it came to reading literacy.

Other factors linked to the home environment can affect children's ability to fully engage with their lessons in school. In particular, previous research has highlighted the importance of students receiving adequate nutrition and sufficient rest before arriving to class. Clerkin and Creaven (2013)

analysed teacher reports from PIRLS and TIMSS 2011, and found that almost two-thirds of pupils in Ireland had a teacher who felt that their ability to teach was limited (a lot or to some extent) by pupils' lacking sufficient rest. Their suggestion that having a TV in the bedroom could contribute towards children's sleep deprivation has been raised elsewhere (Hargadon & Downes, 2019; Nuutinen, Ray & Roos, 2013; Garmy, Nyberg, & Jakobsson, 2012). In addition, Clerkin and Creaven found that just over one-fifth of Fourth Class pupils had a teacher who felt that pupils' lack of basic nutrition was limiting their instruction. In their report, they note that these figures were similar to corresponding international averages, but somewhat higher than in comparison countries such as Northern Ireland, Singapore, and Finland.

Breakfast is widely considered to be associated with improved cognitive function and school performance. Evidence suggests that eating breakfast regularly is positively associated with academic performance (Adolphus, Lawton & Dye, 2013). The American Academy of Paediatricians (Barlow, 2007) recommend that breakfast is eaten daily as part of a healthy and balanced diet aimed at preventing excessive weight gain or obesity. When asked about their child's breakfast consumption as part of Growing Up in Ireland, nearly all mothers reported that their child usually eats something before going to school (Williams et al., 2009). However, according to a World Health Organisation study, 11-year-old girls were more likely to skip breakfast than boys, as were children from lower-SES families. Further, this study found that eating breakfast daily decreased with age in almost all participating countries (Currie et al., 2012). Findings from a subsequent iteration of the Health Behaviours in School-Aged Children (HBSC) study showed similar results. Reporting on Irish HBSC data, Gavin et al. (2015) showed that 4% of boys and 2% of girls in Third and Fourth Class never had breakfast on weekdays. For school-aged children between 10 and 17-years-old, this was the case for 10% of boys and 15% of girls. Further, they note that older children were more likely to report that they never eat breakfast, as were those from lower-SES groups.

Another important aspect of the home environment is its role in facilitating exposure to certain childhood experiences. It has been well documented that early childhood experiences play a major role in determining future outcomes in learning, health, and wellbeing. In particular, research in education has shown that early experiences in the home environment can be foundational for school success (LeFevre et al., 2009; Bus et al., 1995). One major focus of previous research in this area has been on home-based early learning activities in the years before children begin school (Clerkin & Gilligan, 2018; Meinck, Stancel-Piątak & Verdisco, 2018; Segers, Kleemans & Verhoeven, 2015). For example, studies have shown that early literacy and numeracy activities are positively associated with children's cognitive and linguistic ability upon starting primary school (Segers et al., 2015). In their analysis of data from PIRLS and TIMSS 2011, and TIMSS 2015, Meinck et al. found that there was a positive association between the frequency of engagement in early learning activities at home and achievement in mathematics, science, and reading for Fourth grade students.

Clerkin and Gilligan (2018) used TIMSS 2011 data to look at the relationship between early numeracy play (before starting school) and the attitudes children held towards mathematics by Fourth Class. Early numeracy play comprised play with number toys, shapes, construction toys, building blocks, or board/card games, as well as counting things and singing counting rhymes or songs. These types of play include both formal activities (where there is an element of explicit instruction from the caregiver to the child) and informal activities (which arise more organically in daily life or in play scenarios). Clerkin and Gilligan (2018) found that, even while controlling for other relevant factors, early numeracy play was positively associated with children's confidence in mathematics and (among children from higher socioeconomic backgrounds) with liking mathematics. This study also provided an insight into the prevalence of early numeracy play among Fourth Class pupils. Early numeracy play was more common in Ireland than in most other countries. Most children in Ireland

were found to have frequently engaged in early numeracy play, with relatively few never doing so. However, within Ireland, pupils in homes with fewer resources for learning were far less likely to have engaged in each of the various types of early numeracy play that were asked about.

In addition to home-based learning, children have early educational experiences as a result of attendance at pre-primary or early childhood educational programmes. Students who attend at least one year of pre-primary education generally outperform those who do not (OECD, 2016). Generally, pre-primary and early childhood education programmes are divided into those aimed at children aged under three and those for children aged three and older. Eivers and Chubb (2017) note that almost all TIMSS 2015 countries had universal availability of early childhood programmes for children aged three and older, while only half of participating countries reported that this was the case for programmes directed at those under the age of three. Early childhood programmes for children aged three and older were universally available in Ireland at the time, but those aimed at children under the age of three were not. However, since September 2018, children can access the Early Childhood Care and Education (ECCE) Scheme from the age of two years and eight months. Uptake of the ECCE scheme since its initial introduction in 2010 has been extremely high, with more than 95% of eligible children enrolled (DCYA, 2019a).

However, caution should be employed when interpreting international data on pre-primary education in Ireland. TIMSS 2015 collected data on pupils' attendance at pre-primary or early childhood educational programmes before beginning primary school. In Ireland, the Infants grades are usually thought of as being part of primary school. However, under the International Standard Classification of Education (ISCED) framework, Junior and Senior Infants are considered as part of ISCED 0 rather than ISCED 1 (OECD, 1999; OECD/EUROSTAT/UNESCO, 2015). Therefore, when it comes to cross-country comparison, the Infant grades are considered pre-primary, not primary. This can cause some difficulty when comparing Irish data to other countries. TIMSS questionnaires are adapted to suit an Irish context, and therefore all questions asked of parents or teachers that relate to *children starting primary school* specifically refer to *First Class*. However, some respondents still appear to answer these kinds of question with reference to the Infant grades (Eivers & Chubb, 2017), meaning that data referring to activities that occurred before starting primary school in Ireland – including the data reported in Chapter 6 of this report – should be interpreted with that caveat in mind.

Homework often makes up a substantial part of a child's education. Schoolwork done at home can provide students with the opportunity to practice material learned in class, and to develop the ability to work independently. It also offers parents the chance to engage with their child's education by providing an insight into the kind of work they do in school. The extent to which homework is assigned to students varies around the world, but in Ireland it is near-universal (Eivers & Creaven, 2013).

The National Parents' Council (n.d) provides a general guideline to parents on how much homework their child will typically be assigned during the week. It suggests that Third and Fourth Class pupils should expect 30-40 minutes of homework per night. Eivers and Creaven (2013) analysed PIRLS 2011 data to compare parents' reports on how long Fourth grade pupils spent completing homework per day. They found that, compared to other participating countries, pupils in Ireland spent a moderate amount of time on homework, with a large majority (83%) spending 15-60 minutes (37% of pupils spending between 15-30 minutes per night and 46% spending 31-60 minutes). As part of PIRLS and TIMSS 2011, teachers were also asked about how often they assigned reading, mathematics, and science homework to pupils, and how long pupils were expected to spend on homework for each subject. Clerkin (2013) found that Fourth Class pupils in

Ireland generally received shorter homework assignments in reading and mathematics than pupils in other countries, but that they were assigned homework in these subjects on a more frequent basis. For science, pupils in Ireland received shorter assignments while also receiving homework less frequently than their international peers.

For some students, mainstream classes and the formal school day do not fully account for the time they spend in educational settings. In addition to the mainstream education system, students can also participate in so-called "shadow education systems". Typically, shadow education takes the form of supplementary private tutoring (or grinds). Bray (2009) notes that these parallel education systems can have both positive and negative consequences. In one sense, they can help pupils to understand material from mainstream classes, which may also assist teachers. However, they can also exacerbate existing social and economic inequalities, and in some contexts are seen to undermine social trust.

There is a lack of internationally-comparable data on shadow education systems, making it difficult to measure the extent of private tutoring in different countries. Existing research suggests that extensive shadow education systems are widespread in many Asian countries, and previous studies have predominantly focused on these contexts (Bray & Kwok, 2003; Bray, 2009; Bray and Lykins, 2012). TIMSS 2015 inquired about student participation in extra lessons or tutoring, outside of school. As a result, it provides an opportunity to gain some understanding of students' participation in shadow education, both in Ireland and internationally.

The remainder of this report is structured as follows: Chapter 3 describes the education levels and occupational characteristics of parents, as well the languages spoken in the home. Chapter 4 provides details relating to parents' perspectives on their child's education, such as parents' expectations for their child's future educational attainment, their views on their child's school, and their attitudes towards mathematics and science. Also included in this chapter are teachers' perceptions of parental support for learning in their school. Following on from this, Chapter 5 focuses on students' access to educational resources and technology at home, including the number of books in the home and the kinds of digital devices available to them. Chapter 6 discusses students' early educational experiences, such as their engagement in early numeracy and literacy activities before starting school, and their attendance at pre-primary education programmes. Chapter 7 presents information on students' nutrition and sleep, including reports from teachers on the extent to which students' hunger and tiredness affects their ability to teach. Chapter 8 discusses homework in terms of the frequency with which it is assigned and the time students spend doing schoolwork at home. Chapter 9 examines students' participation in shadow education. Finally, Chapter 10 summarises the main findings and identifies key conclusions arising from the analysis.

Chapter 3: Educational qualifications, occupation, and home language

This chapter presents information on the educational background and (for Fourth grade pupils) the occupational characteristics of the parents or guardians of the students who participated in TIMSS 2015, as well as the frequency with which English, Irish, or other languages are spoken at home.

> Parents of Eighth grade (Second Year) students were not asked to complete a Home Questionnaire. Instead, students in Eighth grade were asked some questions about their home background as part of the Student Questionnaire. This means that some of the data presented for Fourth grade (Fourth Class) pupils in this chapter, provided by their parents, is not available for students in Eighth grade.

Parental education

The parents of pupils at primary school level, in Fourth grade, were asked to describe their educational attainment (i.e., their highest educational qualification, or how far they had gone through the education system).

Fourth Class

Slightly more Fourth Class pupils (42%) had at least one parent who reported an undergraduate or postgraduate degree than was found internationally (38%) (Table 3.1). Over a third of pupils in Ireland (36%) had a parent with some third-level education (not to degree level). This was substantially higher than the corresponding international average (21%). The parents of about twice as many pupils internationally as in Ireland reported finishing their formal education at upper secondary (25% vs 13%) or at primary (7% vs 3%) level.

Among our comparison countries, over twice as many parents in Hong Kong (20% of pupils), reported finishing their education at primary or lower secondary level (Group Cert., Intermediate Cert., Junior Cert., GCSE, etc.) than in Ireland (9%), while the corresponding percentage in Northern Ireland (10%) was similar to that in Ireland. At the other extreme, about half of pupils' parents in Australia, Finland, New Zealand, the Republic of Korea, and the Russian Federation (49-52%) reported attaining an undergraduate or postgraduate degree, somewhat higher than in Ireland.

Table 3.1: Percentage of pupils, by parents' highest educational attainment level, parent report (Fourth grade)

	Undergraduate or postgraduate	Post-secondary but not university	Upper secondary	Lower secondary	Some primary or lower secondary
Australia	51	33	10	5	<1
Finland	50	22	26	2	<1
Hong Kong SAR	34	16	31	12	8
Ireland	**42**	**36**	**13**	**6**	**3**
New Zealand	49	28	9	10	2
Northern Ireland	42	16	31	6	5
Rep. of Korea	51	23	25	1	<1
Russian Fed.	52	31	10	5	1
Singapore	47	31	15	3	4
Slovenia	38	19	40	2	<1
TIMSS	38	21	25	8	7

The Home Questionnaire was not administered in England or the United States.
Percentages may not sum to 100 due to rounding.

Second Year

As noted above, no Home Questionnaire was administered for the Grade 8 component of TIMSS, meaning that the parents of Second Year students were not asked to provide any information directly. Instead, the students themselves were asked, as part of the Student Questionnaire, about their parents' or guardians' educational attainment. These student reports therefore come with the caveat that they are a proxy indicator of parental educational attainment based on students' knowledge and understanding of the relevant levels of education, rather than a direct report.

Many students reported that they were unable to answer the question, possibly because they did not know or because they found it difficult to map their understanding of their parents' education on to the response options that were given. This was the case for about one-fifth of students in Ireland (23%) and internationally (21%) (Table 3.2). Among our comparison countries, this ranged from 13% in the Russian Federation to more than half in England (51%) and New Zealand (54%).

More than half of Second Year students reported that their parents attained a university degree or a post-secondary (but not university) qualification (54%) compared to an average of 45% across TIMSS countries. About one-sixth (16%) reported that their parents had completed second-level education, with about 6% reporting that their parents left school at primary or lower secondary level. These percentages are somewhat lower than the corresponding international averages of 20% and 11%, respectively.

Table 3.2: Percentage of students, by parents' highest educational attainment, student report (Eighth grade)

	Undergraduate or postgraduate	Post-secondary but not university	Upper secondary	Lower secondary	Some primary or lower secondary	Don't know
Australia	26	19	13	4	1	37
England	24	13	8	3	1	51
Hong Kong SAR	20	11	33	11	4	22
Ireland	**33**	**21**	**16**	**4**	**2**	**23**
New Zealand	18	10	11	5	1	54
Rep. of Korea	43	8	26	1	<1	22
Russian Fed.	39	25	14	8	<1	13
Singapore	29	24	16	4	4	23
Slovenia	19	29	21	3	<1	29
United States	42	12	20	5	2	20
TIMSS	28	17	20	9	5	21

Percentages may not sum to 100 due to rounding.

Parental occupation *(Fourth Class)*

The parents of Fourth grade pupils were asked to choose, from a list of broad categories provided,[8] which best described their occupation.

Half of the Fourth Class pupils in Ireland (50%) had at least one parent who reported having a 'professional' job (for example; scientists, teachers, health professionals), which was higher than the international average (40%) and within the range reported by our comparison countries, from 43% in the Russian Federation to 65% in Singapore (Table 3.3).[9]

Slightly more than one-fifth of Fourth Class pupils had a parent who reported a clerical job (e.g., office clerks, secretaries; 22%), while about one-tenth had a parent who was a small business owner (11%). These figures are in line with the corresponding international averages (23% and 11%, respectively). Slightly fewer skilled workers (e.g., farmers, forestry workers) were found in Ireland (9%) than on average across TIMSS countries (12%). Small percentages of Fourth Class pupils' parents' described themselves as general workers (e.g., domestic helpers and cleaners, construction workers; 3%) or as having never worked for pay (1%), which are slightly lower than the corresponding TIMSS averages of 5% and 4%, respectively.

8 Examples of specific jobs were provided (e.g., small business owner, Garda, builder, carpenter, senior government official, architect, engineer, scientist, artist, writer, agricultural worker, machine operator, caretaker, porter, and so on) to assist respondents in identifying the most appropriate category.

9 Where both parents were employed, the highest occupation level reported by either parent was taken for this table.

Table 3.3: Percentage of pupils, by parents' highest occupation level (Fourth grade)

	Professional	Small business owner	Clerical	Skilled worker	General worker	Never worked for pay	Not applicable
Australia	58	13	16	7	2	1	3
Finland	53	12	23	8	2	<1	2
Hong Kong SAR	42	11	27	7	7	2	5
Ireland	**50**	**11**	**22**	**9**	**3**	**1**	**4**
New Zealand	59	13	14	9	2	<1	2
Northern Ireland	54	8	21	8	3	1	5
Rep. of Korea	44	15	24	12	1	1	3
Russian Fed.	43	7	32	12	2	1	3
Singapore	65	9	16	3	1	1	4
Slovenia	45	10	28	11	2	<1	4
TIMSS	40	11	23	12	5	4	5

The Home Questionnaire was not administered in England or the United States.
'Highest occupation level' indicates that at least one parent reported this category.
Percentages may not sum to 100 due to rounding.

Home language

The language that the TIMSS tests and questionnaires were administered in varied by country. For example, the language of the test was French in France, and could be either French or English in Canada. In Ireland, the TIMSS test was available in either English or Irish, and students were asked about the extent to which they spoke "English or Irish" at home. There were considerable differences between countries in the extent to which students reported speaking the language in which they were tested at home.

Fourth Class

In Ireland, 77% of Fourth Class pupils reported that they *always* spoke English or Irish at home, compared to 66% of pupils always speaking the local test language at home internationally (Table 3.4). About one in ten Fourth Class pupils (11%) indicated that they *almost always* spoke English or Irish at home, with an additional 10% reporting they did so *sometimes* (compared to 13% and 17% speaking the local language, internationally).

Among our comparison countries, the highest percentages of pupils who *always* spoke the language of the test at home were found in Northern Ireland (84%), the Russian Federation (81%), and the Republic of Korea (80%). By contrast, large multilingual populations were found in Singapore and Hong Kong where, respectively, only 28% and 58% of pupils reported that they *always* spoke the test language at home.

Beyond our comparison countries, the highest percentages *always* speaking the test language at home were found in Japan (91%), Hungary (84%), and Chile (81%). The highest percentages of pupils *never* speaking the test language at home were reported in Kuwait (37%), Morocco (29%), Iran (17%), Indonesia (14%), and Oman (13%).

Table 3.4: Percentage of pupils who speak the language of the test at home, pupil report (Fourth grade)				
	Always	Almost always	Sometimes	Never
Australia	73	12	14	1
England	72	11	16	2
Finland	72	17	10	1
Hong Kong SAR	58	13	28	1
Ireland	**77**	**11**	**10**	**2**
New Zealand	69	15	14	2
Northern Ireland	84	8	7	1
Rep. of Korea	80	12	8	<1
Russian Fed.	81	9	8	1
Singapore	28	20	48	4
Slovenia	72	14	11	3
United States	67	12	19	2
TIMSS	66	13	17	4

Percentages may not sum to 100 due to rounding.

These pupil reports can be compared against parents' reports of the frequency with which the test language is spoken at home (Table 3.5).[10] In most countries, a considerably higher proportion of parents than pupils reported that the participating child *always* spoke the language of the test at home, and relatively fewer reported that they *sometimes* did so (compare Table 3.4 and Table 3.5). For example, in Ireland, 91% of parents report that their child *always* speaks the test language at home, compared to 77% of pupils reporting the same.[11]

Among our comparison countries, and in Ireland, almost all parents reported that their child *always* speaks the test language (ranging from 85%-99%). The sole exception was in Singapore, where only 43% of pupils were reported to speak English so frequently.

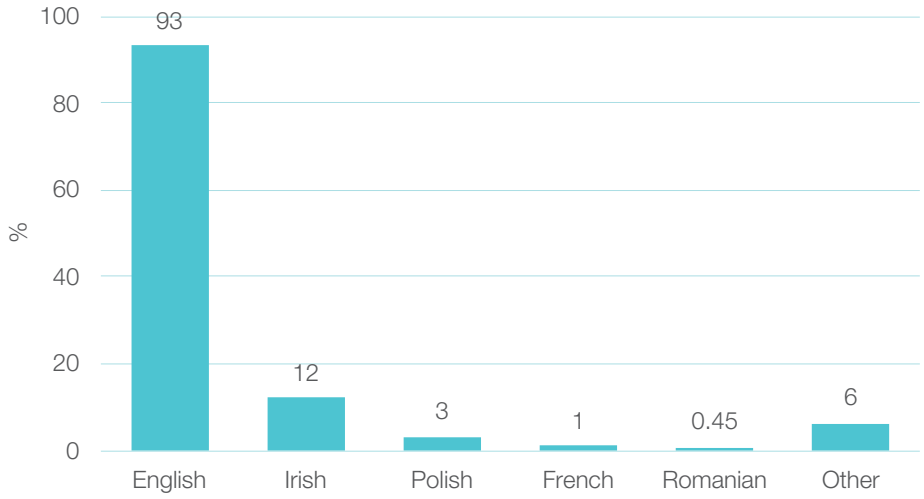
Table 3.5: Percentage of pupils who speak the language of the test at home, parent report (Fourth grade)				
	Always	Almost always	Sometimes	Never
Australia	88	8	4	<1
Finland	90	6	3	<1
Hong Kong SAR	85	7	8	1
Ireland	**91**	**5**	**4**	**<1**
New Zealand	88	7	5	<1
Northern Ireland	94	3	3	<1
Rep. of Korea	99	1	<1	<1
Russian Fed.	93	4	3	<1
Singapore	43	30	25	2
Slovenia	91	6	3	<1
TIMSS	78	9	10	3

The Home Questionnaire was not administered in England or the United States.
Percentages may not sum to 100 due to rounding.

10 Note that, in Ireland, pupils were asked how frequently they spoke "English or Irish" at home, while parents were asked how frequently they spoke "English" for this question. However, parents were also asked additional questions about their use of English, Irish, and other languages with their child, as discussed next.
11 See also Table E3.1 in the accompanying e-appendix (www.erc.ie/timss).

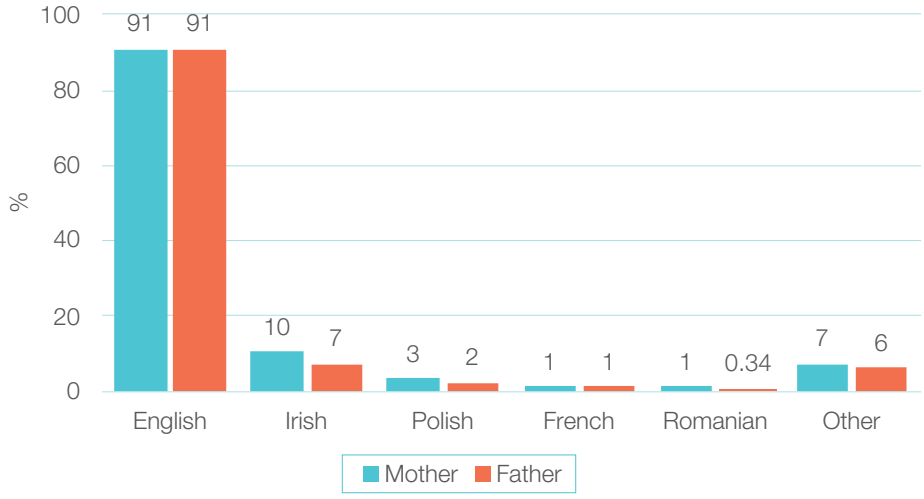
Additionally, parents of Fourth Class pupils were presented with a short list of specified languages and asked to indicate which language(s) their child spoke before beginning First Class (i.e., before the first grade of primary education). The results for Ireland are presented in Figure 3.1. In Ireland, the vast majority of pupils (93%) spoke English before starting First Class, while just over one-in-ten pupils (12%) spoke Irish. Following that, Polish was the most commonly spoken language (3%). An additional 6% of pupils spoke a language other than those listed.

Figure 3.1: Percentage of pupils who spoke various languages before beginning First Class, parent report (Fourth Class)



Based on the same list, parents were asked to indicate which language(s) they spoke at home when talking to their child (Figure 3.2). English was the language most commonly spoken by both parents (91% and 91%). One-tenth of mothers reported that they spoke Irish, while this was the case for 7% of fathers. Among the other languages, parents most commonly spoke Polish (3% of mothers; 2% of fathers).

Figure 3.2: Percentage of pupils, by languages parents used in the home when speaking with their child, parent report (Fourth Class)



Second Year

Table 3.6 shows the corresponding figures for Eighth grade students. In Ireland, 82% of students indicated that they *always* spoke English or Irish at home, compared to 62% of students speaking the local test language at the international average. An additional 14% of students in Ireland reported that they *almost always* or *sometimes* spoke English or Irish at home. Four percent of Second Year students said that they *never* spoke English or Irish at home. This was (alongside Singapore) the highest percentage of students who *never* speak the test language at home among our comparison countries, and was similar to the overall TIMSS international average (5%).

Among the set of comparison countries, students in the Republic of Korea, England, the Russian Federation, Australia, and Ireland (82-89%) were the most likely to *always* speak the language of the test at home. Conversely, this was the case for relatively few students in Singapore (33%), where the TIMSS tests were administered only in English but Mandarin, Tamil, and Malay are also national languages.

Among all countries that participated in TIMSS, most students reported *always* speaking the test language at home in Japan (96%), the Republic of Korea (89%), Hungary, and Chile (both 87%). The highest percentages *never* speaking the test language were found in Kuwait, Malta, Morocco, Lebanon, and Iran (ranging from 13-33%).

Table 3.6: Percentage of students who speak the language of the test at home (Eighth grade)

	Always	Almost always	Sometimes	Never
Australia	82	11	6	1
England	85	9	4	1
Hong Kong SAR	75	9	13	3
Ireland	**82**	**7**	**7**	**4**
New Zealand	79	14	6	1
Rep. of Korea	89	11	<1	<1
Russian Fed.	83	12	5	1
Singapore	33	32	31	4
Slovenia	70	21	7	3
United States	74	17	8	1
TIMSS	62	15	19	5

Percentages may not sum to 100 due to rounding.

Chapter highlights

Parental educational attainment in Ireland was higher than the international averages. For example, 78% of parents of Fourth Class pupils in Ireland had post-secondary or university attainment, compared to 59% on average internationally. Similarly, fifty-four percent of Second Year students reported that their parents had post-secondary or university attainment, compared to 45% on average internationally.

Consistent with this, 50% of parents of Fourth Class students had professional occupations, compared to 40% internationally. The percentages of parents whose occupations were in the small business (11%) and clerical (22%) categories were similar to the international averages. The percentages of skilled (9%) and general (3%) workers, and the percentage never working for pay (1%) in Ireland were slightly lower than on average.

In Ireland, 95% of Fourth Class children always or almost always spoke the language of the test (English or Irish) at home, according to their parents. This is similar to the percentages reported across the eleven comparison countries, with the exception of Singapore (73%). At Second Year, 89% of students in Ireland reported that they always or almost always spoke the English or Irish at home. Again, this is broadly similar to the percentages reported across the comparison countries with the exception of Singapore (65%).

Chapter 4: Parents' perspectives on their child's education

Chapter 4 describes several topics representing parents' perspectives on their child's education. These include parents' expectations for their child's eventual level of educational attainment, parents' perceptions of their child's school, their own attitudes to mathematics and science more specifically, and teachers' perceptions of parental support for learning in their school.

Educational expectations *(Fourth Class)*

Parents of Fourth Class pupils reported holding higher expectations for their child's future education than parents in many of the comparison countries (Table 4.1). Most pupils in Ireland were expected to continue to third-level education (92%) up to, in most cases, an undergraduate degree or higher (80%). The latter figure is lower than in the Republic of Korea (93%) and Hong Kong (90%), but is similar to Singapore (81%) and higher than the corresponding percentages reported in Finland (60%), Northern Ireland (57%), and Slovenia (48%).

Expectations for a short-cycle tertiary qualification (e.g., a third-level diploma not to degree level) were relatively common in Ireland, at 12%, with similar expectations reported in New Zealand, Slovenia, and Singapore. One in three (34%) of Irish pupils' parents expected their child to eventually attain a postgraduate degree, compared to 13% of Australian pupils' parents and 20% in Northern Ireland. (The TIMSS international average was the same as in Ireland, at 34%.) Conversely, expectations of attaining a post-secondary, non-tertiary qualification (e.g., a Post-Leaving Certificate course or an apprenticeship) were rare in Ireland (3%) but were more common in Slovenia (26%), the Russian Federation (10%), New Zealand (10%), Finland (9%), and Australia (8%).

Finally, the parents of only 5% of Fourth Class pupils said that they expected their child's formal education to finish following secondary education, with fewer than 1% of pupils expected to leave school with a lower secondary (i.e., junior cycle) education. By comparison, 14% of pupils internationally were expected to stay in education no further than secondary education, including 31% of Finnish pupils, 28% of pupils in Northern Ireland, 14% in Slovenia, and 11% in the Russian Federation. The percentage of pupils in Northern Ireland (5%) who were expected to leave school following the completion of lower secondary education (i.e., GCSEs) was higher than in any of our other comparison countries and more than twice the TIMSS international average (2%).

Table 4.1: Percentage of pupils, by parents' expectations for child's education (Fourth grade)

	Finish postgraduate degree	Finish bachelor's or equivalent	Finish short-cycle tertiary	Finish post-secondary, non-tertiary	Finish upper secondary	Finish lower secondary
Australia	13	58	8	8	12	1
Finland	26	34	0	9	30	1
Hong Kong SAR	28	62	3	2	3	1
Ireland	**34**	**46**	**12**	**3**	**5**	**<1**
New Zealand	24	45	12	10	6	3
Northern Ireland	20	37	9	6	23	5
Rep. of Korea	34	58	6	0	1	<1
Russian Fed.	40	34	5	10	8	3
Singapore	26	55	15	2	1	1
Slovenia	22	26	13	26	14	<1
TIMSS	34	36	9	7	12	2

The Home Questionnaire was not administered in England or the United States.
Percentages may not sum to 100 due to rounding.

Parental views of their child's school *(Fourth Class)*

As part of the questionnaire, parents were presented with eight statements regarding their views of their child's school – for example, their perceptions of pastoral care, parental inclusion, and academic support.

Parents in Ireland reported largely positive attitudes towards their child's school, expressing higher levels of agreement with each of the statements than was found internationally (Table 4.2). The parents of the vast majority of Fourth Class pupils *agreed a lot* that their school provided a safe environment (90%) and that their school cared about their child's progress (84%). The equivalent international averages were considerably lower (64% and 62%, respectively).

Most parents expressed positive views regarding their school's efforts to include and inform them about their child's education. Nearly three-quarters (72%) of parents in Ireland *agreed a lot* that their child's school does a good job at including them in their child's education, compared to just over half (53%) of parents internationally. Similarly, 69% of parents *agreed a lot* that their child's school does a good job of informing them of their child's progress (TIMSS average: 58%).

Parents in Ireland also expressed high level of satisfaction with the academic support that their child's school provided, particularly with regard to mathematics (77%) and reading (82%). However, parents were somewhat less positive about the extent of schools' academic support for science. Just over half of parents (54%) *agreed a lot* that their child's school does a good job helping them to become better in science, with 12% disagreeing to some extent. This was, by some distance, the biggest reservation reported in response to these items.

Table 4.2: Percentage of pupils, by parental perceptions of their school (Fourth grade), Ireland and TIMSS average

		Agree a lot	Agree a little	Disagree a little	Disagree a lot
My child's school does a good job including me in my child's education	IRL	72	23	4	2
	TIMSS	53	37	7	2
My child's school provides a safe environment	IRL	90	9	1	1
	TIMSS	64	30	4	1
My child's school cares about my child's progress in school	IRL	84	14	2	<1
	TIMSS	62	32	5	1
My child's school does a good job informing me of his/her progress	IRL	69	24	5	1
	TIMSS	58	32	8	2
My child's school promotes high academic standards	IRL	69	26	4	1
	TIMSS	44	41	12	3
My child's school does a good job at helping him/her become better at maths	IRL	77	19	3	1
	TIMSS	56	35	8	2
My child's school does a good job at helping him/her become better at science	IRL	54	34	9	3
	TIMSS	51	38	9	2
My child's school does a good job at helping him/her become better at reading	IRL	82	15	2	<1
	TIMSS	58	33	7	2

Percentages may not sum to 100 due to rounding.

The responses to these eight statements were combined in order to create a summary indicator of parents' perception of schools' performance in these areas. The results are presented in Table 4.3. As shown, most parents in Ireland were positive about the performance of their child's school, with 80% of parents reportedly *very satisfied* and a further 18% being *satisfied.* This compares favourably to the corresponding international averages (59% and 35%, respectively). Among Ireland's comparison countries, only Northern Ireland had a comparable percentage of parents who were *very satisfied* with their child's school (81%).

At the other extreme, 2% of parents in Ireland were *less than satisfied* with the performance of their child's school, which is lower than the TIMSS average (6%). Among our comparison countries, the least positive attitudes were found among parents in the Republic of Korea and Slovenia. In the Republic of Korea, about one in six parents (17%) were *very satisfied* with the performance of their child's school and a similar proportion (16%) were *less than satisfied.* This was the case for (respectively) 27% and 9% of parents in Slovenia.

Table 4.3: Percentage of pupils and mean mathematics and science achievement, by parents' perception of school performance (Fourth grade)

	Very satisfied *(ref)*			Satisfied			Less than satisfied		
	%	Maths	Science	%	Maths	Science	%	Maths	Science
Australia	–	–	–	–	–	–	–	–	–
Finland	54	537	556	42	538	555	4	536	553
Hong Kong SAR	55	622	562	40	**611**	**554**	5	**592**	**529**
Ireland	80	550	531	18	553	533	2	–	–
New Zealand	63	514	526	32	511	529	6	**484**	510
Northern Ireland	81	584	527	16	590	540	3	581	544
Rep. of Korea	17	616	593	67	**609**	590	16	**603**	587
Russian Fed.	54	564	564	41	566	**573**	5	559	565
Singapore	58	623	595	37	**616**	590	5	**590**	**567**
Slovenia	27	527	550	64	530	554	9	521	546
TIMSS	59	506	508	35	**503**	506	6	**495**	**498**

The Home Questionnaire was not administered in England or the United States.
A dash (–) indicates that data were not available.
Percentages may not sum to 100 due to rounding.
Scores in **bold** indicate statistically significant differences from the reference group (p<.05).

In Ireland, parents' perception of school performance was not associated with pupils' achievement in mathematics or science. Fourth Class pupils whose parents were *very satisfied* with their child's school scored an average of 550 on the mathematics assessment, while those whose parents were *satisfied* achieved an average score of 553.[12] For science, those whose parents were *very satisfied* with school performance achieved an average of 531, compared to 533 among pupils whose parents were *satisfied*. These small differences were not statistically (or substantively) significant. Significant differences were found at the TIMSS international average, with lower scores associated with lower parental satisfaction.

Parents' attitudes towards mathematics and science *(Fourth Class)*

Parents in Ireland generally reported positive attitudes towards mathematics and science (Table 4.4).[13] Almost all parents (98%) agreed (*a lot* or *a little*) that mathematics, science or technology are necessary for most occupations. Similarly, agreement that science can explain how things in the world work (99%) and that engineering is necessary to design things that are safe and useful (99%) was almost universal.

More moderate attitudes were found in response to the statement 'science and technology can help solve the world's problems', with just over half of parents (55%) agreeing *a lot,* and 9% disagreeing to some extent, although these percentages were similar to the corresponding international averages. The statement that elicited least endorsement was the proposition that 'learning science is for everyone', with which 14% of parents in Ireland disagreed.

12 The percentage of pupils whose parents were *less than satisfied* in Ireland is too small to give a reliable estimate of achievement.
13 A separate report focusing on the attitudes reported by Fourth Class and Second Year students, *Students' perspectives on learning mathematics and science: Results from TIMSS 2015 in Ireland*, is forthcoming.

Table 4.4: Percentage of pupils, by parental attitudes towards mathematics and science (Fourth grade), Ireland and TIMSS average

		Agree a lot	Agree a little	Disagree a little	Disagree a lot
Most occupations need skills in math, science, or technology	IRL	80	18	2	<1
	TIMSS	65	30	5	1
Science and technology can help solve the world's problems	IRL	55	36	7	2
	TIMSS	52	39	7	2
Science explains how things in the world work.	IRL	80	19	1	<1
	TIMSS	62	33	4	1
My child needs maths to get ahead in the world	IRL	74	23	2	1
	TIMSS	61	32	7	1
Learning science is for everyone	IRL	60	27	11	3
	TIMSS	56	34	9	2
Technology makes life easier	IRL	67	28	4	1
	TIMSS	64	32	4	1
Maths is applicable to real life	IRL	73	22	4	1
	TIMSS	69	27	3	1
Engineering is necessary to design things that are safe and useful	IRL	81	18	1	<1
	TIMSS	66	30	3	1

Percentages may not sum to 100 due to rounding.

These eight items were used to calculate a composite indicator of parents' attitudes towards mathematics and science across all countries (Table 4.5). By this measure, the parents of almost all Fourth Class pupils reported *very positive* (76%) or *positive* attitudes (24%) towards science and mathematics.

Parents in Ireland reported more positive attitudes than the average parent across all TIMSS countries, and also in relation to parents in many of our comparison countries. Only Northern Ireland and Singapore had higher percentages of parents reporting *very positive attitudes* (77% and 79%, respectively). By contrast, pupils in the Republic of Korea (34%) and Slovenia (34%) were relatively unlikely to have parents with *very positive attitudes* towards mathematics and science.

Table 4.5: Percentage of pupils and mean mathematics and science achievement, by parents' attitudes towards mathematics and science (Fourth grade)

	Very positive attitude *(ref)*			Positive attitude			Less than positive attitude		
	%	Maths	Science	%	Maths	Science	%	Maths	Science
Australia	–	–	–	–	–	–	–	–	–
Finland	60	545	563	38	**527**	**545**	2	–	–
Hong Kong SAR	60	623	566	38	**606**	**545**	2	–	–
Ireland	76	555	536	24	**536**	**519**	1	–	–
New Zealand	70	520	533	28	**493**	**511**	2	–	–
Northern Ireland	77	588	533	22	**577**	**522**	1	–	–
Rep. of Korea	34	625	604	62	**602**	**584**	5	**583**	**572**
Russian Fed.	68	564	567	31	565	569	1	–	–
Singapore	79	624	597	20	**603**	**576**	1	–	–
Slovenia	34	538	561	63	**525**	**548**	3	**510**	**541**
TIMSS	66	510	512	32	**495**	**496**	2	509	**504**

The Home Questionnaire was not administered in England or the United States.
A dash (–) indicates that data were not available.
Percentages may not sum to 100 due to rounding.
Scores in **bold** indicate statistically significant differences from the reference group (p<.05).

In general, within countries, a significant positive association was observed between parents' attitudes to mathematics and science and pupil achievement. In other words, children whose parents expressed more positive attitudes towards mathematics and science tended to perform at a higher level on the TIMSS mathematics and science assessments than children whose parents reported more ambivalent attitudes. In Ireland, pupils whose parents held *very positive* attitudes scored an average of 555 in mathematics, compared to 536 among pupils whose parents reported *positive* (but more moderate) attitudes. A similar pattern was seen for science achievement in Ireland (536 vs 519), and for both domains across most of our comparison countries.

Teachers' perceptions of parental support for learning

Fourth grade teachers and the principals of the participating schools were both asked about several aspects of parents' support for their child's education.

Fourth Class

Both teachers' and principals' perspectives provided broadly similar pictures of parental involvement. In general, parental involvement was reported to be higher in Ireland than was found internationally (Table 4.6).[14] Parents' commitment to ensure that their children are ready to learn, and their support for their children's academic achievement, were both reported as being particularly high in Ireland. For example, the teachers of 56% of Fourth Class pupils, and the principals of 63%, described parents' commitment to ensure that their children are ready to learn at school as being *high* or *very high* (compared to 35%, in both cases, for the TIMSS average).

14 School principals' reports of parental involvement were generally similar to those provided by the class teachers. Therefore, for brevity, principals' responses are not shown here but they are provided in full in the accompanying e-appendix (www.erc.ie/timss).

Across all categories – also including parental involvement in school activities, parents' expectations for the children's academic achievement, and parental pressure for the school to maintain high academic standards – it was rare for the level of parental involvement to be described by teachers as *very low* (ranging from 0-2% in Ireland and 1-4% internationally).

Table 4.6: Percentage of pupils by teachers' reports of parental support for learning (Fourth grade), Ireland and TIMSS average

		Very high	High	Medium	Low	Very low
Parental involvement in school activities	IRL	15	35	35	14	2
	TIMSS	9	31	44	13	4
Parental commitment to ensure that pupils are ready to learn	IRL	13	43	37	6	2
	TIMSS	6	29	47	14	4
Parental expectations for pupil achievement	IRL	23	48	25	4	0
	TIMSS	16	47	31	5	1
Parental support for pupil achievement	IRL	15	44	36	5	0
	TIMSS	7	31	48	12	3
Parental pressure for school to maintain high academic standards	IRL	13	40	38	7	2
	TIMSS	10	33	42	12	3

Percentages may not sum to 100 due to rounding.

Second Year

In general, a similar pattern was seen at Eighth grade (Table 4.7). The teachers of Second Year students reported *high* or *very high* levels of parental support for learning more widely than teachers in many other countries. For example, 68% of students in Ireland had teachers who reported *high* or *very high* expectations for student achievement, compared to 53% at the TIMSS average. The only exception to this pattern was in relation to parental involvement in school activities, for which similar levels of involvement were reported in Ireland as internationally.

Table 4.7: Percentage of students by mathematics teachers' reports of parental support for learning (Eighth grade), Ireland and TIMSS average

		Very high	High	Medium	Low	Very low
Parental involvement in school activities	IRL	7	23	46	21	4
	TIMSS	5	23	43	21	8
Parental commitment to ensure that students are ready to learn	IRL	8	35	42	14	2
	TIMSS	4	22	45	21	7
Parental expectations for student achievement	IRL	24	43	25	8	<1
	TIMSS	14	39	35	10	3
Parental support for student achievement	IRL	9	45	37	9	0
	TIMSS	6	25	45	18	6
Parental pressure for school to maintain high academic standards	IRL	20	43	27	9	1
	TIMSS	9	28	40	16	6

Percentages may not sum to 100 due to rounding.

Chapter highlights

Parents' expectations for their child's eventual educational qualifications were higher in Ireland than internationally, on average, and higher than in many of our comparison countries. Eighty per cent of parents of Fourth Class pupils expected their child to attain an undergraduate or postgraduate degree, and another 12% expected their child to attain another third-level qualification.

Parents in Ireland reported a high degree of satisfaction with their child's school, including aspects such as the safety of the school environment, the school's care for their child, the school's level of academic support, and the school's success in involving parents and keeping them informed of their child's progress. Parents were largely satisfied that the school helps their child to improve in reading and mathematics, but were less satisfied that the school helps their child to progress in the knowledge and understanding of science. In all respects, parents in Ireland expressed greater satisfaction than in most other countries, including our comparisons countries, with the exception of Northern Ireland, where levels of parental satisfaction were similar.

Parents in Ireland also reported more positive attitudes towards mathematics and science than was found on average across all TIMSS countries, as well as in comparison to parents in many of our comparison countries. In Ireland, 76% of parents reported *very positive* attitudes to mathematics and science . This was higher than in all of the comparison countries except Northern Ireland (77%) and Singapore (79%).

Finally, teachers and school principals reported that parental support for their child's learning was high in Ireland and this was generally higher than on average across TIMSS countries. Parents' commitment to ensuring that their children are ready to learn, and parental support for their child's academic achievement, were both particularly high in Ireland, at both grade levels (Fourth Class and Second Year).

Chapter 5: Educational resources and technology at home

This chapter describes students' access to educationally-relevant resources at home. These include the number of books (and children's books), other educational resources (such as an internet connection), and the availability of various forms of digital devices, including mobile phones and TVs in the bedroom.

Books in the home

Parents, and students at both grade levels, were asked to describe the number of books available at home.

Fourth Class

According to parent reports, pupils in Ireland had a greater number of books in their home than the average Fourth grade pupil internationally.[15] For example, 37% of pupils in Ireland had more than 100 books in their home, compared to 28% across all TIMSS countries (Table 5.1). Conversely, 13% of pupils in Ireland had 10 books or fewer in their home, while this was the case for 21% of their international peers.

Findings for Northern Ireland were very similar, with 36% of pupils having access to over 100 books in their home and 13% having 10 books or fewer. Elsewhere, there were comparatively high percentages of pupils with 10 or fewer books at home in some high-performing countries such as Hong Kong (24%) and Singapore (20%). On the other hand, half of pupils in Australia (50%) had over 100 books in their home, as did 46% of pupils in New Zealand and 45% in the Republic of Korea.

Table 5.1: Percentage of pupils, by numbers of books in the home, parents' reports (Fourth grade)

	0-10	11-25	26-100	101-200	200+
Australia	6	11	33	21	29
Finland	8	13	37	19	23
Hong Kong SAR	24	22	31	11	12
Ireland	**13**	**15**	**34**	**17**	**20**
New Zealand	9	12	33	19	27
Northern Ireland	13	18	33	16	20
Rep. of Korea	11	13	32	15	30
Russian Fed.	11	21	38	14	16
Singapore	20	21	36	11	12
Slovenia	8	18	41	17	16
TIMSS	21	20	30	13	16

The Home Questionnaire was not administered in England or the United States.
Percentages may not sum to 100 due to rounding.

15 'Books in the home' specifically refers to hardcopy books, but not ebooks, magazines, newspapers, or children's books. Children's books were the focus of a separate question, reported in Table 5.2.

Parents were also asked about the number of *children's* books within their home (Table 5.2). Generally, pupils in Ireland had more children's books in their home than pupils in other TIMSS countries. Just over a quarter (27%) of pupils in Ireland had 100 or more children's books at home, compared to an international average of 14%. Further, relative to the TIMSS average, pupils in Ireland were less likely to have 10 or fewer children's books (7% vs 22%). The Republic of Korea had the largest proportion of pupils with more than 100 children's books at home (65%),[16] while this was the lowest in the Russian Federation (11%). In Hong Kong, almost one-fifth (19%) of pupils had 10 or fewer children's books.

Table 5.2: Percentage of pupils, by numbers of children's books in the home, parents' reports (Fourth grade)

	0-10	11-25	26-50	51-100	100+
Australia	5	8	21	31	36
Finland	4	12	30	33	22
Hong Kong SAR	19	20	23	18	19
Ireland	**7**	**14**	**26**	**26**	**27**
New Zealand	5	11	22	27	34
Northern Ireland	6	13	24	29	29
Rep. of Korea	4	4	9	17	65
Russian Fed.	12	26	32	18	11
Singapore	12	19	28	22	20
Slovenia	5	19	35	29	12
TIMSS	22	21	25	18	14

The Home Questionnaire was not administered in England or the United States.
Percentages may not sum to 100 due to rounding.

TIMSS 2015 also collected information on the number of books in the home from pupils (Table 5.3). According to these self-reports, 9% of Fourth Class pupils in Ireland had 10 books or fewer. This was lower than the corresponding international average (16%). Close to two-fifths (37%) of pupils in Ireland reported having over 100 books in their home. By comparison, this was the case for 26% of pupils internationally. Among the comparison countries, pupils in the Republic of Korea were the most likely to have 200 books or more (44%), compared to 16% of pupils in Ireland.

16 However, note that while 65% of Korean pupils were reported to have 100+ *children's books* at home (Table 5.2), only 45% of Korean children were reported to have 100+ *books* at home more generally (Table 5.1). It is possible that parents in the Republic of Korea did not consider children's books in reporting the data shown in Table 5.1.

Table 5.3: Percentage of pupils, by numbers of books in the home, pupils' reports (Fourth grade)

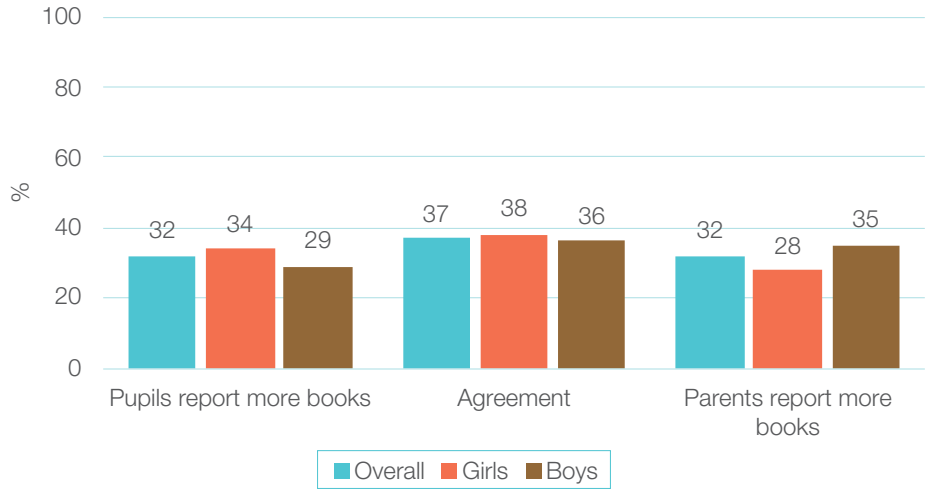
	0-10	11-25	26-100	101-200	200+
Australia	8	19	36	21	16
England	11	22	35	18	14
Finland	5	16	42	24	14
Hong Kong SAR	14	20	32	18	16
Ireland	**9**	**20**	**33**	**21**	**16**
New Zealand	11	19	33	20	17
Northern Ireland	10	23	33	20	15
Rep. of Korea	4	4	18	29	44
Russian Fed.	9	33	37	12	9
Singapore	10	21	38	18	13
Slovenia	8	25	41	15	11
United States	14	24	34	15	13
TIMSS	16	26	31	14	12

Percentages may not sum to 100 due to rounding.

A comparison of pupils' and parents' reports of the number of books at home (Figure 5.1 and Table 5.4) reveals that their reports differed somewhat from one another. Overall, only 37% of pupils had parents who were in agreement with them about the number of books in their home (Figure 5.1). The remaining two-thirds of pupils were evenly split in terms of whether the pupils had reported more books (32%) or whether the parents had reported more (32%).

However, although pupils and parents frequently provided different responses for the number of books in the home, these differences were relatively small (Table 5.4). That is, where responses differed, they tended to refer to adjacent categories in most cases (e.g., with a parent selecting *101-200 books* and their child selecting either *26-100 books* or *200+*).[17] As was the case in 2011 (Cosgrove & Creaven, 2013), girls tended to report slightly more books at home than boys (Figure 5.1 and Table 5.4).

Figure 5.1: Percentage of pupils, by pupil-parent agreement on books in the home, (Fourth Class)



17 For clarity of presentation the full table of results from this cross-tabulation are not provided here but can be found in the e-appendix (www.erc.ie/timss).

Table 5.4: Frequencies of categories of books in the home: Pupils' and parents' reports (Fourth Class)										
Overall (%)	**0-10**		**11-25**		**26-100**		**101-200**		**200+**	
Books in the home (pupil)	9		20		33		21		16	
Books in the home (parent)	13		15		34		17		20	
By gender (%)	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**
Books in the home (pupil)	8	11	21	20	33	33	22	19	17	16
Books in the home (parent)	14	13	16	15	34	34	17	17	19	21

Percentages may not sum to 100 due to rounding.

Second Year

Table 5.5 shows the figures for number of books in the home as reported by Eighth grade students.[18] Students in Ireland tended to report higher numbers of books at home than their international counterparts. For example, 34% of students in Ireland reported more than 100 books in their home, compared to 25% of students on average across TIMSS countries. Further, a smaller proportion of students in Ireland (15%) had access to 10 books or fewer in the home when compared to the international average (20%). In the comparison countries, students in the Republic of Korea were the most likely to report 200 or more books in the home (39%), followed by students in Australia (21%).

Table 5.5: Percentage of students, by numbers of books in the home (Eighth grade)					
	0-10	**11-25**	**26-100**	**101-200**	**200+**
Australia	12	19	27	21	21
England	17	23	28	17	15
Hong Kong SAR	18	26	31	13	13
Ireland	**15**	**22**	**29**	**19**	**15**
New Zealand	14	19	30	19	18
Rep. of Korea	7	7	22	25	39
Russian Fed.	7	30	39	15	9
Singapore	18	27	31	14	11
Slovenia	11	26	36	16	12
United States	17	21	29	17	16
TIMSS	20	28	26	13	12

Percentages may not sum to 100 due to rounding.

Resources for learning at home

As well as books, students at both levels were asked about other resources at home. In particular, students were asked to indicate whether they had an internet connection and their own bedroom in which they could study.

Fourth Class

In Ireland, the vast majority of Fourth Class pupils (92%) had an internet connection at home (TIMSS: 81%) while just over three-quarters (76%) had their own room (TIMSS: 65%) (Figure 5.2).

18 Note that the parents of Second Year students were not asked to complete a questionnaire, so these data reflect only students' reports.

Figure 5.2: Percentage of pupils with access to home study supports, Ireland and TIMSS average (Fourth grade)

A composite measure of Fourth grade pupils' *home resources for learning* was created based on the socioeconomic characteristics of parents, the number of books in the home, and the number of home study supports.[19] In Ireland, one-third (33%) of pupils were categorised as having *many* home resources for learning, compared to 17% of pupils internationally. An additional 65% of pupils in Ireland had *some* home resources for learning, with only 2% found to have *few resources*.

Among our comparison countries, similar percentages of pupils were found to have *many* home resources for learning in Finland (34%) and Northern Ireland (35%). The Republic of Korea had the highest percentage of pupils with *many resources* (50%). At the other extreme, this was the case for only 16% of pupils in the Russian Federation.

Both in Ireland and at the international level, there was a positive association between home resources for learning and pupil achievement in mathematics and science. For example, pupils in Ireland who had *many resources* had an average mathematics score of 587, compared to those with *some resources* whose average score was 534. At the TIMSS average, pupils who were reported to have *many resources* achieved a mean score of 569 in mathematics, while those with *some resources* achieved a mean score of 501. Both in Ireland and internationally, these differences were statistically significant.

19 This measure was calculated for all countries by the TIMSS international consortium, based on responses to the following items: the number of books in the home (pupil report), the number of children's books in the home (parent report), the number of home study supports (student report), parental occupation (parent report), and parental education (parent report).

Table 5.6: Percentage of pupils, mean mathematics and science achievement, by parents' reports of home resources for learning (Fourth grade)

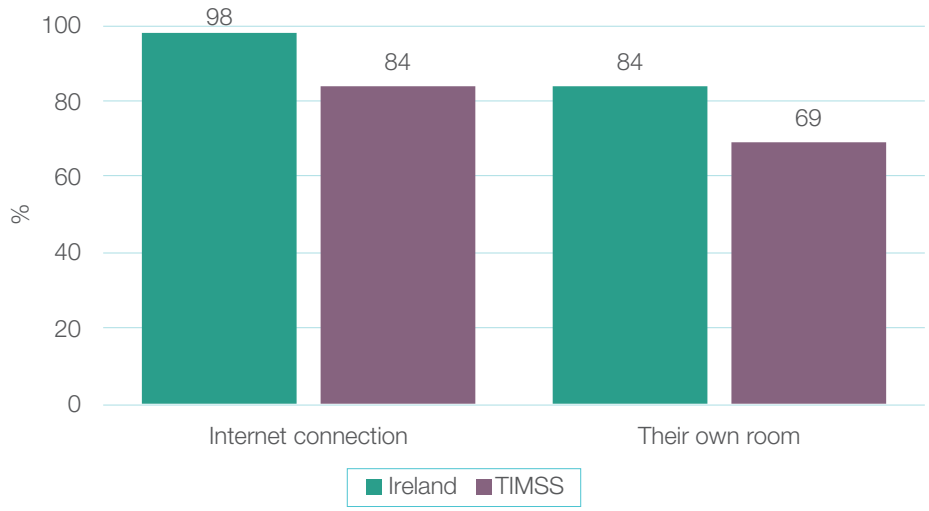
	Many resources *(ref)*			Some resources			Few resources		
	%	Maths	Science	%	Maths	Science	%	Maths	Science
Australia	–	–	–	–	–	–	–	–	–
Finland	34	563	581	66	**525**	**543**	0	–	–
Hong Kong SAR	24	655	599	69	**607**	**548**	7	**581**	**521**
Ireland	33	587	567	65	**534**	**516**	2	–	–
New Zealand	41	547	563	58	**490**	**503**	1	–	–
Northern Ireland	35	632	570	64	**564**	**511**	1	–	–
Rep. of Korea	50	635	613	49	**584**	**567**	1	–	–
Russian Fed.	16	599	606	83	**559**	**562**	2	–	–
Singapore	27	669	647	71	**605**	**576**	2	–	–
Slovenia	21	569	589	78	**519**	**544**	1	–	–
TIMSS	17	569	567	74	**501**	**503**	9	**427**	**426**

The Home Questionnaire was not administered in England or the United States.
A dash (–) indicates that data were not available.
Percentages may not sum to 100 due to rounding.
Scores in **bold** indicate statistically significant differences from the reference group (p<.05).

Second Year

Eighth grade students were asked similar questions. Almost all Second Year students (98%) reported an internet connection at home, and 84% of students in Ireland reported having their own bedroom. In both cases, these figures were higher than the corresponding international averages (84% and 69%, respectively).

Figure 5.3: Percentage of students with access to home study supports, Ireland and TIMSS average (Eighth grade)



A composite measure of home educational resources was also constructed for Eighth grade students (Table 5.7). This measure was created based on student responses regarding parental education levels, the number of books in the home, and the number of home study supports (e.g., internet connection; students having their own bedroom).[20]

In Ireland, one-fifth (20%) of students were found to have *many* home educational resources. Most of the remaining students in Ireland (74%) had *some resources*. However, 6% of students had *few* home educational resources. The corresponding international averages were 13%, 72%, and 15%, respectively. Therefore, a greater proportion of students in Ireland reported *many* home educational resources, and relatively fewer reported *few* resources.

Several of Ireland's comparison countries had a similar percentage of students with *many resources,* including Australia (23%), the United States (22%), England (19%), and New Zealand (19%). Students in the Republic of Korea were the most likely to have *many resources* (37%). However, countries such as Slovenia (12%), the Russian Federation (12%), and Hong Kong (12%) were just below the international average in this regard. In Hong Kong, 15% of students were found to have *few resources*, the highest percentage among the comparison countries.

Table 5.7: Percentage of students, mean mathematics and science achievement, by students' reports of home educational resources (Eighth grade)

	Many resources *(ref)*			Some resources			Few resources		
	%	Maths	Science	%	Maths	Science	%	Maths	Science
Australia	23	548	562	73	**497**	**503**	4	**439**	**429**
England	19	584	606	76	**507**	**525**	5	**462**	**470**
Hong Kong SAR	12	634	584	74	**595**	**546**	15	**560**	**513**
Ireland	20	567	580	74	**518**	**523**	6	**450**	**445**
New Zealand	19	550	575	75	**486**	**505**	6	**416**	**430**
Rep. of Korea	37	638	584	60	**589**	**541**	3	**524**	**483**
Russian Fed.	12	567	576	83	**535**	**541**	5	**512**	**509**
Singapore	12	668	654	77	**622**	**598**	11	**565**	**532**
Slovenia	14	553	595	83	**513**	**547**	3	**455**	**469**
United States	22	567	579	71	**509**	**521**	7	**469**	**476**
TIMSS	13	540	547	72	**481**	**486**	15	**431**	**432**

Percentages may not sum to 100 due to rounding.
Scores in **bold** indicate statistically significant differences from the reference group (p<.05).

This measure of home educational resources was positively associated with student achievement in mathematics and science, both in Ireland and internationally. In Ireland, students who reportedly had *many resources* achieved a mean mathematics score of 567, compared to those with *some resources* who scored, on average, 518. The small percentage of students who had *few resources* achieved an average mathematics score of 450. Similar patterns were observed for science achievement. These differences between the groups were statistically significant.

20 Note that, in contrast to Fourth grade, parental occupation is not part of the index at Eighth grade as the Home Questionnaire was not administered at this grade level.

Technology at home

The parents of Fourth Class pupils were asked about the number of 'digital information devices' (defined as 'computers, tablets, smartphones, smart TVs, and e-readers') that they have at home. Second Year students were asked similar questions.

Fourth Class

A higher level of access to digital devices was reported for Fourth Class pupils than for their peers internationally (Table 5.8). Almost two-fifths of children in Ireland (40%) were in homes with seven or more digital information devices, about twice as many as the one-fifth (19%) who had access to three or fewer devices. At the TIMSS international average, in contrast, there was little difference between the corresponding percentages at either end of the spectrum (31% and 34%, respectively). Digital information devices were reported as being more widespread in Ireland than in Hong Kong, the Republic of Korea, the Russian Federation, and Slovenia, but less widespread than in Finland.

Table 5.8: Percentage of pupils, by number of digital information devices in the home, parent reports (Fourth grade)

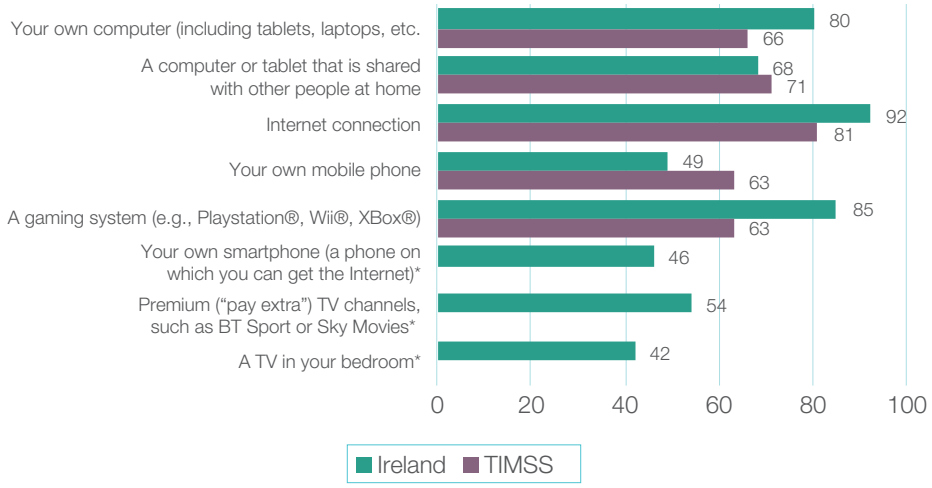
	More than 10 devices	7-10 devices	4-6 devices	1-3 devices	None
Australia	12	30	42	16	<1
Finland	17	40	36	7	<1
Hong Kong SAR	9	20	42	29	1
Ireland	**10**	**29**	**41**	**18**	**<1**
New Zealand	8	24	43	24	1
Northern Ireland	11	32	42	15	<1
Rep. of Korea	2	17	49	31	<1
Russian Fed.	4	13	38	41	3
Singapore	12	26	37	24	1
Slovenia	5	22	48	24	<1
TIMSS	9	21	36	29	4

Percentages may not sum to 100 due to rounding.

A similar picture emerged from pupils' own reports of their access to technology at home (Figure 5.4). A greater proportion of Fourth Class pupils reported having their own computer, an internet connection, and a gaming system (e.g., Wii) at home than the TIMSS average, with similar percentages for access to a shared computer or tablet. Relatively fewer children in Ireland reported having their own mobile phone (49% compared to 63% at the TIMSS average) or a shared computer or tablet (68% in Ireland but 71% at the TIMSS average). Each of these differences was statistically significant.

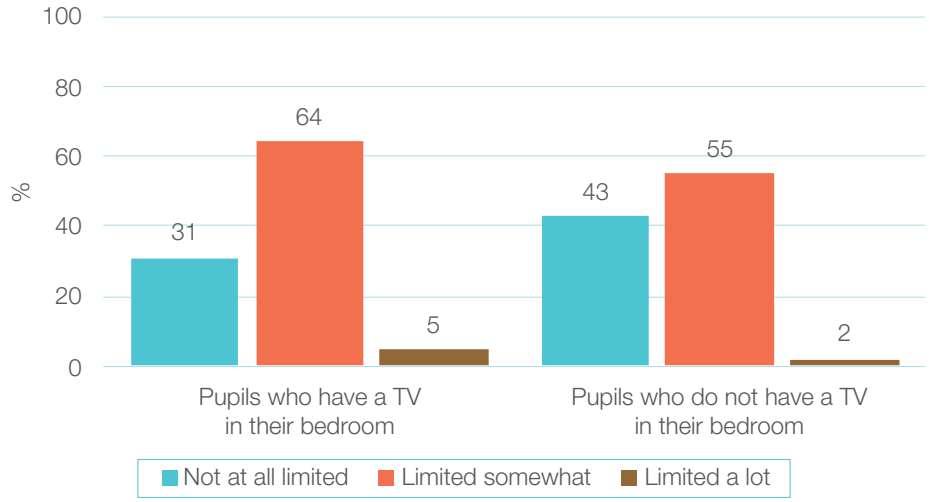
A number of additional country-specific questions were also asked in Ireland (and therefore have no comparable international average). The responses to these questions indicated that close to half of all Fourth Class pupils have their own smartphone (defined for them as 'a phone on which you can get the internet') and premium TV channels at home. In most cases, the pupils who described themselves as having a 'mobile phone' and a 'smartphone' were the same (i.e., of the 49% of pupils in Ireland who said they had a mobile phone, 87% also said they had a smartphone). This implies that the true proportion of pupils with *either a mobile phone or smartphone* is slightly more than half of all pupils.

Figure 5.4: Percentage of pupils who have various items in their home, pupil report (Fourth grade), Ireland and TIMSS average[21]



Finally, more than two-fifths (42%) of Fourth Class pupils reported having a TV in their bedroom. Given the substantial proportion of Irish teachers who report that their ability to teach is limited to some degree by pupils' coming to class tired (Clerkin et al., 2017), it is interesting to note that the issue of pupils coming to class tired appears to be more prevalent in classes where more pupils have a TV in their bedroom (Figure 5.5). The differences in the distribution of teachers' responses across the two groups (TV or no TV) were statistically significant.

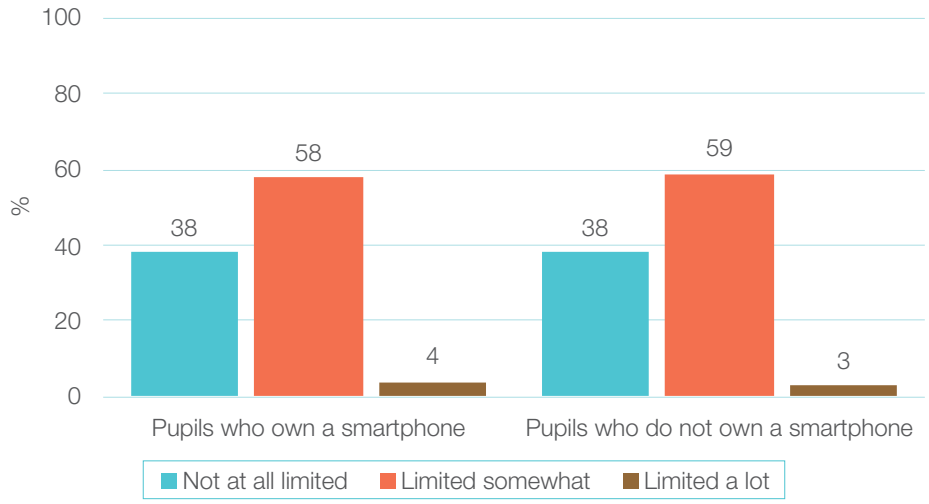
Figure 5.5: Percentage of pupils who have a TV in their bedroom, by teachers' reports of the extent to which their teaching is *limited by pupils lacking sleep* (Fourth Class)



By comparison, no such relationship with lack of sleep was observed among pupils who own their own smartphone (Figure 5.6).

21 Items marked with an asterisk were only presented to pupils in Ireland.

Figure 5.6: Percentage of pupils who own a smartphone, by teachers' reports of the extent to which their teaching is *limited by pupils lacking sleep* (Fourth Class)



Second Year

Access to digital information devices was reported to be much more common among Eighth grade students (Table 5.9) than was reported at Fourth grade. (Note, however, that the Eighth grade responses were provided by students, whereas the corresponding information at Fourth grade was provided by parents.) The extent of ownership of digital information devices in Ireland was above the international average. Most notably, few students in Ireland (3%) reported having fewer than four such devices at home, compared to 20% internationally.

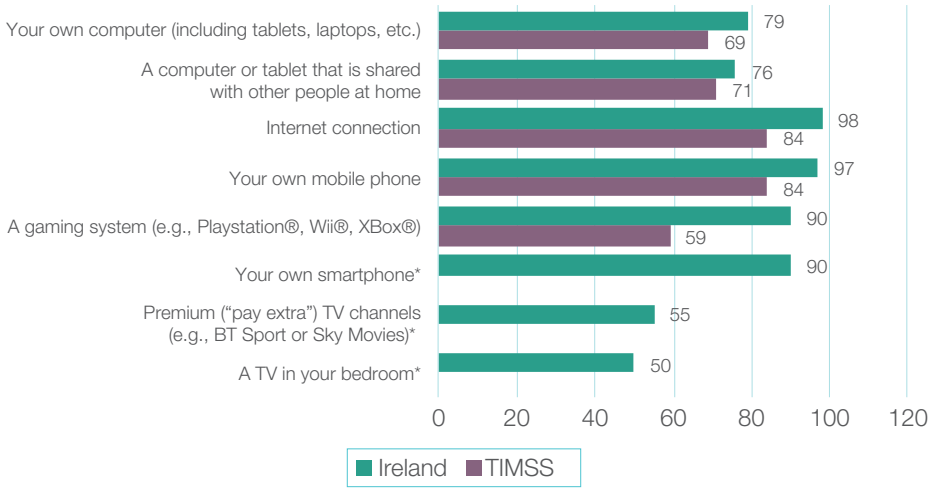
Table 5.9: Percentage of pupils, by number of number of digital information devices in the home, student reports (Eighth grade)

	More than 10 devices	7-10 devices	4-6 devices	1-3 devices	None
Australia	44	34	18	4	<1
England	52	31	15	2	<1
Hong Kong SAR	20	32	35	13	<1
Ireland	**41**	**36**	**19**	**3**	**<1**
New Zealand	33	33	27	7	<1
Rep. of Korea	8	37	43	11	<1
Russian Fed.	21	31	35	13	<1
Singapore	28	37	27	7	<1
Slovenia	32	39	25	4	<1
United States	42	31	21	5	<1
TIMSS	28	27	26	17	3

Percentages may not sum to 100 due to rounding.

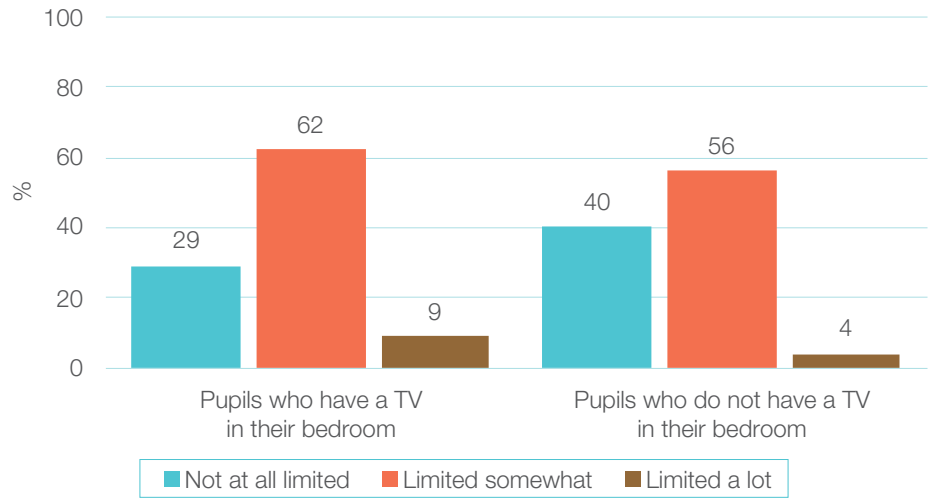
Second Year students reported significantly higher rates of ownership of various forms of technology than their peers internationally (Figure 5.7), including a computer or tablet of their own, a shared computer or tablet, an internet connection, a gaming system, and a mobile phone. Almost all students in Ireland (90%) reported having a smartphone of their own, and half (50%) had a TV in their bedroom.

Figure 5.7: Percentage of students who have various items in their home, student report (Eighth grade), Ireland and TIMSS average[22]



As at primary level, Second Year teachers were significantly more likely to report difficulties arising from students coming to school too tired to learn effectively in classes where more students had a TV in their bedroom (Figure 5.8).

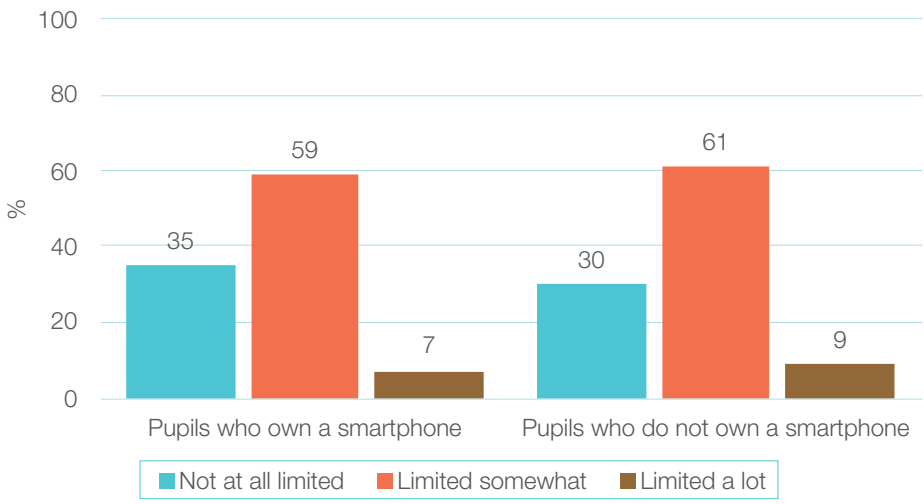
Figure 5.8: Percentage of students who have a TV in their bedroom, by teachers' reports of the extent to which their teaching is *limited by students lacking sleep* (Second Year)



Also as at primary level, such differences were less apparent in relation to smartphone ownership (Figure 5.9). There was a slight tendency for teachers to report more difficulties related to tiredness among the minority of students (see Figure 5.7) who reported not owning a smartphone. However, as the latter group represents only 10% of the Second Year population, this should be interpreted cautiously.

22 Items marked with an asterisk were only presented to students in Ireland.

Figure 5.9: Percentage of students in Ireland who own a smartphone, by teachers' reports of the extent to which their teaching is *limited by students lacking sleep* (Second Year)



Chapter highlights

Students in Ireland were more likely to have high numbers of books at home, and less likely to have very few books at home, than was reported internationally across all TIMSS countries. The reported figures were very similar in Ireland and Northern Ireland. Australia, New Zealand, and the Republic of Korea were among a small number of countries where students were reported to have access to more books at home than in Ireland. These patterns were found at both grade levels (parent reports for Fourth Class and student reports for Second Year), and both for books in general and for children's books specifically.

At both grade levels, students' access to the internet and a room of their own at home were more common in Ireland compared to the TIMSS average. A composite scale of home learning resources[23] was constructed. Students in Ireland had more access to home learning resources than was found on average internationally. More students were reported to have access to many home learning resources in some of the comparisons countries (e.g., Republic of Korea) but fewer students in others (e.g., Russian Federation, Singapore). Northern Ireland, Finland, and England were among several countries reporting similar figures to Ireland. Within countries, greater access to resources was positively associated with mathematics and science achievement.

Students in Ireland were more likely to report having many (seven or more) digital information devices (computers, tablets, smartphones, smart TVs, and e-readers) at home than the TIMSS average, and were less likely to report no or few (up to three) devices. There was substantial variation among our comparison countries on this measure. Access to specific devices was also higher than average in Ireland, at both grade levels, including access to a computer or tablet for the student's use and access to gaming systems. Almost half of Fourth Class pupils (49%) reported having their own mobile phone, as did almost all Second Year students (97%). Although these figures include simpler (non-smartphone) mobile phones, the vast majority of phones owned by students at both levels were smart devices.

23 A scale comprising books at home, internet access, a room of their own, parental education and (at Fourth grade only) parental occupation.

Chapter 6: Learning in early childhood

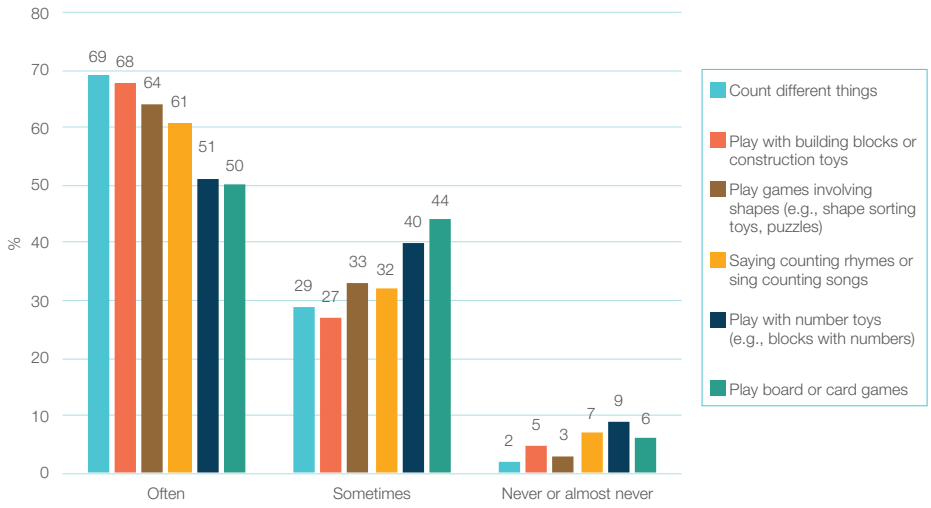
Chapter 6 presents parents' responses to a series of questions asking them to recall how frequently they engaged in various forms of early numeracy or literacy activities with their child before they entered the first grade of primary school, as well as their child's ability to demonstrate numeracy- or literacy-related skills at that age. Children's attendance at pre-primary education is also described. Note that, because the data in this chapter were asked of parents, they refer only to the primary-level participants in the study.

Early literacy and numeracy learning activities *(Fourth Class)*

Parents were asked first about the nature and extent of informal early learning activities in the home. This refers to types of play or parent-child interactions taking place before the child began school (First Class)[24] that would be expected to support the development of literacy- and numeracy-related knowledge and skills in early childhood.

Figure 6.1 shows the frequency with which Fourth Class pupils engaged in various types of *numeracy* activities (or numeracy play) before beginning primary school. Counting objects was the most common activity that pupils in Ireland engaged in *often* (69%), followed by play involving building blocks or construction toys (68%). Only 2% of pupils were reported to *never or almost never* count objects at home. About half of pupils played with number toys (51%) and played board games (50%) *often*, while this was *(almost) never* the case for 9% and 6% of pupils, respectively. These figures are very similar to those reported for children who participated in TIMSS in Ireland in 2011 (Clerkin & Gilligan, 2018).

Figure 6.1: Percentage of pupils, by parental reports of their child's engagement in various types of early numeracy activities before beginning primary school (Fourth Class)

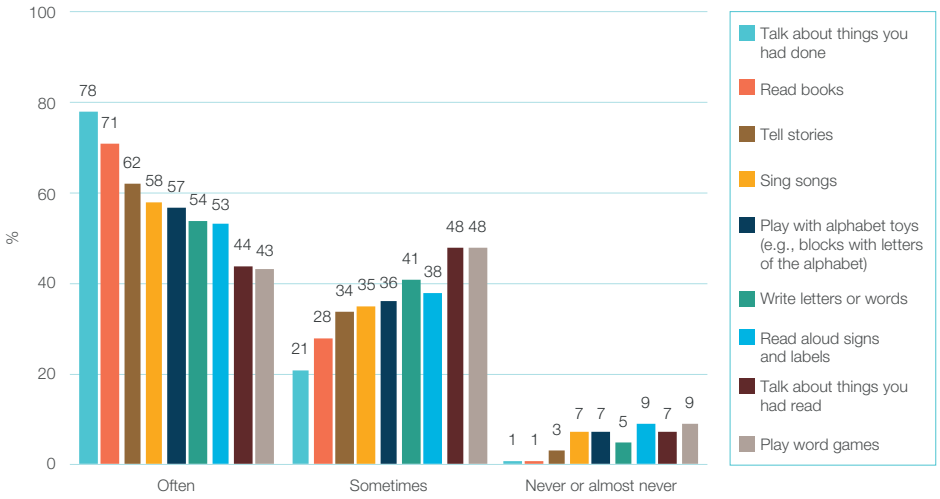


24 'First Class' was specified in Ireland in order to maintain international comparisons, which referred to the First grade of primary school.

Figure 6.2 presents corresponding information on early *literacy* activities that pupils were reported to have engaged in before starting school. More than half of parents reported *often* talking about things (79%), reading books (71%), telling stories (62%), singing songs (58%), playing with alphabet toys (57%), writing letters or words (54%), and reading signs or labels aloud (53%). Slightly lower proportions reported *often* talking about things they had read (44%) or playing word games (43%) with their child at a young age.

Small, but non-negligible, percentages of parents (5-9%) reported that they *never or almost never* wrote letters or words, sang songs, played with alphabet toys, talked about things they had read, read letters of signs aloud, or played word games with their children before they started school.

Figure 6.2: Percentage of pupils, by parental reports of their child's engagement in various types of early literacy activities before beginning primary school (Fourth Class)



As was found in 2011 (Clerkin & Gilligan, 2018), parents' reports of their child's engagement in early numeracy activities presented generally similar patterns for girls and boys; although statistically significant differences were observed, they tended to be small in magnitude (Table 6.1). The two exceptions were play with building blocks or construction toys and singing counting rhymes or songs. A higher proportion of girls than boys (8% vs 3%) *(almost) never* played with building blocks before starting school, according to their parents, and fewer girls *often* played with building blocks (60% vs 75%). Conversely, fewer boys (58%) than girls (65%) *often* sang counting songs or counting rhymes before starting school.

More consistency, and more substantive differences, were observed when early numeracy activities were examined by categories of students' home resources for learning (which can be viewed as a proxy indicator for socioeconomic status with particular emphasis on educationally-relevant factors).[25] For each of the activities that were specified, children in homes with fewer resources for learning engaged in early numeracy play less frequently (Table 6.1). For example, 17% of children in homes with few learning resources were described by their parents as having *(almost) never* said counting rhymes or sang counting songs before starting school. This compares to 8% of children in homes with some learning resources, and 5% of children with many learning resources

25 As described in Chapter 5, this is a composite measure constructed for all countries, comprising parental education, parental occupation, the number of books in the home, the number of children's books, the availability of an internet connection, and whether the child has a room to study in.

at home. The inverse relationship was observed among children who *often* said counting rhymes or sang counting songs (48%, 57%, and 70%, respectively).

Table 6.1: Percentage of pupils, by parental reports of their child's engagement in various types of early numeracy activities by gender and family SES (Fourth Class)

	Frequency of play	Gender		Home resources for learning		
		Girls *(ref)*	Boys	Few	Some *(ref)*	Many
Saying counting rhymes or sing counting songs	(Almost) never	6	**8**	**17**	8	**5**
	Often	65	**58**	**48**	57	**70**
Play with number toys (e.g., blocks with numbers)	(Almost) never	9	9	**17**	10	**6**
	Often	53	**50**	**31**	48	**58**
Count different things	(Almost) never	2	**2**	**13**	2	**1**
	Often	70	**68**	**51**	64	**80**
Play games involving shapes (e.g., shape sorting toys, puzzles)	(Almost) never	2	**4**	**12**	3	**1**
	Often	65	**62**	**37**	59	**74**
Play with building blocks or construction toys	(Almost) never	8	**3**	**13**	6	**3**
	Often	60	**75**	**50**	63	**77**
Play board or card games	(Almost) never	6	**6**	6	7	**3**
	Often	51	**49**	**27**	47	**57**

Percentages may not sum to 100 due to rounding.
Percentages in **bold** indicate statistically significant differences from the reference group (p<.05).

With regards to early literacy activities, parents were more likely to sing songs, to tell stories, to write letters, and to read books to (or with) their daughters than their sons (Table 6.2). For the other activities, although some significant differences were found, broadly similar patterns of engagement were reported for boys and girls.

Substantial differences were observed in engagement in early literacy activities with reference to the level of home resources for learning. For example, 91% of children in homes with *many resources for learning* were described as having *often* read books with their parents before beginning school, whereas this was the case for 26% of children in homes where *few resources for learning* were available. Conversely, a substantial minority (10%) of children who had *few resources* at home *never or almost never* read books at a young age, while this was true for only a handful of pupils in homes with *many resources.* The activities that were most common in homes with *few resources* were parents talking about things they had done (with 60% of parents *often* doing so) and singing songs (45% *often*).

Table 6.2: Percentage of pupils, by parental reports of their child's engagement in various types of early literacy activities by gender and family SES (Fourth Class)

	Frequency of play	Gender		Home resources for learning		
		Girls *(ref)*	Boys	Few	Some *(ref)*	Many
Read books	(Almost) never	1	**1**	**10**	1	**<1**
	Often	74	**68**	**26**	62	**91**
Tell stories	(Almost) never	2	**4**	**11**	4	**2**
	Often	65	**60**	**32**	56	**76**
Sing songs	(Almost) never	5	**8**	9	8	**4**
	Often	65	**53**	**45**	55	**66**
Play with alphabet toys (e.g., blocks with letters of the alphabet)	(Almost) never	7	7	**16**	8	**5**
	Often	57	56	**33**	54	**63**
Talk about things you had done	(Almost) never	1	**1**	**6**	1	**<1**
	Often	80	**77**	**60**	75	**87**
Talk about things you had read	(Almost) never	7	**8**	**15**	9	**4**
	Often	47	**42**	**22**	39	**55**
Play word games	(Almost) never	8	**10**	**12**	10	**6**
	Often	43	**42**	**26**	38	**54**
Write letters or words	(Almost) never	4	**6**	9	5	**4**
	Often	59	**49**	**34**	50	**62**
Read aloud signs	(Almost) never	8	**10**	**29**	11	**3**
	Often	55	**51**	**25**	48	**65**

Percentages may not sum to 100 due to rounding.
Percentages in **bold** indicate statistically significant differences from the reference group (p<.05).

Finally, the responses for all of the specified activities were combined and used to calculate an overall index of the frequency with which parents and children engaged in early learning (literacy and numeracy) activities before the child started school. The percentage of pupils in Ireland (62%) who *often* engaged in literacy and numeracy activities before beginning primary school was somewhat lower than in Northern Ireland and the Russian Federation (68% and 70%, respectively) but considerably higher than in Hong Kong (21%), Finland (29%), Singapore (35%), the Republic of Korea (48%) and on average across TIMSS countries (43%).

Both at the international average and within most countries, greater engagement in early learning activities at a young age was significantly positively associated with mathematics and science achievement in Fourth grade (Table 6.3). In Ireland, pupils whose parents reported *often* (on average) engaging in literacy and numeracy activities before their child started school achieved a mean mathematics score of 560, compared to 535 among the pupils whose parents *sometimes* engaged in these activities. The corresponding figures for science were 541 and 516, respectively. Similarly, on average across TIMSS countries, pupils who *often* engaged in early literacy and numeracy activities had significantly higher mean mathematics and science scores than those who *sometimes* or *never or almost never* engaged in these activities.

Table 6.3: Percentage of pupils and mean mathematics and science achievement, by literacy and numeracy activities before beginning primary school (Fourth grade)

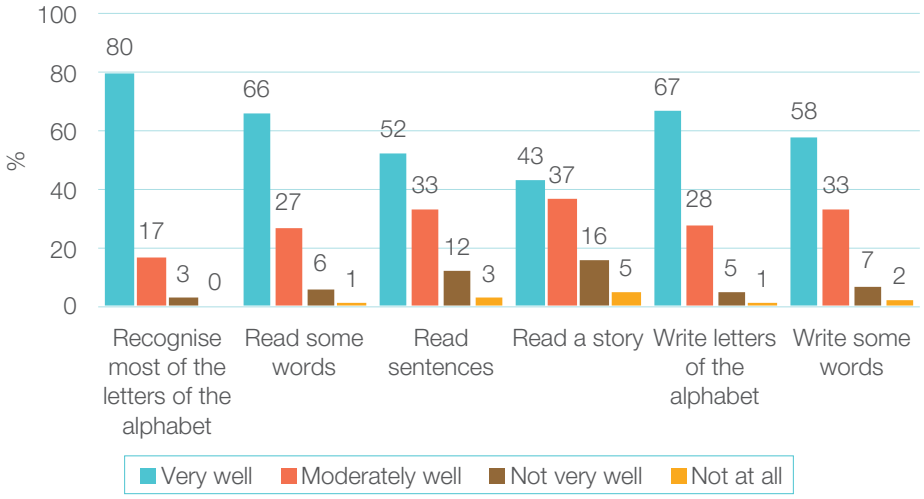
	Often *(ref)*			Sometimes			Never or almost never		
	%	Maths	Science	%	Maths	Science	%	Maths	Science
Australia	–	–	–	–	–	–	–	–	–
Finland	29	547	567	69	**533**	**551**	1	–	–
Hong Kong SAR	21	638	582	75	**612**	**552**	5	**587**	**533**
Ireland	62	560	541	38	**535**	**516**	1	–	–
New Zealand	61	525	539	38	**492**	**507**	1	–	–
Northern Ireland	68	592	537	31	**571**	**514**	0	–	–
Rep. of Korea	48	625	603	50	**596**	**579**	2	–	–
Russian Fed.	70	568	572	30	558	**558**	1	–	–
Singapore	35	636	611	61	**611**	**583**	4	**581**	**547**
Slovenia	56	533	557	43	524	547	1	–	–
TIMSS	43	518	521	54	**497**	**499**	3	**435**	**427**

The Home Questionnaire was not administered in England or the United States.
A dash (–) indicates that data were not available.
Percentages may not sum to 100 due to rounding.
Scores in **bold** indicate statistically significant differences from the reference group (p<.05).

Parental views on child's early literacy and numeracy ability *(Fourth Class)*

As well as the activities they engaged in at home, parents were asked to describe their child's ability to demonstrate a variety of early literacy and numeracy skills before they entered First Class. Figure 6.3 shows that most children in Ireland were described by their parents as being able to recognise most of the letters of the alphabet, write some letters, read some words, and write some words either *moderately* or *very well* before First Class. Reading sentences and reading stories posed more difficulty, but were nonetheless accomplished *moderately* or *very well* by most children. For each of these tasks, the percentage of pupils in Ireland whose parents reported that they could complete them *very well* was substantially above the TIMSS average. For example, the TIMSS average for reading a story *very well* was 16% (compared to 43% in Ireland), and for reading some words it was 33% (compared to 66% in Ireland).

Figure 6.3: Percentage of pupils, by how well pupils could do various literacy tasks before beginning First Class, parents' reports (Fourth Class)



About half of pupils were reported to be able to count by themselves, recognise written numbers, and write numbers *up to 100 or higher* before entering First Class (Figure 6.4). An additional (approximately) one-third of pupils were able to do so, in each case, *up to 20*. Substantial minorities of Fourth Class pupils (15-22%) were described by their parents as being able to count independently, and to recognise or write numbers, either *not at all* or *up to 10* before First Class.

Figure 6.4: Percentage of pupils, by how well pupils could do various numeracy tasks before beginning First Class, parents' reports (Fourth Class)

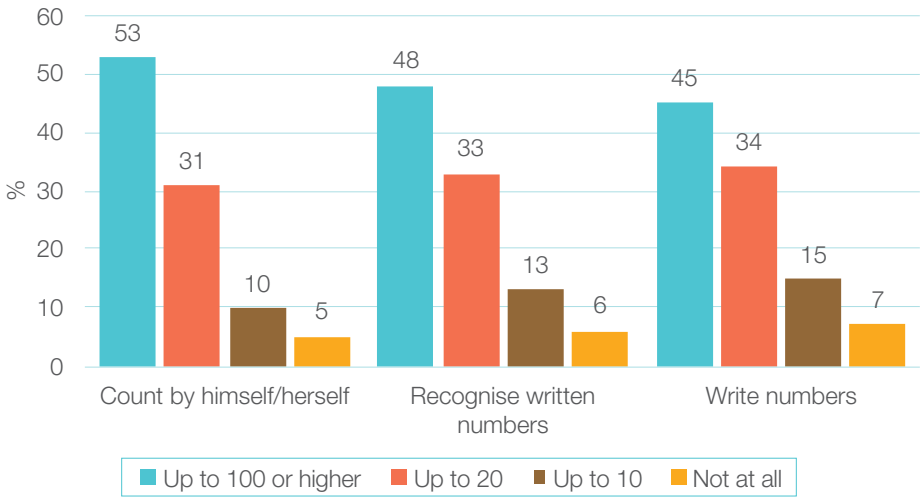
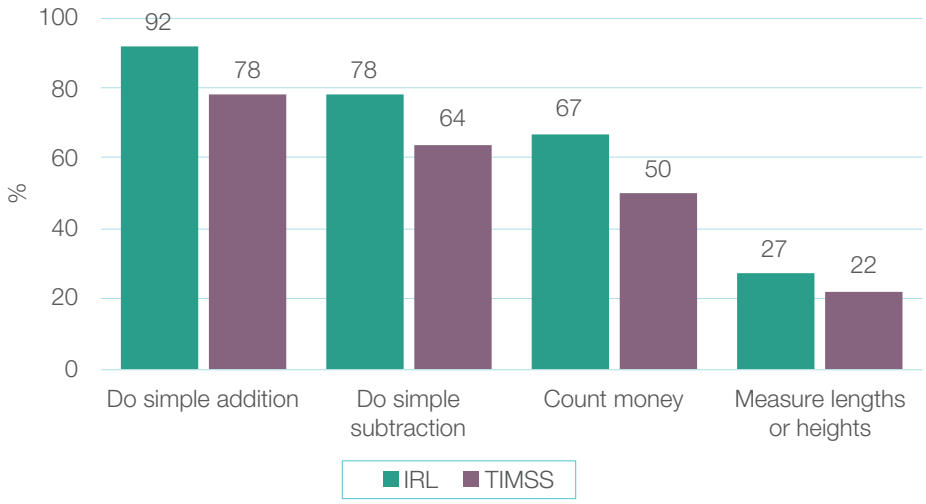


Figure 6.5 shows that, compared to their peers in other countries, pupils in Ireland were reported by their parents to demonstrate greater facility with numeracy-related tasks before entering primary school (First grade).

Figure 6.5: Percentage of pupils, by whether pupils were able to do various numeracy tasks before beginning First grade, parents' reports (Fourth grade), Ireland and TIMSS average



Parents' reports of their child's ability to demonstrate these various skills before beginning school were combined to create an overall indicator. This composite measure was strongly associated with students' achievement in Fourth grade, both at the international average and within the participating countries (Table 6.4).

In Ireland, about half of pupils (51%) were reported by their parents to be able to demonstrate the skills listed above *very well*, on average. This was one of the highest percentages reported in any TIMSS country, with only the Republic of Korea (53%) reporting a higher proportion. A slightly smaller percentage of pupils in Ireland were reported to be able to do the tasks *moderately well* (43%), while a small, but non-negligible, percentage of pupils (6%) were described by their parents as being *not well* able to do these tasks before starting school. The achievement of the latter group in Fourth Class (489 for mathematics and 477 for science) was significantly, and substantially, lower than the achievement of pupils who could *sometimes* do the activities before school (530 and 515). Both groups also achieved substantially lower scores than pupils who were reported to do the various tasks *very well* before they started school (575 and 552).

Table 6.4: Percentage of pupils and mean mathematics and science achievement, by how well pupils could do literacy and numeracy tasks upon entering primary school, parents' reports (Fourth grade)

	Often *(ref)*			Sometimes			Never or almost never		
	%	Maths	Science	%	Maths	Science	%	Maths	Science
Australia	–	–	–	–	–	–	–	–	–
Finland	22	581	589	49	**539**	**555**	29	**501**	**530**
Hong Kong SAR	33	639	582	62	**607**	**548**	5	**571**	**505**
Ireland	51	575	552	43	**530**	**515**	6	**489**	**477**
New Zealand	9	557	556	50	**521**	**532**	41	**490**	**512**
Northern Ireland	–	–	–	–	–	–	–	–	–
Rep. of Korea	53	627	606	43	**591**	**574**	3	**539**	**532**
Russian Fed.	17	601	598	59	**568**	**572**	24	**531**	**535**
Singapore	43	655	626	51	**599**	**572**	5	**521**	**495**
Slovenia	7	574	587	41	**540**	**560**	52	**514**	**541**
TIMSS	21	537	535	53	**501**	**504**	25	**470**	**476**

The Home Questionnaire was not administered in England or the United States.
A dash (–) indicates that data were not available.
Percentages may not sum to 100 due to rounding.
Scores in **bold** indicate statistically significant differences from the reference group (p<.05).

There was wide variation across countries on this measure. For example, many pupils in Slovenia (52%), New Zealand (41%), Finland (29%) and the Russian Federation (24%) were reported by their parents as being *not well* able to do the early literacy and numeracy tasks before starting school. However, in Fourth grade, Russian pupils achieved higher scores than their peers in almost all other countries on both the TIMSS mathematics and science assessments, while Slovenian and Finnish pupils performed highly on the science assessment.

Comparing subjective parental reports of this nature *across* countries should be done with caution. However, the clear pattern *within* all countries is that parents' judgement of their child's abilities before starting school are strongly related to their actual achievement in Fourth grade.

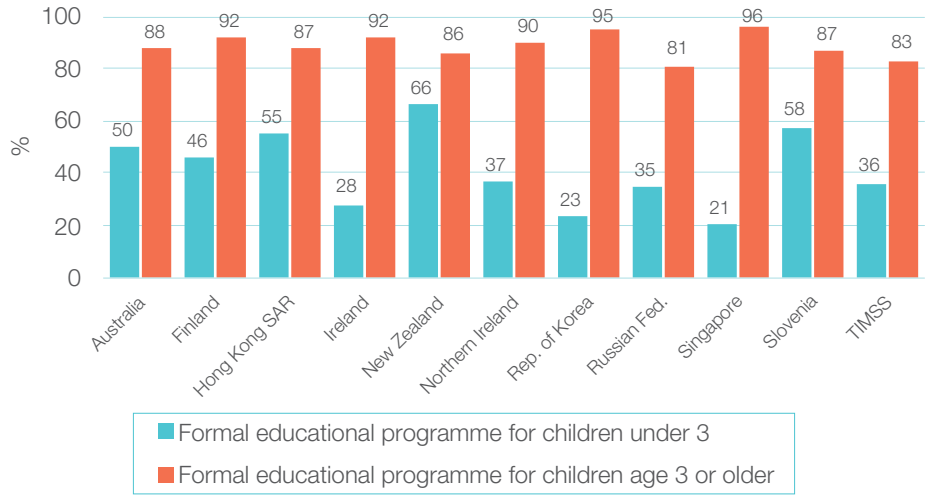
Pre-primary education *(Fourth Class)*

The parents of pupils in Fourth grade were asked about aspects of their child's educational experiences before starting primary school (i.e., First grade). These reports should be interpreted bearing in mind the caveat that, although First Class was specified in the Irish version of the TIMSS questionnaire, it is possible that some parents answered thinking of 'primary school' more generally, counting Junior Infants and Senior Infants as part of primary school. Although commonly regarded as the beginning of primary school in Ireland, the Infants classes are officially classified as pre-primary grades under internationally-comparable classification schemes. Eivers and Chubb (2017) discuss this issue further in the context of differences between the Irish education system and those in our comparison countries.

This caveat is particularly important to bear in mind with regard to the data on pupils' attendance at pre-primary or early childhood educational programmes before beginning primary school (Figure 6.6). In Ireland, 28% of pupils were reported by their parents to have attended a formal early childhood education programme aimed at children younger than 3 years old (Figure 6.6). This was substantially lower than the corresponding figure in New Zealand (66%), Slovenia (58%), Hong Kong

(55%), Australia (50%), and Finland (46%), and lower than the 36% of pupils internationally. By contrast, the vast majority of Irish pupils (92%) were reported to have attended a formal educational programme for children aged 3 or older, such as those available as part of the ECCE scheme. This was higher than in many of our comparison countries, and the TIMSS average (83%).

Figure 6.6: Percentage of pupils who attended formal educational programmes for children under 3, and children age 3 or older, parent reports (Fourth grade)



Chapter highlights

As the Home questionnaire was administered to parents of Fourth Class pupils, but not of Second Year students, the following summary refers only to Fourth Class.

Parents in Ireland reported that their children engaged in early literacy and numeracy activities (or early literacy and numeracy play) more regularly than their peers in many other countries – 62% often doing so in Ireland, compared to 43% at the TIMSS average. This includes activities such as (for literacy) reading books, singing songs, telling stories, talking about things in daily life, or playing with alphabet toys; and (for numeracy) counting objects, singing counting songs, playing with shapes, or playing with blocks. Early learning activities were reported to be more frequent in homes with more learning resources. Greater frequency of early literacy and numeracy play before starting school was positively associated with mathematics and science achievement in Fourth Class.

When asked to estimate how well their child could demonstrate a variety of specified literacy- and numeracy-related skills before First Class (First grade), many parents of Fourth Class pupils estimated high levels of skill when their children were younger. This included skills such as recognising letters of the alphabet, writing letters of the alphabet, reading some words, counting by themselves, writing numbers, and doing simple addition and subtraction.

On a combined index of these pre-school skills, Fourth Class pupils were rated as being more advanced in this regard than many Fourth grade pupils in other countries. In Ireland, 51% of pupils were estimated to be able to perform these skills very well and 43% moderately well before First Class, compared to 21% and 53%, respectively, at the TIMSS average. Among our comparison countries, only Republic of Korea (53%) and (to a lesser degree) Singapore (43%) reported comparable percentages who could do these early literacy and numeracy tasks very well.

Finally, a relatively high percentage of pupils in Ireland (92%) were reported to have attended a formal pre-primary educational programme for children aged three or older, compared to the international average (83%). Fewer pupils in Ireland (28%) had attended a programme aimed at children aged under three, compared to an average of 36%. However, these figures should be interpreted cautiously as, in Ireland's case, Junior and Senior Infants are classified internationally as preschool education whereas many parents could consider these as part of primary schooling, and also bearing in mind changes to the eligibility criteria for the ECCE scheme since 2015.

Chapter 7: Nutrition and sleep

Chapter 7 presents information from students and teachers on two factors that could affect students' readiness to learn in school: their diet (or hunger), and sleep (or tiredness).

Fourth Class

First, all Fourth grade pupils were asked how often they eat breakfast on school days (Table 7.1). Eating breakfast before school was common for pupils in Ireland, with 83% indicating that they do so *every day*. This is higher than the 67% of pupils who do so internationally. A small percentage of pupils in Ireland (3%) *never or almost never* had breakfast during the week (TIMSS: 8%).

Pupils in Ireland were more likely to eat breakfast on every school day than their peers in any of our comparison countries. In England, three-quarters of pupils ate breakfast every day before school, with an additional 21% having breakfast *most days* or *sometimes.* Likewise, in Northern Ireland, almost three-quarters of Fourth grade pupils reported that they had breakfast *every day*, while a small proportion reported *never or almost never* doing so (5%). Eating breakfast *every day* was less common among pupils in the United States (53%) and Singapore (54%), while Slovenia had the lowest proportion of pupils in this regard (48%). In these three countries, a substantial minority of pupils reported *never or almost never* having breakfast on a school day (13-19%).

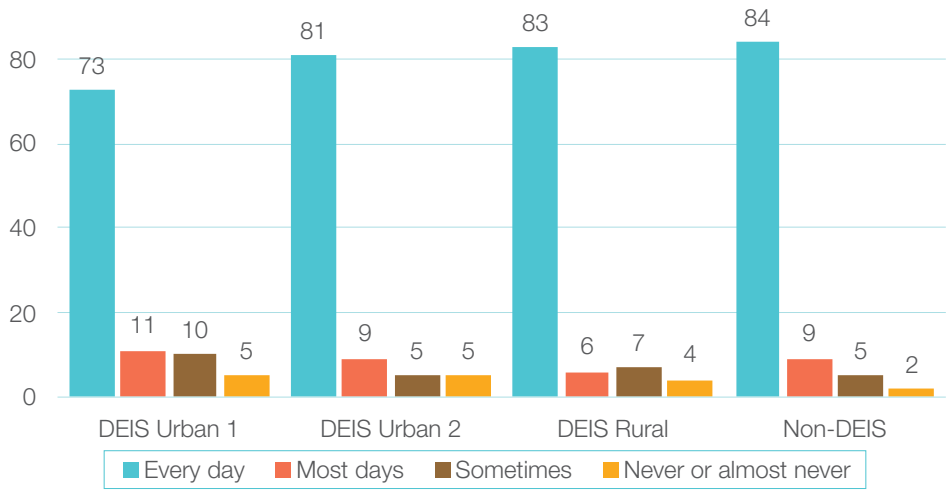
Table 7.1: Percentage of pupils, by how often breakfast is consumed on school days (Fourth grade)

	Every day	Most days	Sometimes	Never or almost never
Australia	70	16	10	4
England	75	12	9	4
Finland	73	17	8	3
Hong Kong SAR	73	11	9	8
Ireland	**83**	**9**	**5**	**3**
New Zealand	71	14	11	4
Northern Ireland	72	13	10	5
Rep. of Korea	62	18	12	8
Russian Fed.	69	15	12	5
Singapore	54	12	19	16
Slovenia	48	12	21	19
United States	53	17	18	13
TIMSS	67	11	14	8

Percentages may not sum to 100 due to rounding.

Although most pupils in Ireland reported having breakfast every day before school, there was some variation in this by schools' DEIS status (Figure 7.1). In particular, pupils attending schools with the highest concentration of educational disadvantage (DEIS Urban 1) were the least likely to report that they have breakfast *every day* (73%), while those in schools which were not in receipt of the school support programme under DEIS ('non-DEIS' schools) were the most likely to do so (84%). Pupils in non-DEIS schools were also the least likely to report that they *never or almost never* eat a breakfast before school (2%).

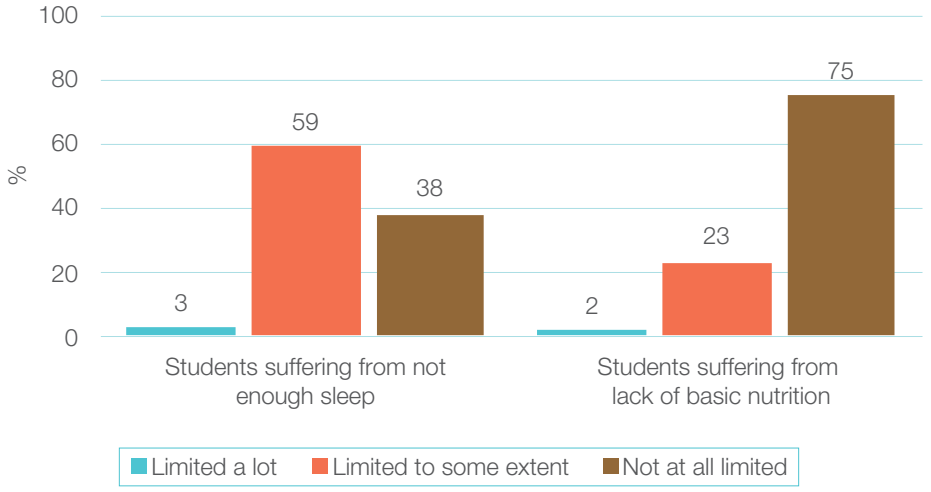
Figure 7.1: Percentage of pupils, by how often breakfast is consumed on school days, by schools' DEIS status (Fourth Class)



Poor or inadequate nutrition can present a barrier to pupils' engagement in the classroom. As well as pupils' own reports of the frequency with which they tend to eat breakfast on schooldays, their teachers were asked about the extent to which pupils' hunger or poor nutrition affects their ability to teach effectively. In Ireland, one in four pupils (25%) were taught by a teacher who felt their teaching was limited (*a lot* or *to some extent*) due to pupils lacking basic nutrition (Figure 7.2). This was the case for 33% of pupils, internationally.[26]

A more commonly-reported issue was pupils arriving to class insufficiently well-rested. In Ireland, almost two-thirds (62%) of pupils were taught by a teacher who felt their ability to teach was limited (*a lot* or *to some extent*) by pupils not getting enough sleep (Figure 7.2). This was reported slightly more frequently in Ireland than in other TIMSS countries (59%).[27] Teacher reports on both of these issues were similar to those provided in 2011 (Clerkin & Creaven, 2013). (See also Chapter 5 for teachers' reports of students' lack of sleep in relation to access to TVs and smartphones.)

Figure 7.2: Percentage of pupils, by teachers' reports of issues that limit their ability to teach their class (Fourth Class)



26 The equivalent figures at the TIMSS average were: 5% *limited a lot*, 28% *limited to some extent*, 67% *not at all limited.*
27 The equivalent figures at the TIMSS average were: 9% *limited a lot*, 50% *limited to some extent*, 42% *not at all limited.*

Second Year

Eighth grade students were also asked how frequently they eat breakfast on school days (Table 7.2). Both in Ireland and internationally, Eighth grade students were less likely to consume breakfast every day than their Fourth grade counterparts. In Ireland, 62% of Second Year students ate breakfast *everyday*, with an additional 15% of students indiciating that they did so *most days* (TIMSS: 49% and 15%, respectively). Around one in ten students in Ireland (11%) reported that they *never or almost never* consume breakfast on school days. This was higher than the equivalent figure for Irish Fourth grade pupils (3%) but broadly similar to reports from Eighth grade students across all countries (13%).

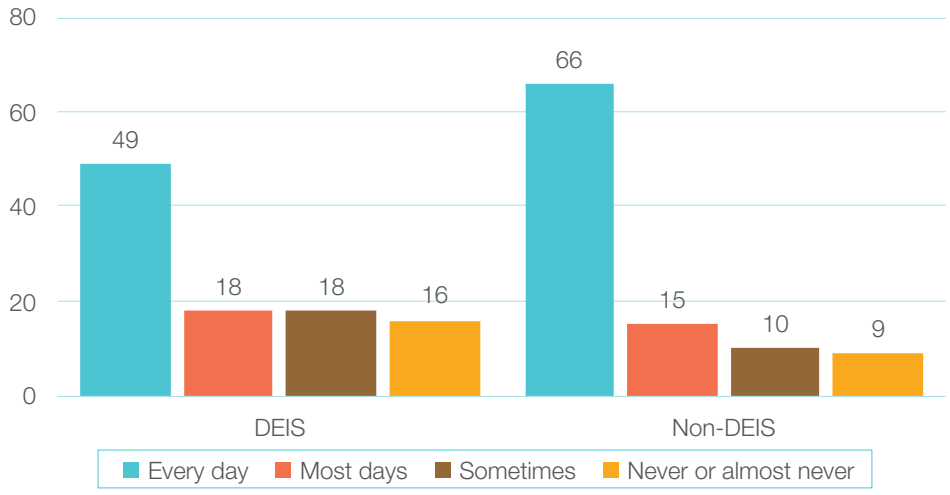
Table 7.2: Percentage of students, by how often breakfast is consumed on school days (Eighth grade)

	Every day	Most days	Sometimes	Never or almost never
Australia	54	19	15	12
England	48	17	17	18
Hong Kong SAR	53	18	18	11
Ireland	**62**	**15**	**12**	**11**
New Zealand	53	20	16	11
Rep. of Korea	52	18	16	15
Russian Fed.	54	20	17	9
Singapore	39	16	22	23
Slovenia	35	15	23	27
United States	39	19	22	21
TIMSS	49	17	22	13

Percentages may not sum to 100 due to rounding.

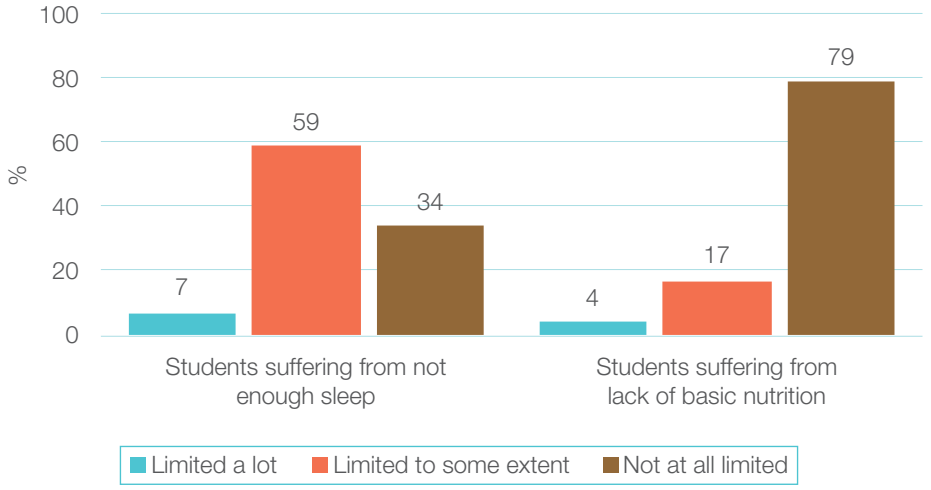
There was some variation in how often Second Year students consumed breakfast on school days when taking schools' DEIS status into consideration (Figure 7.3). For example, two-thirds (66%) of students in non-DEIS schools reported that they consume breakfast *every day*, while this was the case for around half (49%) of students in DEIS schools. Students in DEIS schools were more likely to *never or almost never* eat breakfast (16%) than those attending non-DEIS schools (9%).

Figure 7.3: Percentage of students, by how often breakfast is consumed on school days and schools' DEIS status (Second Year)



The teachers of Second Year students were also asked about the extent to which students' lack of sleep or poor nutrition affects their ability to teach effectively. Figure 7.4 shows the reports provided by mathematics teachers. In Ireland, about one-fifth (21%) of students had a mathematics teacher who felt that their ability to teach was limited (*a lot* or *to some extent*) by students lacking basic nutrition.[28] This was substantially lower than the equivalent international average (43%).[29]

Figure 7.4: Percentage of students, by mathematics teachers' reports of issues that limit their ability to teach their class (Second Year)



Second Year mathematics teachers were more likely to report that their ability to teach was limited (*a lot* or *to some extent*) by students not getting enough sleep, with two-thirds (66%) of students having a teacher who indicated that this was the case. Internationally, a similar proportion of students (69%) had a mathematics teacher whose ability to teach was affected by this issue.[30]

Chapter highlights

At both Fourth Class and Second Year, students in Ireland were more likely to report eating breakfast every day or most days before school than their peers in any or the comparison countries or at the TIMSS international average. Conversely, students in Ireland were less likely to eat breakfast only sometimes or never on a school day.

Nonetheless, almost one-in-ten Fourth Class pupils (8%) and one-quarter of Second year students (23%) ate breakfast sometimes or never before school. The corresponding figures at the international average were 22% and 35%, respectively. Both in Ireland and internationally, regular breakfast consumption was less common among post-primary students than among primary-level pupils. In Ireland, students in DEIS Urban Band 1 (primary) or DEIS (post-primary) schools were less likely to eat breakfast every day before school than students in non-DEIS schools.

28 Second Year science teachers reported that poor student nutrition limited their ability to teach as follows: 1% *limited a lot*, 22% *limited to some extent*, and 77% *not at all limited*. The corresponding international averages were: 7% *limited a lot*, 35% *limited to some extent*, and 58% *not at all limited*.

29 The international averages for Eighth grade mathematics teachers were: 8% *limited a lot*, 35% *limited to some extent*, and 57% *not at all limited*.

30 The TIMSS averages were: 13% *limited a lot*, 56% *limited to some extent*, and 31% *not at all limited*.

Although most teachers reported that inadequate nutrition among their students was not something that caused a problem for their teaching, a fifth to a quarter (the teachers of 25% of Fourth Class pupils and 21% of Second Year students) reported that a lack of basic nutrition among students limited (to some extent or a lot) their ability to teach.

In contrast, students' levels of tiredness were regarded as a bigger problem by teachers. Almost two-thirds of students at both grade levels (62% at Fourth Class; 66% at Second Year) had teachers who reported that students' tiredness in class limited their ability to teach to some extent or a lot.

Chapter 8: Homework

In this chapter, data on the time that students spend doing schoolwork at home are described by parents (at Fourth grade) and by students (at Eighth grade).

Fourth Class

According to parental reports, around half (52%) of Fourth Class pupils in Ireland do homework every day during the week (Table 8.1). An additional 47% of pupils in Ireland did homework three or four times a week (compared to 24% internationally), while very few pupils were assigned homework less than once a week (<1%) or not at all (<1%). Therefore, almost all pupils in Ireland are reported to receive homework at least three times per week.

On average across TIMSS countries, 58% of Fourth grade parents reported that their children did homework every day. This was most frequently the case for pupils in the Russian Federation, where 93% of pupils did homework every day. High percentages were also found in Hong Kong (79%), Slovenia (71%) and Northern Ireland (66%). In contrast, only around a quarter of pupils in Australia (25%) and New Zealand (22%) were reportedly assigned homework every day.

Table 8.1: Percentage of pupils, frequency of homework assigned during the week, parent report (Fourth grade)

	Every day	3 or 4 times a week	1 or 2 times a week	Less than once a week	No homework
Australia	25	42	24	5	4
Finland	59	37	3	<1	<1
Hong Kong SAR	79	9	6	2	3
Ireland	**52**	**47**	**<1**	**<1**	**<1**
New Zealand	22	40	25	6	7
Northern Ireland	66	33	1	<1	<1
Rep. of Korea	41	31	22	4	2
Russian Fed.	93	4	1	<1	2
Singapore	39	38	18	2	3
Slovenia	71	26	2	1	<1
TIMSS	58	24	11	3	4

The Home Questionnaire was not administered in England or the United States.
Percentages may not sum to 100 due to rounding.

Second Year

Second Year students were also asked how frequently their teachers assign mathematics and science homework during the week. Table 8.2 presents the results for mathematics homework. In Ireland, three-quarters (75%) of students reported that their teacher assigned homework every day, with an additional 21% indicating that this was the case three or four times a week. Very few students were given homework only once or twice a week (3%) or less than once a week (1%). With the exception of the Russian Federation, students in the other comparison countries were assigned mathematics homework less often than students in Ireland.

There were substantial differences between the comparison countries in terms of how often students were assigned mathematics homework. For example, the majority of students in the Russian

Federation (80%) and Slovenia (71%) received mathematics homework every day. In contrast, this was only the case for 2% of students in England and 5% of students in the Republic of Korea. In most countries, few students *never* received mathematics homework, with the exception of the Republic of Korea where this was the case for one in five students (20%).

Table 8.2: Percentage of students, frequency of mathematics homework assigned during the week, students' reports (Eighth grade)

	Every day	3 or 4 times a week	1 or 2 times a week	Less than once a week	Never
Australia	17	28	33	16	5
England	2	12	61	21	4
Hong Kong SAR	38	35	19	6	2
Ireland	**75**	**21**	**3**	**1**	**1**
New Zealand	10	25	32	25	8
Rep. of Korea	5	13	27	35	20
Russian Fed.	80	18	2	<1	<1
Singapore	22	52	22	4	1
Slovenia	71	23	4	2	1
United States	46	29	14	7	3
TIMSS	40	28	19	8	4

Percentages may not sum to 100 due to rounding.

In addition to receiving homework more frequently, students in Ireland generally spent more time on their mathematics homework than the average student across all TIMSS countries (Table 8.3). In Ireland, almost one-fifth (19%) of students reported that they spend *3 hours or more* on their mathematics homework during the week, compared to 15% of students across other TIMSS countries. Further, approximately half of students (49%) spent *more than 45 minutes but less than 3 hours* on their mathematics homework (TIMSS: 36%). Just under one-third (32%) of students in Ireland spent *45 minutes or less* on their mathematics homework, compared to nearly half of students internationally (49%).

In the comparison countries, students in the Russian Federation were the most likely to spend *3 hours or more* during the week working on assigned mathematics homework, with 43% indicating that this was the case. This was extremely uncommon for students in England (1%), New Zealand (4%), and the Republic of Korea (3%) (particularly given the relative infrequency with which mathematics homework is assigned; see Table 8.2 above).

In Ireland, there were no significant (or substantial) differences in mathematics achievement between those who spent *3 hours or more* (531) on their homework each week and those who spent *more than 45 minutes but less than 3 hours* (533). However, both of these groups scored higher, on average, compared to those who spent *45 minutes or less* (507) on their homework.

Table 8.3: Percentage of students and mean mathematics achievement, by weekly time students spend on assigned mathematics homework, students' reports (Eighth grade)

	3 hours or more		More than 45 minutes but less than 3 hours *(ref)*		45 minutes or less	
	%	Maths	%	Maths	%	Maths
Australia	9	530	35	527	56	**491**
England	1	–	26	539	73	**514**
Hong Kong SAR	21	596	45	604	34	582
Ireland	19	531	49	533	32	**507**
New Zealand	4	500	28	517	68	**485**
Rep. of Korea	3	604	16	600	81	607
Russian Fed.	43	532	43	543	14	543
Singapore	22	633	55	631	23	**586**
Slovenia	21	**505**	44	518	35	524
United States	18	**547**	36	530	46	**502**
TIMSS	15	**481**	36	491	49	**474**

A dash (–) indicates that data were not available.
Percentages may not sum to 100 due to rounding.
Scores in **bold** indicate statistically significant differences from the reference group (p<.05).

In contrast, Second Year students in Ireland were assigned science homework far less frequently than mathematics homework (Table 8.4). About one-fifth of Second Year students (21%) reported that their teacher assigned science homework every day (compared to 75% of students for mathematics). An additional 34% of students received science homework *3 or 4 times a week*, while 33% were given homework once or twice during the week. Just over one in ten students (12%) were given homework *less than once a week* or *never.*

Nonetheless, students in Ireland received science homework more often than students in other countries. Among the comparison countries, no other students were as likely to be assigned science homework every day of the week. Following Ireland, students in the United States were the most likely to receive science homework every day (11%). Receiving science homework was relatively uncommon for students in the Republic of Korea, with 38% of students reporting that they are assigned homework *less than once a week* and a further 41% reportedly *never* receiving science homework.

Table 8.4: Percentage of students, frequency of **science** homework assigned during the week, students' reports (Eighth grade)					
	Every day	**3 or 4 times a week**	**1 or 2 times a week**	**Less than once a week**	**Never**
Australia	5	17	36	30	12
England	2	13	47	31	9
Hong Kong SAR	5	24	50	18	3
Ireland	**21**	**34**	**33**	**8**	**4**
New Zealand	5	19	31	33	13
Rep. of Korea	1	4	16	38	41
Russian Fed.	–	–	–	–	–
Singapore	6	38	44	10	2
Slovenia	–	–	–	–	–
United States	11	23	30	24	13
TIMSS	13	25	34	19	9

A dash (–) indicates that data were not available.
Percentages may not sum to 100 due to rounding.

In general, students (both in Ireland and internationally) spent less time each week on science homework than on mathematics homework (Table 8.5). In Ireland, 5% of students spent *3 hours or more* on science homework (TIMSS: 5%). One-third of students (33%) reportedly spent *more than 45 minutes but less than 3 hours* doing science homework (TIMSS: 28%), while a further 61% spent *45 minutes or less* (TIMSS: 67%).

In Ireland, students who spent *more than 45 minutes but less than 3 hours* (539) on their science homework, on average, achieved a significantly higher score than those who spent *3 hours or more* (510). While this group also had a higher mean score than those who spent *45 minutes or less* (535), this difference was not significant. A similar pattern could be seen at the international level. Students spending *more than 45 minutes but less than 3 hours* achieved an average of 491 in science across all TIMSS countries, compared to those who spent *3 hours or more* (466) and students who spent *45 minutes or less* (485) on their homework. The differences between each of these groups was statistically significant.

Table 8.5: Percentage of students and mean science achievement, by weekly time students spend on assigned science homework, students' reports (Eighth grade)

	3 hours or more		More than 45 minutes but less than 3 hours (ref)		45 minutes or less	
	%	Science	%	Science	%	Science
Australia	3	518	24	529	73	**510**
England	1	–	26	568	72	**529**
Hong Kong SAR	4	**533**	34	549	62	546
Ireland	5	**510**	33	539	61	535
New Zealand	3	**515**	23	534	74	**510**
Rep. of Korea	1	–	8	546	91	557
Russian Fed.	–	–	–	–	–	–
Singapore	9	606	52	609	39	**579**
Slovenia	–	–	–	–	–	–
United States	4	**525**	22	540	74	**531**
TIMSS	5	**466**	28	491	67	**485**

A dash (–) indicates that data were not available.
Percentages may not sum to 100 due to rounding.
Scores in **bold** indicate statistically significant differences from the reference group (p<.05).

Chapter highlights

Almost all Fourth Class pupils were given homework at least three days per week. Half of Fourth Class pupils (52%) completed homework every (school)day. This was less than the TIMSS international average (58%) and several of the comparison countries, including the Russian Federation (93%), Hong Kong (79%), and Northern Ireland (66%), but more than in Australia (25%), Singapore (39%), or the Republic of Korea (41%).

At post-primary level, science homework was assigned to students less regularly than mathematics homework, and students reported spending less time on science homework than on mathematics. This was true both in Ireland and internationally. However, homework in both subjects was assigned more regularly to Second Year students in Ireland than to Eighth grade students in the comparison countries, with the exception (for mathematics only) of the Russian Federation.

Associations between the amount of time spent on homework and achievement in the TIMSS mathematics and science assessments were varied, with differing and inconsistent patterns observed across many countries at Eighth grade. This indicates that time spent on homework should not be regarded in itself as a reliable indicator of student achievement outcomes.

Chapter 9: Shadow education

TIMSS is a curriculum-based assessment – that is, students are tested on mathematical and scientific content with which they are expected to have some degree of familiarity through their national curricula. As well as aligning the assessment to the curricula in participating countries as much as possible, system-level policy information is also gathered from each country and published as the TIMSS Encyclopaedia (Mullis, Martin, Goh & Cotter, 2016; see also Eivers & Chubb, 2017). However, an important characteristic of education that is not captured by comparing official policy documents across countries in this manner is the extent to which students engage in formal education outside school, often known as *shadow education* or, in Ireland, as 'grinds'.

In order to gain some insight into the frequency and nature of shadow education internationally, the parents of Fourth grade pupils were asked about their child's attendance at "extra lessons or tutoring not provided by the school" related to mathematics or science in the 12 months leading up to the survey, while Eighth grade students described their own attendance at extra lessons or tutoring. In both cases, students or parents who indicated participation in shadow education were also asked to clarify the main rationale for attending extra lessons outside school – either to help the student to excel in class, or to keep up with the pace of their regular lessons.

Fourth Class

Participation in extra lessons at primary level was rare in Ireland, according to parents. Only 8% of Fourth Class pupils attended extra lessons in mathematics (Table 9.1), and only 2% of pupils attended extra lessons in science (Table 9.2). In Ireland, mathematics tutoring so that pupils could keep up in class was slightly more common than tutoring intended to help the pupil excel.

For both subject areas, the small number of pupils who did attend extra tutoring were approximately evenly-distributed between those who attended for less than 4 of the previous 12 months, those who attended for between 4 and 8 months, and those who attended for more than 8 months within the last year. Note that this refers to the span of time for which pupils attended extra lessons, but parents were not asked to indicate the duration of the lessons (or tutoring sessions) themselves.

Table 9.1: Percentage of pupils attending extra lessons/tutoring in mathematics, parents' reports (Fourth grade)

	No[a]	Yes, to excel in class	Yes, to keep up in class	Did not attend[a]	Less than 4 months	4-8 months	More than 8 months
Australia	85	6	9	84	4	5	7
Finland	88	5	7	82	11	4	3
Hong Kong	56	15	29	57	10	9	24
Ireland	**92**	**3**	**5**	**90**	**3**	**3**	**4**
New Zealand	86	5	8	85	5	4	6
N. Ireland	75	14	10	72	15	8	6
Rep. of Korea	34	28	38	34	8	11	47
Russian Fed.	85	8	8	84	6	6	4
Singapore	42	26	32	38	10	13	40
Slovenia	87	9	4	83	9	5	3
TIMSS	79	11	10	78	9	5	8

The Home Questionnaire was not administered in England or the United States.
Percentages may not sum to 100 due to rounding.
[a] Percentages for 'No' and 'Did not attend' may vary because of slight differences in missing data.

A comparison with the other countries included in Table 9.1 shows that fewer Fourth Class pupils attended extra lessons or tutoring for mathematics than Fourth grade students in any of our comparison countries. While 8% of Irish pupils engaged in some form of shadow education, the next-lowest figures were found in Finland (12%) and Slovenia (13%). At the other extreme, participation in extra lessons outside school was more common than not in the Republic of Korea (66%) and Singapore (58%), and was also common in Hong Kong (44%).

Interestingly, a substantial minority of Fourth grade pupils in Northern Ireland (25%) were reported to attend extra lessons or tutoring in mathematics – about three times higher than the figure in the Republic. However, whereas pupils in Hong Kong, Republic of Korea, and Singapore tended to attend extra tutoring for most of the year (more than 8 months), it was more common for children in Northern Ireland to receive extra tutoring in shorter spells (less than 4 months).

In many countries, *keeping up in class* was given somewhat more frequently than *to excel in class* as the reason for extra mathematics tutoring (e.g., in Australia, Finland, Hong Kong, Ireland, New Zealand, Republic of Korea, Singapore). By contrast, excelling in class was given as the main rationale more frequently in Northern Ireland and Slovenia.

As extra tutoring in science was generally much less common than tutoring for maths (compare Table 9.1 and Table 9.2), these patterns did not emerge as clearly with regard to science at primary level (Table 9.2). Notably, however, more than one-third of pupils in the Republic of Korea (34%) and Singapore (43%) did receive extra lessons in science – in most cases for the majority of the year.

Table 9.2: Percentage of pupils attending extra lessons/tutoring in science, parents' reports (Fourth grade)

	No[a]	Yes, to excel in class	Yes, to keep up in class	Did not attend[a]	Less than 4 months	4-8 months	More than 8 months
Australia	97	1	2	97	1	1	1
Finland	98	1	1	97	1	1	1
Hong Kong	89	4	7	87	4	3	6
Ireland	**98**	**1**	**1**	**97**	**1**	**1**	**1**
New Zealand	97	1	1	97	1	1	1
N. Ireland	97	2	1	97	2	1	1
Rep. of Korea	66	12	22	66	6	7	21
Russian Fed.	94	3	3	94	2	2	2
Singapore	57	19	24	52	9	11	29
Slovenia	96	3	1	95	2	2	1
TIMSS	89	6	6	89	4	3	4

The Home Questionnaire was not administered in England or the United States.
Percentages may not sum to 100 due to rounding.
[a] Percentages for 'No' and 'Did not attend' may vary because of slight differences in missing data.

Second Year

Participation in extra tutoring was more common at post-primary level. Sixteen per cent of Second Year students described themselves as attending extra lessons for mathematics, evenly split between those doing so for less than 4 months and those attending tutoring for longer (Table 9.3). The percentage of students attending extra lessons in Ireland was much lower than the TIMSS international average (44%).

As was the case at Fourth grade, fewer Eighth grade students in Ireland reported taking part in extra lessons for mathematics than in any of our comparison countries. The East Asian countries (Hong Kong, Republic of Korea, and Singapore) reported the highest rates of participation in shadow education (48-71%). Substantial percentages of students in the Russian Federation (40%) and Slovenia (38%) also reported attending extra mathematics lessons. Students in Ireland were slightly more likely to report attending extra lessons to keep up in class than to excel. On the other hand, on average across TIMSS countries, attending extra lessons in order *to excel in class* was relatively more common, and also more common compared to the reports provided by parents at Fourth grade.

Table 9.3: Percentage of students attending extra lessons/tutoring in mathematics, students' reports (Eighth grade)

	No[a]	Yes, to excel in class	Yes, to keep up in class	Did not attend[a]	Less than 4 months	4-8 months	More than 8 months
Australia	76	11	12	76	10	6	8
England	81	10	9	80	10	4	5
Hong Kong	52	15	34	52	19	11	19
Ireland	**84**	**7**	**9**	**85**	**8**	**4**	**4**
New Zealand	77	9	13	79	11	4	5
Rep. of Korea	29	42	28	30	12	12	46
Russian Fed.	60	24	16	62	21	8	9
Singapore	45	28	27	40	22	13	25
Slovenia	62	25	13	61	23	10	7
United States	75	12	13	75	16	4	5
TIMSS	56	27	17	59	20	9	12

Percentages may not sum to 100 due to rounding.
[a] Percentages for 'No' and 'Did not attend' may vary because of slight differences in missing data.

As at primary level, extra tutoring in science was generally less frequent than for mathematics at Eighth grade, although some countries did report high rates of participation. Among our comparison countries (Table 9.4), shadow education related to science was most common in Singapore (35%), the Republic of Korea (33%), Slovenia (30%), the Russian Federation (25%), Hong Kong (22%) and Australia (21%).

Attendance at extra lessons appeared to be used for different purpose in different countries, as indicated by the percentages of students reporting attendance *in order to excel* in science classes compared to those attending *in order to keep up*. In Ireland, only 6% of Second Year students reported attending extra lessons for science (with an even split between those attending extra lessons to excel in class and to keep up in class), compared to one-third of students (33%) at the TIMSS international average.

Table 9.4: Percentage of students attending extra lessons/tutoring in science, students' reports (Eighth grade)

	No[a]	Yes, to excel in class	Yes, to keep up in class	Did not attend[a]	Less than 4 months	4-8 months	More than 8 months
Australia	79	14	7	89	4	2	4
England	89	5	7	89	6	2	3
Hong Kong	78	7	15	79	10	5	6
Ireland	**95**	**3**	**3**	**95**	**2**	**1**	**2**
New Zealand	87	5	9	89	6	3	3
Rep. of Korea	67	15	18	68	11	6	15
Russian Fed.	75	13	11	75	15	4	6
Singapore	65	16	19	61	18	9	12
Slovenia	70	21	9	70	20	6	4
United States	86	7	8	86	8	2	4
TIMSS	67	19	14	71	15	7	8

Percentages may not sum to 100 due to rounding.
[a] Percentages for 'No' and 'Did not attend' may vary because of slight differences in missing data.

Chapter highlights

Few Fourth Class pupils (8%) participated in extra lessons in mathematics outside school. This was lower than the TIMSS average (21%) and was also lower than in any of the comparison countries. Particularly high rates of shadow education participation at primary level were reported in the Republic of Korea (66%), Singapore (58%), Hong Kong (44%), and Northern Ireland (25%). These figures underline the necessity to consider factors beyond the formal education system and curriculum in interpreting student achievement and learning.

Shadow education lessons (or 'grinds') were more common at post-primary level, both in Ireland and internationally. However, Second Year students still reported lower rates of participation in extra lessons than Eighth grade students in many other countries, including the comparison countries. About one-in-six (16%) Second Year students in Ireland took additional lessons in mathematics, compared to 44% on average across TIMSS countries. The corresponding figures in the comparison countries ranged from 19% (England) to 71% (Republic of Korea).

At both grade levels, participation in extra lessons in science was less common than for mathematics. Very low rates of science shadow education were reported for most countries at Fourth grade, albeit with some notable exceptions (e.g., 43% in Singapore, 34% in the Republic of Korea).

Shadow education in science was much more common at Eighth grade. Participation rates in the comparison countries ranged from 35% (Singapore) to 11% (England), with the overall TIMSS average at one-third of students (33%). Extra lessons in science were much less common among Second Year students in Ireland (5%).

In many countries, including Ireland, there was a relatively even division between student who took part in shadow education in order to keep up in class and those who took extra lessons with a view to excelling. However, this was not universal. For example, in Hong Kong, more students reported extra lessons to keep up in class while, in Slovenia, students who took additional lessons were more likely to do so to excel in class.

Chapter 10: Summary and discussion

This report has presented a variety of data on the home environments of the Fourth Class and Second Year students who took part in TIMSS 2015. Some of the main findings are summarised and highlighted in this final chapter.

Home language, education background, and educational supports

Internationally, most students reported speaking the language they were tested in at home. This was also true in Ireland, where the percentage of pupils who always or almost always spoke the test language (here, English or Irish) was higher than the TIMSS average. The percentages reported in Ireland were similar to those for several of our comparison countries (Finland, New Zealand, Northern Ireland, Slovenia). By contrast, almost all students in the Republic of Korea spoke Korean at home, but comparatively few students regularly spoke the test language in Singapore.

The parents of students in Ireland reported a higher level of educational attainment than was found at the TIMSS international average. More parents in Ireland had completed a university degree or other post-secondary qualification, while internationally parents were comparatively more likely to report finishing school at primary, lower secondary, or upper secondary levels. Educational qualifications were higher in some of our comparison countries (e.g., Australia, Russian Federation) than in Ireland but lower in others (e.g., Northern Ireland, Slovenia), although all of the comparison countries were above the international average. Parents in Ireland were also somewhat more likely to report professional occupations than was found internationally. Again, this varied among our comparison countries.

Parents in Ireland reported higher expectations for their child's educational attainment than parents in many other countries. Among our comparison countries, the percentage of pupils expected to attain an undergraduate or postgraduate degree was exceeded only in Hong Kong, the Republic of Korea, and Singapore. Substantial minorities of parents in Finland and Northern Ireland expected their children to finish their education at lower secondary or upper secondary level.

Parents' and students' reports also indicate that students in Ireland have greater access to certain educational supports at home – including books, children's books, and an internet connection – than their peers in many other countries. At both primary and post-primary levels, greater access to educational resources at home was significantly and substantially associated with higher achievement in mathematics and science.

Parents' perspectives on their child's education

An important finding is that, in general, the parents of Fourth Class pupils reported a high degree of satisfaction with many aspects of their child's education. Indeed, parental satisfaction was higher in Ireland than in any of our comparison countries except Northern Ireland, and was substantially above the TIMSS international average. Most parents in Ireland agreed that their child's school provides a safe environment, cares about their child's progress, and does a good job of including them in their child's education. This indicates a high degree of trust and respect among parents for

the work being done by teachers, principals, and other school staff. It is noteworthy that the high regard appears to be mutual, given that teachers in Ireland (at both grade levels) also reported a higher level of parental support for children's learning than was reported by teachers internationally. Parents also widely viewed Irish schools as doing a good job at helping pupils to improve in reading and in mathematics.

However, there was less support for the proposition that schools are helping Fourth Class pupils to improve in science. Fewer parents endorsed this statement, and more parents disagreed with it, than with any other aspect of their views on their child's school. This relative reticence is interesting given that it accompanies quite positive attitudes among parents towards science and mathematics more generally (see below). The low level of disagreement when asked about their satisfaction with science (with, instead, a relatively high proportion of 'middling' responses) indicates that parents are not necessarily especially critical of their child's school's approach to teaching science. Rather, it seems that parents simply have less strongly-held opinions on their child's progress in science, compared to progress in reading or mathematics.

There are a number of possible interpretations of this finding. It may suggest that schools in Ireland provide less information to parents about their child's progress in science. Currently, primary schools are mandated to administer standardised tests in reading and mathematics to pupils at the end of Second Class, Fourth Class, and Sixth Class, although in practice most schools administer tests at all levels from First Class to Sixth Class. This means that most pupils participate in standardised testing in reading and mathematics at least annually and that the results of these tests are sent to parents. This is less likely to be true of science, given that science tests are not mandated. Alternatively, or in addition, it may be that parents tend to pay less attention to information given to them about progress in science compared to reading and mathematics, if the latter two are seen as more 'core' subjects or as being assessed more reliably – again, possibly related to familiarity with standardised test results. A third possibility is that some parents feel that their child could make more progress in science if more time (or resources) were devoted to science teaching in school, therefore leaving some scope for greater satisfaction.

The likelihood is that some combination of these factors, and perhaps others, are at play. The factors contributing to parents' views of their child's school and their child's progress – in general terms, and in various specific domains – could benefit from further examination in future studies. In particular, it would be useful to examine how the views of parents of post-primary students overlap with, or differ from, the views of parents of primary students, which was not possible here due to the fact that the Home Questionnaire was administered at primary level only.

From their own perspectives, parents in Ireland reported more positive attitudes about mathematics and science than parents in most other countries, including many of our comparison countries. Three-quarters of pupils in Ireland had parents who were categorised as having a *very positive attitude* to mathematics and science, with almost all other pupils having parents who expressed a *positive attitude* (and approximately 1% expressing a *less than positive attitude*). In Ireland, and in most other countries, more positive parental attitudes were associated with higher pupil achievement in both domains. Parents in Ireland reported strong agreement that most occupations need skills in mathematics, science, or technology; that science explains how things in the world work; that their child needs mathematics to get ahead in the world; that mathematics is applicable to real life; and that engineering is necessary to design things that are safe and useful. The most ambivalent attitudes were expressed for the idea that learning science is for everyone (the parents of about one-in-seven Fourth Class pupils disagreed). In Ireland and internationally, more positive parental attitudes towards mathematics and science were associated with higher student achievement.

Learning in early childhood

Similar to the TIMSS 2011 findings reported by Clerkin and Gilligan (2018), parents in Ireland reported engaging in early numeracy and literacy activities (or literacy and numeracy play) with their children before they started First Class to a much greater extent than parents in many other countries. On the whole, early literacy and numeracy activities showed a strong positive association with mathematics and science achievement, in Ireland and internationally.

Although parents in Ireland reported similar levels of literacy and numeracy play for most activities regardless of their child's gender, some differences by gender were observed. Parents reported playing with building blocks or construction toys more frequently with boys than with girls, and more frequently singing counting songs or counting rhymes with girls than with boys. It was also more common to read books, tell stories, write letters, or sing songs with girls than boys.

Substantial differences in early learning activities were apparent in relation to the level of home resources for learning available to a family (a composite measure that includes indicators of socioeconomic status). Each of the specified forms of literacy- or numeracy-related play were reported to be significantly less frequent in homes with lower home resources for learning. The most common activity reported by parents in homes with few resources for learning was talking to their child about things they were doing in their daily life. Conversely, the least common activities included reading books, talking about things they had read, and playing with alphabet toys.

This might suggest an ongoing need for literacy support for many parents by organisations such as the National Adult Literacy Agency. The introduction of extended opening hours for many libraries around the country, the abolition of library fines, and the introduction of a campaign to engage children and older people with their local library (*Irish Times*, 13 June 2018) is welcome in this regard.

An important point also worth noting with regard to early numeracy learning is that some common forms of play might not be recognised as having mathematical aspects by many parents – for example, ordering objects by size, matching pairs of identical or related objects, creating patterns, or understanding the properties of various 2-D and 3-D shapes (e.g., a triangle has three sides, which can be equal or unequal). Discussing these aspects with children as they play offers opportunities to support the development of early numeracy skills in a natural setting. There are a number of popular television programmes (e.g., *Team Umizoomi*), books (e.g., *The Very Hungry Caterpillar*), and games (e.g., *Matching Pairs*; *Guess Who?*) that facilitate learning and discussion of early numeracy concepts. In addition, www.mathsthroughstories.org maintains a list of (at the time of writing) more than 500 different stories for all ages that incorporate a range of mathematical concepts.

The almost universal uptake of places in the ECCE scheme (DCYA, 2019a; see Chapter 6) is also welcome, given that ECCE providers must adhere to the principles espoused by the Síolta and Aistear frameworks for early years care and education (DCYA, 2019b). As well as providing detailed guidelines on pedagogy and play for children in early childhood care and education settings (DES, 2017; NCCA, 2009), the Aistear framework encourages practitioners to "help to build parents' confidence in their own literacy and numeracy skills and in using the home as a learning environment" (NCCA, 2009, p. 15). This can occur through a variety of approaches, including collaborating with local adult education groups, organising workshops for parents on topics such as learning through play, and discussing their child's progress with parents.

Sleep and nutrition

Students in Ireland – at both primary and post-primary level – were more likely to report eating breakfast on a schoolday than their peers internationally, including all of our comparison countries. However, almost one-tenth of Fourth Class pupils (8%) and almost one-quarter of Second Year students (23%) reported never or only sometimes eating breakfast before school. Breakfast consumption was slightly less frequent among students attending DEIS schools (particularly, at primary level, Urban Band 1 schools). This is consistent with findings from the international HBSC survey that children in 'low affluence' families were significantly less likely to eat breakfast every day (including weekends) than children in 'medium affluence' or 'high affluence' families (Lazzeri et al., 2016).

Nonetheless, teachers' reports indicated that a lack of sleep, or insufficient quality sleep, presents more challenges in the classroom than inadequate nutrition. Among Second Year students, a non-negligible minority (7%) had teachers who reported that their ability to teach their class was limited *a lot* by students' tiredness. When expanded to also include teachers whose ability to teach is limited *to some extent*, most Second Year students (66%) were in classes where students' lack of sleep was seen as a problem by their teachers. The corresponding percentages were similar, albeit slightly lower, among Fourth Class pupils, where 62% of pupils had teachers who reported this as an issue.

Lack of sleep was identified as a limiting factor to a greater degree by teachers whose students reported having a TV of their own in their bedroom. That is, students who had a TV in the bedroom were significantly more likely – at both grade levels – to have a teacher who felt that their ability to teach was limited *to some extent* or *a lot* by students' lack of sleep. Although correlational and cross-sectional, these data are consistent with longitudinal research (Nuutinen et al., 2013) suggesting that the use of a TV or computer in the bedroom predicts short sleep duration and later bedtimes 18 months later among 10- and 11-year-old children (i.e., of similar age to Fourth Class pupils). It is also consistent with comments about the availability of a TV in the bedroom in relation to children's bedtime and sleep duration provided by Sixth Class children attending a DEIS Band 2 school, and their parents, in a small-scale sleep intervention study reported recently by Hargadon and Downes (2019).

Sleep disruption may be related to the direct displacement of sleeping time by screen use at night time, disruptive effects of the light emitted by screens before going to bed, or to indirect effects related to the displacement of physical activity (which is associated with superior sleep quality) by screens earlier in the day and increased mental and physiological arousal before going to bed (Haughton, Aiken & Cheevers, 2015; Nuutinen et al., 2013). Keane and colleagues (2017) note that the American Academy of Paediatricians (Barlow, 2007) recommend that children limit their total daily screen time to no more than two hours. Keane et al. (2017) also observe, using HBSC data, that less than one-quarter of Irish 10- to 17-year-olds report meeting that guideline.

Use of technology

At the same time, the widespread availability to students of technology at home – computers, tablets, and smartphones connected to the internet, as reported in Chapter 5 – presents a clear contrast to the relative rarity with which devices such as these are generally used by students in school for pedagogical purposes (see Clerkin et al., 2017, for comparison at Fourth Class; Clerkin et al., 2018, for comparison at Second Year; McKeown, Denner, McAteer, Shiel & O'Keefe, 2019, for comparison among 15-year-olds).

The IEA's International Computer and Information Literacy Study, carried out with Eighth grade

students in 2018, found substantial variation in students' levels of computer and information literacy both within and between countries (Fraillon, Ainley, Schulz, Friedman, & Duckworth, 2019). Despite the common perception of today's students as 'digital natives', Fraillon et al. (p.242) are clear that:

> The ICILS 2018 data again support the contention that, regardless of our own impressions of the facility with which young people embrace new technologies, there remain large proportions of young people who can complete only the most basic technical operations when using a computer. One danger of assuming that young people are imbued with a capacity to manage complex functions on computers is that we may infer that there is little need to formally address knowledge, skills, and understandings as part of schooling. The ICILS 2018 data support the findings of ICILS 2013 in demonstrating that many grade 8 students have developed little more than rudimentary CIL [computer and information literacy] capacities. Formal schooling needs to play a more significant role in developing these capacities within young people given that it is clear that, for many students, they are not currently being developed through other means.

For example, substantial minorities of Eighth grade students reported that they had not been taught about the importance of logging out of shared computers, or about sharing information on social media responsibly (Fraillon et al., 2019). Ireland did not participate in ICILS 2018, so data for Second Year students specifically are not available. However, in the absence of evidence to the contrary, it seems reasonable to assume that Irish students, no less than their peers in other countries, could benefit from more structured instruction in and use of information technologies in school settings.

In this light, the ongoing work of the National Council for Curriculum and Assessment in supporting the early stages of the rollout of a Computer Science subject at Leaving Certificate level[31] and examining practice in other jurisdictions at primary level (NCCA, 2016, 2018), following the recent introduction of Coding[32] as a short course at junior cycle, is welcome. The *Digital Strategy for Schools* (DES, 2015) and, within this Strategy, the implementation and evaluation of the *Digital Learning Framework* (e.g., Cosgrove, Moran, Feerick & Duggan, 2019; www.dlplanning.ie) aim to support greater embedding of digital technologies in teaching, learning and assessment. Schools are supported to implement the Digital Learning Framework through the provision of professional learning from the PDST and an 'ICT grant' for the purchase of digital technology equipment and software.[33] Two key challenges identified to the realisation of the Digital Strategy are variations in broadband and connectivity, particularly at primary level; and the provision of technical support in schools (Cosgrove et al., 2019). The Covid-19 pandemic has underlined the urgency of addressing these challenges and ensuring that teachers receive adequate professional and technical support, following schools', parents', and pupils' experiences of remote learning in 2020 and the possibility of similar periods of remote learning being required in future.

In addition, Webwise (part of the Professional Development Service for Teachers and another component of the Digital Strategy) launched a resource for teachers of the Junior Cycle Digital Media Literacy Short Course in February 2020. The new resource, known as Connected, "aims to

31 See https://www.ncca.ie/media/4378/lccs-2020-phase-2-subject-brochure-100120.pdf.
32 See https://curriculumonline.ie/getmedia/cc254b82-1114-496e-bc4a-11f5b14a557f/NCCA-JC-Short-Course-Coding.pdf.
33 See https://www.education.ie/en/Circulars-and-Forms/Active-Circulars/cl0018_2019.pdf.

empower young people to be effective, autonomous and safe users of technology and online media" (www.webwise.ie/connected, 12th February 2020) by tackling topics such as online rights, big data, news and false information, and online wellbeing.

Homework

With regard to homework, Second Year students reported that science homework was assigned by their teachers much less frequently than mathematics homework. However, it was also the case that students in Ireland received science homework more regularly than their counterparts in any of our comparison countries, as well as more regularly than the TIMSS average.

The small percentage of students (5%) who reported spending more than three hours per week on science homework achieved significantly lower scores on the TIMSS science assessment than their classmates who spent less time (including those who spent 45 minutes or less per week). This may indicate that some students who may be struggling with science are spending substantial periods of time each week completing assignments.

The opposite pattern was reported for mathematics. Students who spent less than 45 minutes per week on mathematics homework achieved significantly lower scores than those who spent up to or more than 3 hours completing (the more frequently-assigned) mathematics tasks at home.

Shadow education

Finally, the TIMSS 2015 data provide information on the extent and nature of students' participation in 'shadow' educational activities outside the formal school system (i.e., grinds). The findings underline the importance of interpreting achievement-related data from studies such as TIMSS, PIRLS, and PISA holistically, looking beyond official curriculum or policy prescriptions and purely school- or classroom-based data.

Extra lessons or tutoring outside school were common in several high-performing countries even at primary level, most notably in the Republic of Korea, Singapore, and Hong Kong (between 44% and 66%). Among our comparison countries, Northern Ireland (25%) was also notable for having a relatively high proportion of Fourth grade pupils engaged in extra mathematics tuition, most likely related to high-stakes entrance examinations for selective post-primary schools. However, the pattern of participation in shadow education was different in Northern Ireland, where extra tutoring was most often short-term, than in the East Asian countries where it was predominantly a year-round activity.

In Ireland, shadow education at primary level was rare, with fewer than one-tenth of parents reporting that their child had attended extra lessons in mathematics. Nonetheless, at 8% of Fourth Class pupils, the extent of the phenomenon is not negligible, even in Ireland. By contrast – and as in other countries – extra lessons in science were much rarer than for mathematics. In Ireland, just 2% of Fourth Class pupils engaged in extra science tuition outside school.

Participation in extra lessons was more widespread among Second Year students, with about one-sixth of students in Ireland reporting additional mathematics tuition outside school. However, the same general patterns were observed at post-primary as at primary level. Specifically, we see that shadow education was less common in Ireland than in any of our comparison countries, and was lower than the TIMSS international average; that extra lessons to keep up in class were slightly more common than extra lessons to excel; and that extra tuition in science was comparatively rare.

Other findings from TIMSS 2015 and TIMSS 2019

Other findings arising from Ireland's participation in TIMSS 2015 are available to download from www.erc.ie/timss/reports. These include short reports on the mathematics and science achievement of Fourth Class and Second Year students (Clerkin et al., 2016), structural characteristics of the Irish education system (Eivers & Chubb, 2017), and the teaching of mathematics and science in Fourth Class (Clerkin et al., 2017) and in Second Year (Clerkin et al., 2018). A further report on student attitudes and engagement is forthcoming in 2020 (Perkins et al., in press).

The first national and international reports for the most recent cycle of TIMSS, which was conducted in 2019, will be published in December 2020. Following this, further national thematic analysis is planned. It is envisaged that these further analyses will incorporate follow-up work on the main theme and findings in this report.

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