National Foundation for Educational Research

Report

How prepared were primary teachers and pupils in England for the shift to online learning?

Insights from TIMSS 2019

National Foundation for Educational Research (NFER)

How prepared were primary teachers and pupils in England for the shift to online learning? Insights from TIMSS 2019

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Contents

Executive Summary

Introduction

In recent years, prior to the onset of the COVID-19 pandemic, encouraging the use of technology in the classroom and building pupils' and teachers' digital skills have become an explicit policy goal in many countries around the world. In 2020, the use of Information and Communication Technologies (ICT) in the classroom came to the fore as educational technology and, more specifically, remote learning, played a key role in minimising the educational disruptions of school shutdowns imposed by the health crisis.

Globally, learning loss as a result of school closures is expected to be significant. These learning losses are also expected to further contribute to widen socioeconomic gaps in pupil performance, where the abrupt shift to online learning exposed digital inequities in global education systems. These include differences in familiarity with technology and teacher professional development (PD), which are important enablers for the effective integration and use of technology in the classroom.

In this report, we used data from the 2019 Trends in International Mathematics and Science Study (TIMSS), collected before the onset of the pandemic, to illustrate global differences in digital familiarity in the classroom and teacher professional development in technology. The influence these factors have on pupil performance in maths or science in normal times is not straightforward. However, they do provide a useful indication of how well-positioned countries were to engage with a rapid and unexpected shift to remote learning due to COVID-19.

Key findings

Familiarity with computers and digital skills

- Before the pandemic, the variation in availability of computers for Year 5 pupils across countries was considerable, with an international average below 50 per cent for both maths and science lessons. Access for pupils in England was below this average, whereas among high-performing comparator countries it was 14 percentage points higher.
- Higher availability of computers across high-performing countries did not necessarily translate to more frequent use of computers in the classroom. Like other high-performing countries, teachers and pupils in England were relatively infrequent users of computers in the classroom. The percentage of pupils using computers at least once a week for schoolwork in England was 12 percentage points lower than the international average in science and three percentage points lower in maths.
- Year 5 pupils in more affluent schools in England were more likely to have access to computers and exposure to their use in learning. For example, they were 34 percentage points more likely to have had computers available for science lessons and 57 percentage points more likely to have had teachers who used computers to support learning in maths lessons at least once per week, compared with pupils from more disadvantaged schools.

Teacher preparedness to incorporate technology into instruction

- Internationally, only a third of pupils had teachers who participated in professional development in integrating technology into maths instructions in the two years prior to the survey. England was below this average, where only 17.5 per cent of pupils had teachers who had participated in this training.
- The socioeconomic gap observed in computer access and use in England is not reflected in teacher training. A similar percentage of pupils from more affluent and more disadvantaged schools in England had teachers who had previously received professional development in integrating technology into maths instruction.
- Globally, 72 per cent of Year 5 pupils had teachers who reported needing further training in technology for maths instruction. This proportion was higher than for other types of professional development related to maths content, pedagogy, curriculum and assessment.
- Although the number of days of mandatory school closures in England was below the median for TIMSS-participating countries, teachers received relatively less professional development in technology incorporation into instruction than other countries with a similar length of school closures, such as Singapore, Lithuania and Northern Ireland.

Conclusions and recommendations

The key takeaway from this report is that there was considerable variation in computer availability, use and teacher professional development in technology incorporation across 2019 TIMSS-participating countries, and England was below the international average in each of these categories. In the context of pandemic-induced school closures, this may have translated to a comparatively more challenging transition to online learning. Additionally, disadvantaged pupils in England were less likely to have had access to computers in the classroom and to be frequent classroom computer users, potentially further contributing to disadvantage gaps in online learning engagement. This points towards three broad recommendations for policy-makers:

1. It is more important than ever to be clear on how technology can be most effectively embedded into teaching practice. This is particularly true in the short term, but a longer-term understanding of what factors mediate the impact of technology on learning is key to developing teaching practices for future needs and resilience.
2. Professional development in technology incorporation should be a high policy priority moving forward. This report highlights the relative lack of this type of teacher training in England in comparison to other countries, and the opportunity available to realise benefits for teachers, pupils and the wider education system.
3. Particular attention should be given to technology gaps for schools serving the most disadvantaged pupils, in terms of both availability and use of ICT tools. These gaps should be investigated further and targeted support provided to schools in using technology in evidence-informed ways.

1 Introduction

In recent years, prior to the onset of the COVID-19 pandemic, encouraging the use of technology in the classroom and building pupils' and teachers' digital skills have become an explicit policy goal in many countries around the world. This has been driven mostly by the desire to reduce teacher workloads, make education more efficient and build digital capabilities, given that research offers no conclusive evidence of the impact of Information and Communication Technologies (ICT) on learning outcomes (OECD, 2015). In 2020, the use of ICT in the classroom came to the fore because educational technology and, more specifically, remote learning, played a key role in minimising the educational disruptions of school shutdowns imposed by the health crisis.

Globally, the impact of learning loss as a result of school closures is expected to be significant (Hanushek and Woessmann, 2020). These learning losses are also expected to further contribute to widen socioeconomic gaps in pupil performance, as the transition to online learning has penalised pupils that have limited access to ICT at home, low exposure to ICT by their teachers, or who have teachers with limited proficiency with technology (OECD, 2020a). While online learning has been associated with poorer outcomes as compared to traditional instruction (JPAL, 2019), it has allowed governments to ensure some learning continuity and help contain the spread of the virus. Nevertheless, the abrupt shift to online learning exposed digital inequities in global education systems. These include differences in familiarity with technology and teacher professional development (PD), which are important enablers for the effective integration and use of technology in the classroom (Hennessy and London, 2013).

In this report, we used data from the 2019 Trends in International Mathematics and Science Study (TIMSS), collected before the onset of the pandemic,[1] to illustrate global differences in digital familiarity in the classroom and teacher professional development in technology. As we have noted, the influence these factors have on pupil performance in maths or science in normal times is not straightforward. However, they do provide a useful indication of how well-position countries were to engage with a rapid and unexpected shift to remote learning due to COVID-19. Data from the TIMSS teacher survey in England was available for between 40 and 50 per cent of participating pupils, and so some caution should be exercised in generalising the results

> TIMSS is an international large-scale assessment that compares mathematics and science achievement of Year 5 and Year 9 pupils (ages 9-10 and 13-14) around the world every four years.

To understand global pre-pandemic digital preparedness, we consider two questions:

- Were pupils and teachers familiar with computer use in the classroom?
- Were teachers sufficiently trained to effectively incorporate technology into instruction?

[1] Data collection for TIMSS 2019 was carried out between October 2018 and April 2019, making it a valuable source of pre-pandemic information.

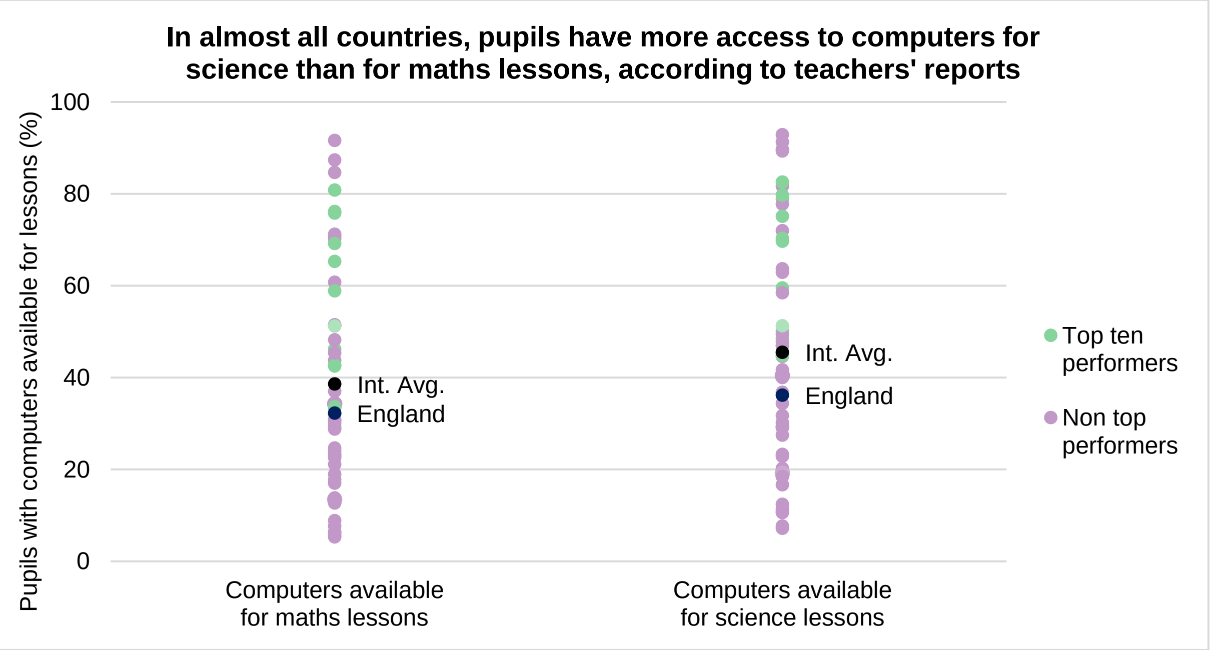
2 Were pupils and teachers familiar with computer use in the classroom?

TIMSS 2019 provides evidence on the extent to which pupils had access to computers in the classroom and the extent to which these computers were used for teaching. Although this does not directly predict the success of online learning, we might reasonably expect high classroom computer access and use to be associated with pupil and teacher familiarity with ICT tools for learning, and to facilitate the transition to COVID-induced online learning. Conversely, low levels of familiarity may have further exacerbated the challenges many pupils and schools faced as a result of poor access to computers and the internet at home, which was a strong impediment to effective home learning and had a disproportionate impact on disadvantaged pupils (Sharp *et al.*, 2020).

There was significant variation in computer availability in the classroom internationally

The average rate of pupils having access to computers in the classroom was relatively low, although there was significant variation among TIMSS-participating countries (Figure 1). Internationally, 46 per cent of pupils had access to computers for science lessons and 39 per cent for maths lessons. In the majority of countries, more pupils had access to computers in science lessons than maths lessons, with the exception of Hong Kong, Norway, Poland, Azerbaijan and South Africa. Pupils in high-performing countries tended to have higher levels of access to computers in their maths and science lessons than the international average.

Figure 1: Digital resource access in the classroom (Teachers' reports, TIMSS 2019)

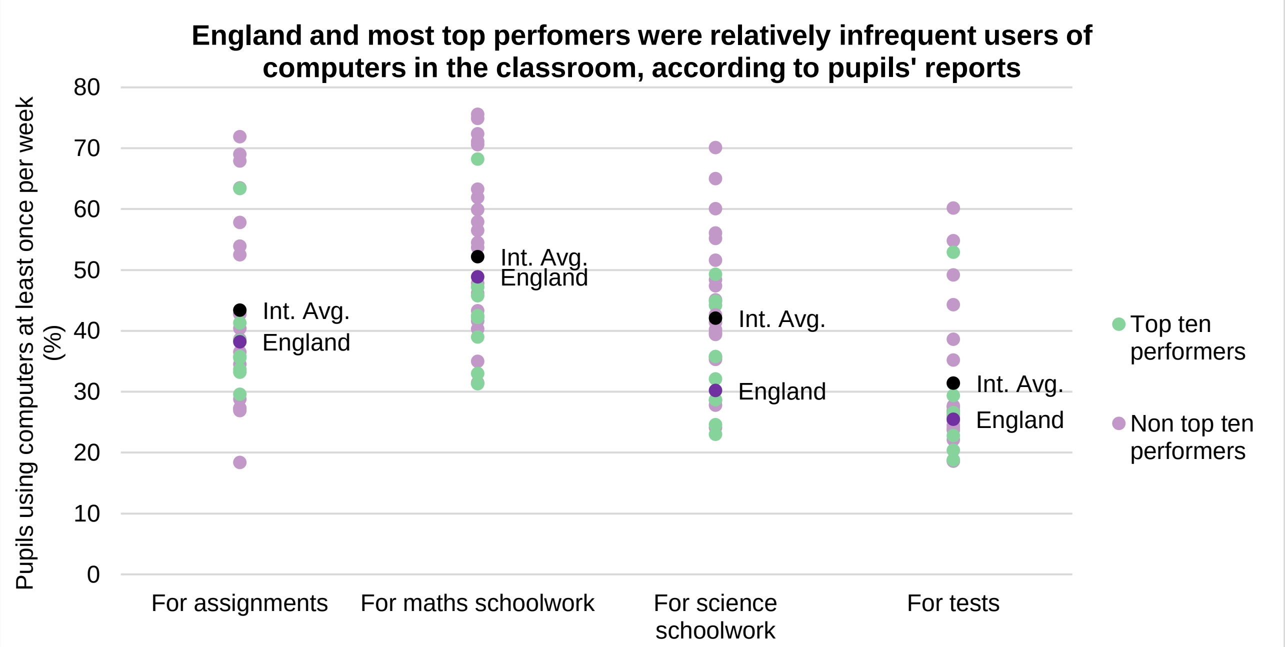


England, however, was an exception. Despite being a high-performing country, pupils in England came in below the international average in both computer availability for maths (32 per cent) and science (36 per cent).

Pupils in England used computers less frequently than their international peers

Availability of computers, however, only tells us one side of the story, since having access to ICT tools does not necessarily imply effective use. The TIMSS pupil questionnaire asked pupils how often they used computers or tablets for schoolwork, assignments and tests (Figure 2). For assignments, 43 per cent of pupils globally reported using a computer or tablet at least once a week. Pupils were more likely to frequently use computers for maths schoolwork (52 per cent) compared to science schoolwork (42 per cent). However, only 31 per cent of pupils reported using computers at least once a week for tests or quizzes, the lowest across each of the categories.

Figure 2: Pupils using computers at least once per week (Pupils' reports, TIMSS 2019)



In contrast to the findings on computer availability, most high-performing countries were well *below* the international average across each of the computer usage measures. England was no exception, usually sitting between 5 and 10 percentage points lower than the international average in each category.[2]

Results from the teacher survey tell the same story. Fifteen per cent of Year 5 pupils in England had teachers who used computers to support learning in maths lessons for the whole class at least once per week; again below the international average of 20 per cent. This was also true for most high-performing countries, though the difference was not as pronounced as in pupils' reports. Thus, for England, prior to the pandemic pupils had relatively low access to computers in the classroom and were also relatively infrequent users of computers for learning activities. This is in

[2] It should be noted that the sample of countries in Figure 2 is reduced from the full sample of 58 because we only observe data from the 30 countries which took e-TIMSS (computer survey).

contrast to other high-performing countries which had relatively high access to computers, but low usage.

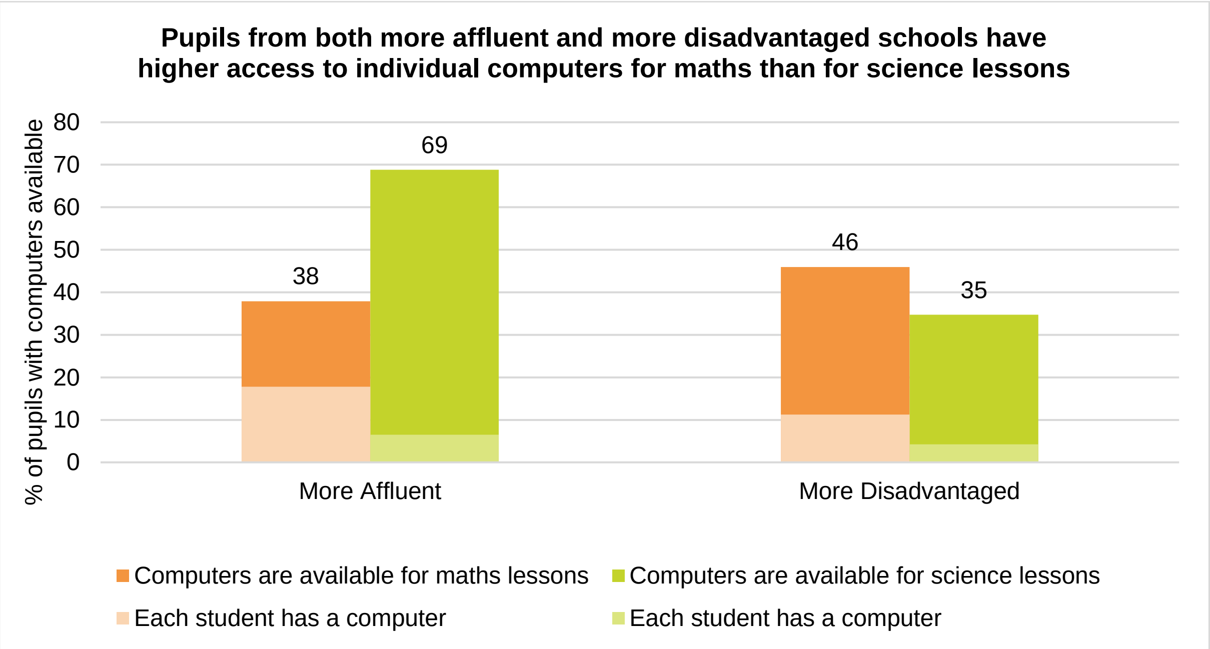
The question of whether computer access and use are linked directly to a country's performance is beyond the scope of this research, and any connection that does exist is likely to be mediated by a range of other factors (such as the quality of teaching). Indeed, previous research has found no conclusive evidence suggesting computers have a positive impact on education outcomes, and has highlighted concerns that investments in classroom computers can crowd out other priority education investments (OECD, 2015).

Nevertheless, the fact that England lagged behind other high-performing countries in both access to classroom computers and frequency of use prior to the pandemic is notable in considering preparedness for crises such as the pandemic. Low rates of computer access and use in the classroom could be associated with pupil and teacher inexperience with digital learning tools, which in turn may have had an impact on the extent of learning losses incurred by a more challenging shift to online learning.

Socioeconomic gaps in availability and use of computers in England emerge in primary school

Using teachers' reports and the school's socioeconomic composition from the head teacher questionnaire, we can consider availability rates of computers in Year 5 classes for affluent and disadvantaged schools (Figure 3).

Figure 3: Classroom availability of computers by school socioeconomic composition (teacher's reports, TIMSS 2019)

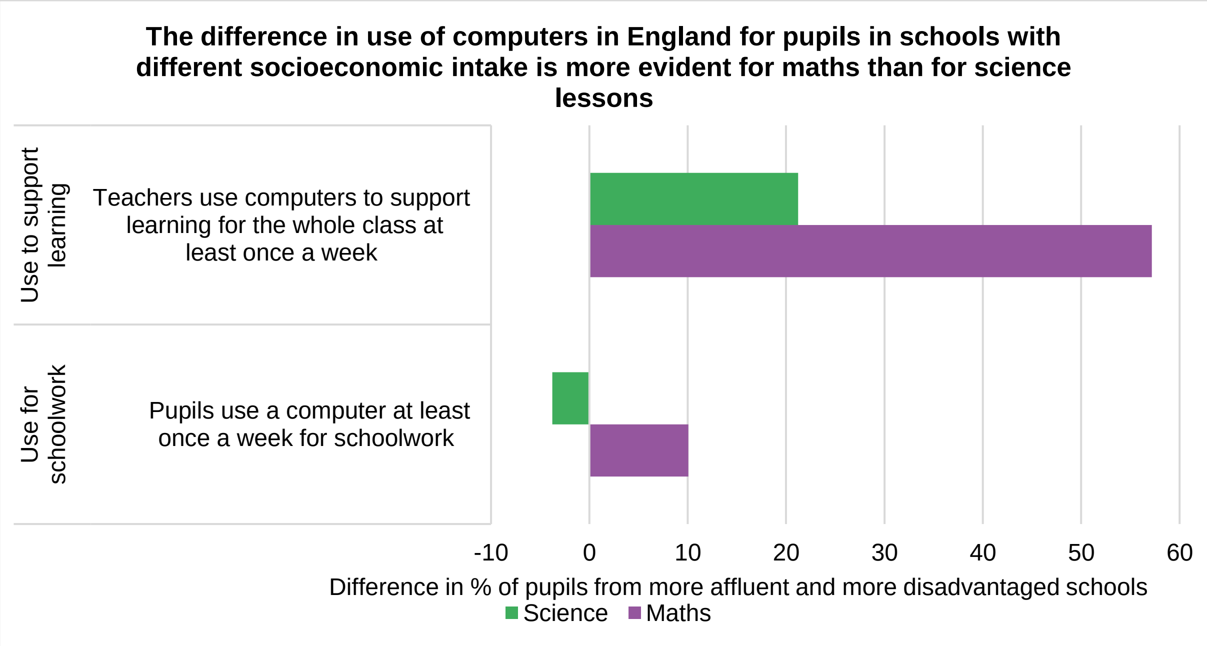


This reveals socioeconomic gaps that were most evident for science lessons, where pupils from affluent schools were 34 percentage points more likely to have general access to computers or tablets than more disadvantaged schools.[3] For maths lessons, this difference was smaller and not statistically significant. Pupils in England had more individual computers available for maths than for science, regardless of their school's socioeconomic composition.

A similar trend is observed in the frequency of classroom computer use, although the socioeconomic gap is more pronounced for maths than for science. Figure 4 shows the percentage point difference in teachers' and pupils' reported use of computers in school, between schools with more affluent and more disadvantaged pupils. A positive gap indicates greater use in more affluent schools, while a negative gap suggests the opposite. In England, pupils in more affluent schools were 57 percentage points more likely to have teachers who use computers to support maths learning at least once per week, compared with pupils from more disadvantaged schools.

These findings reinforce results from PISA 2018, which highlighted the gap in access to online learning platforms between advantaged and disadvantaged schools, finding that this gap was far larger in the UK than the average across countries in the OECD (OECD, 2020b). These pre-pandemic gaps may in part be associated with socioeconomic gaps observed by previous NFER research, where teachers in the most deprived schools in England were over three times more likely to report that their pupils were four months or more behind in their curriculum-related learning in July 2020, compared to teachers in the least deprived schools (Sharp *et al.*, 2020).

Figure 4: Classroom use of computers by school socioeconomic composition (TIMSS 2019)



However, teacher and pupil familiarity with computer use in the classroom is not the only factor associated with an effective transition to online learning. Data collected in an earlier NFER survey found that high pupil engagement with remote teaching is significantly associated with lower

[3] This difference is statistically significant at the 10% level.

learning loss for pupils, and pupil engagement is higher among teachers who had received training in classroom ICT use (Lucas *et al*., 2020). This alludes to the importance of complementing digital access with strategies to build the teacher skills necessary to promote pupil engagement with online learning activities, which is the focus of the next section.

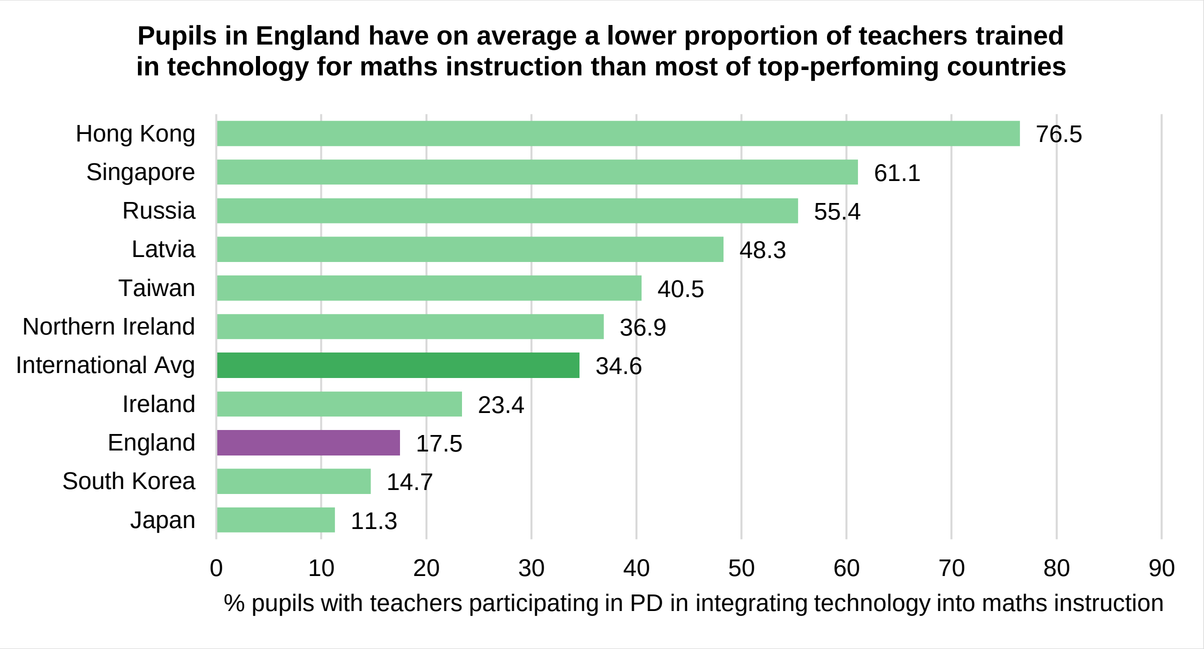
3 Were teachers sufficiently prepared to incorporate technology into instruction?

TIMSS 2019 also gathered data on the proportions of teachers who had received professional development in maths content, assessment and pedagogy, improving critical thinking skills, addressing individual pupil needs and ICT incorporation into instruction in the two years prior to the survey.[4] While trends in the other categories are worthy of study in their own right, professional development in incorporating technology into instruction is most relevant to the discussion here. We would expect, all else equal, that teachers in countries with high levels of ICT training would have the skills necessary to better engage with remote learning, leading to higher engagement in remote learning and lower learning loss incurred through pandemic-induced school closures.

There was significant international variation in provision of professional development in technology

Globally, TIMSS 2019 suggests that there was a high degree of variation in proportions of teachers having received professional development in integrating technology into instruction. From Figure 5, in high-performing countries, Japan was on the low end of the scale, with 11 per cent of pupils having teachers who had received training, while Hong Kong is at the opposite end, with 77 per cent.

Figure 5: Participation in professional development in technology incorporation for maths instruction (TIMSS 2019)



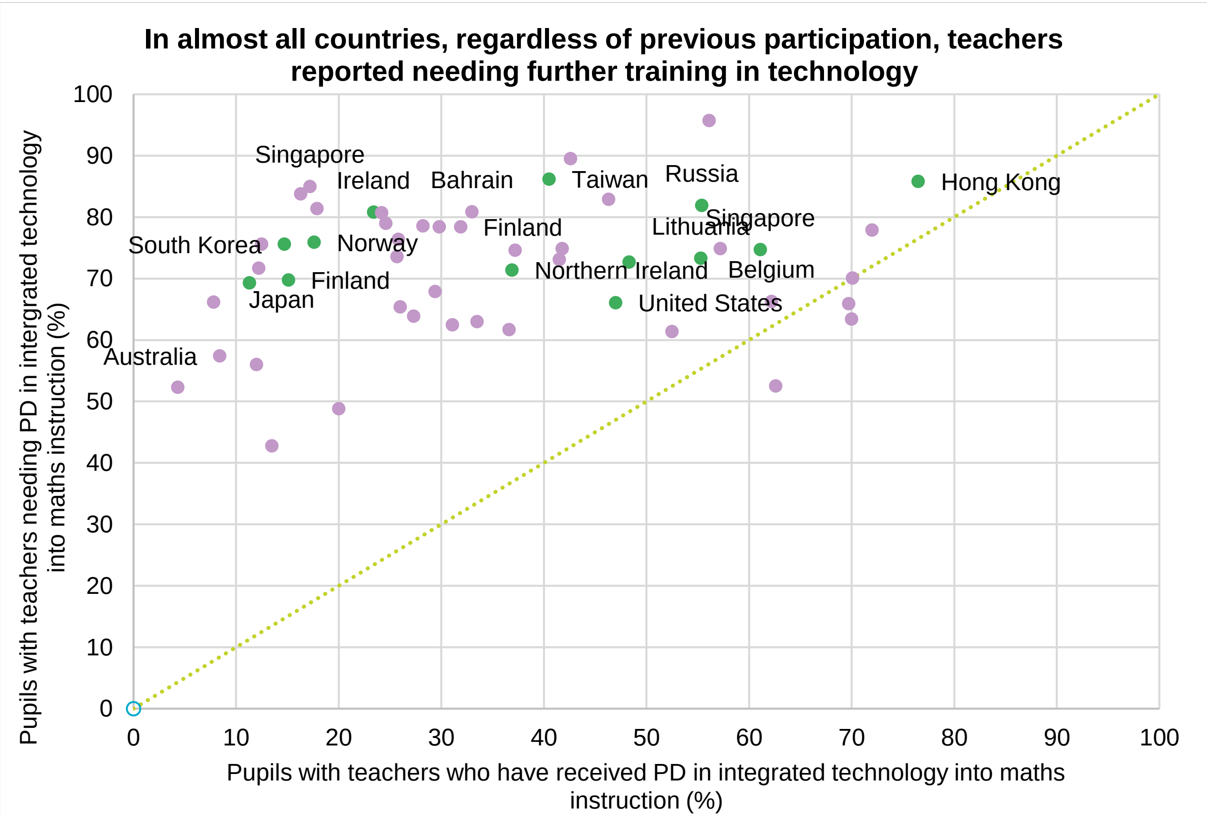
[4] Our analysis is focused on professional development in ICT incorporation in maths, as response rates for the science variables in the teacher survey are too low to be reliably reported.

On average, however, professional development in technology incorporation is an area in which many countries have room to improve, as the international average was only 35 per cent – and in England this was only true for 17.5 per cent of respondents.[5] This is in line with previous research using the OECD Teaching and Learning International Survey (TALIS) that showed that participation rates in professional development (including for ICT skills) for teachers in England are below the OECD average (OECD, 2020a).

There is a high perceived need for more professional development in technology incorporation, even in countries with high provision rates

In 2019, for the first time, the TIMSS questionnaire also asked teachers what type of professional development they think they need in the future. Globally, 72 per cent of pupils had teachers that reported needing further training in technology incorporation for maths instruction. This proportion was higher than for all other types of professional development such as maths content, pedagogy, curriculum and assessment.

Figure 6: Previous participation and self-reported need for training in integrating technology into maths instruction (TIMSS 2019)



Even amongst high-performing countries, 65 per cent of pupils had teachers in need of further training in technology incorporation. Figure 6 below shows that most TIMSS-responding countries

[5] It is worth noting that Year 9 teachers in England reported slilghtly higher participation rates for ICT training at 22 per cent. However, this was still well below the Year 9 international average of 51 per cent.

are clustered around the international average, suggesting that a need for future professional development is high even for countries that have relatively high proportions of teachers having received training in the past. [6]

Among countries with similar lengths of school closures, teachers in England had received less professional development in technology incorporation than their international peers

Teachers' preparedness to integrate technology into their teaching will have been especially relevant in countries that experienced longer periods of school closure. Indeed, all else being equal, we would expect more days of school closure and lower levels of teacher professional development provision to result in a higher learning impact, and vice versa.

To explore these potential differential impacts, we can consider the proportion of pupils with teachers reporting having received this professional development in each TIMSS country alongside the number of days of school closures (Figure 7). We estimated the number of days of mandatory school closures using data collected by the Oxford University Blavatnik School of Government (BSG) COVID-19 tracker. This estimate reflects the number of days per country in which any type of school at any level was required by the government to close between January 1, 2020 and October 22, 2020.[7] [8] [9] Unsurprisingly, there was significant global variation in mandatory school closure policies, with the international median days of school closures for TIMSS-participating countries at 194.

Before the pandemic, there was no obvious systematic difference between high and low-performing countries' Year 5 teachers' participation in technology PD, with both groups of countries dispersed fairly evenly. High-performing countries in the higher-impact quadrant include South Korea and the Republic of Ireland, which had high levels of school closure and low levels of teacher preparedness according to this measure. On the other hand, countries in the lower-impact quadrant include Northern Ireland, Latvia, Lithuania, Singapore and Taiwan. There was much more variation in professional development provision in countries that were near or above the international median days of school closure, while countries that experienced lower days of school closures tended to be more consistent in having lower rates of teachers who had received professional development in integrating technology into maths instruction.

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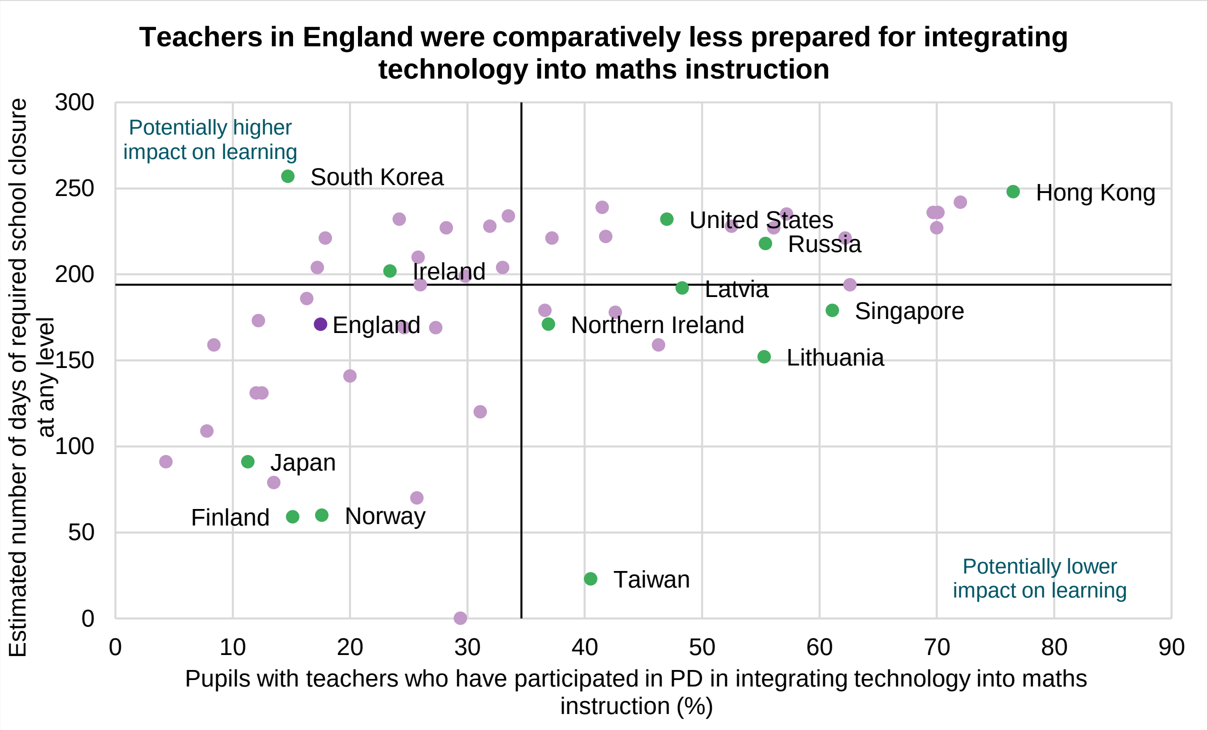
[6] Unfortunately, England is not presented in this chart since data for 'need future training in integrating technology' is available for less than 40% of participating pupils.
[7] When the school closures data was originally accessed, it was only available for the United Kingdom and was not able to distinguish between England and Northern Ireland.
[8] The school closure data is also unable to distinguish between primary/secondary schools and universities. It should be interpreted as a general indicator of relative general closure intensity. See the Methodology section for further details.
[9] While it is not exactly clear how the dataset treats school holidays, a visual inspection of the data suggests that schools were fairly consistently mandated to be closed between June and August.

Figure 7: Participation in technology PD and days of required school closures (TIMSS 2019)



Note: the horizontal axis crosses at the international median of days of school closures for TIMSS countries, the vertical axis crosses at the international average of pupils with teachers who participated in training in integrating technology into maths instruction in the two years before the survey.

England was in neither the higher nor the lower potential impact quadrant as, despite the fact that professional development provision was lower than the international average, schools in the United Kingdom experienced slightly fewer days of school closure than many other countries. However, even compared to countries with similar days of school closures, teachers in England were much less likely to have received professional development in technology incorporation into maths instruction. Pupils in countries such as Latvia and Singapore were around three times more likely to have teachers who had received this kind of training.

Indeed, differences were apparent even within the United Kingdom, as Year 5 pupils in Northern Ireland were about twice as likely to have teachers who had received technology training.[10] This means that, as schools closed, 82 per cent of pupils in England lacked teachers who had received professional development in integrating technology. These pupils may therefore have been at higher risk of experiencing learning loss and a lack of engagement in remote learning.

[10] Figure 7 suggests that England and Northern Ireland experienced the same number of days of school closure, but, as the data was available only for the United Kingdom, there may be some differences.

4 Conclusions and recommendations

This report has highlighted large differences between the availability and use of computers in maths and science lessons across countries that took part in TIMSS 2019. Similar variation among countries can be observed in the extent to which teachers had received professional development to support the integration of technology in their instruction. In England we find that access to computers for pupils was below the international average, as was the use of computers in the classroom. However, this was less likely to be the case in more affluent schools. Only 18 per cent of pupils in England had teachers who had participated in professional development to support the integration of technology – lower than the international average, and lower than other countries that experienced similar levels of school closure in response to the pandemic.

These findings, when coupled with the experiences of COVID-19, suggest a number of areas for policy attention.

It is more important than ever to be clear on how technology can be most effectively embedded into teaching practice

Concerns about increasing the use of computers for instruction have previously highlighted the opportunity costs of computer-based instruction replacing more 'traditional' uses of teaching time, given inconclusive evidence about the impact of technology on pupils' outcomes (OECD, 2015, Falck *et al.* 2015). As countries shifted to remote learning in an effort to lessen the learning loss due to school closures, these opportunity costs were reduced, and the new global circumstances have changed government's incentives in favour of investing in education technology. Even prior to the pandemic, the Department for Education (DfE) had set goals to improve internet connectivity in schools and help schools to procure computers and other digital equipment, motivated by reducing teacher workloads, making education more efficient and building digital skills (DfE, 2019).

Given this, the causes and effects of lower use of computers in maths and science lessons in high-performing countries warrants further investigation, as well as the factors that mediate the impact of technology in pupils' outcomes. It is also critically important to consider the wider impacts of technology (in the classroom and for home learning) on the quality of teaching and learning and how this can be improved. This is true regardless of whether technology investment continues to be motivated by the same pre-pandemic goals, or to introduce greater resilience to external shocks and to facilitate remote teaching in future.

Professional development in technology incorporation should be a high policy priority moving forward

After the closure of schools in England, the DfE took steps to provide computer and internet connections to pupils, particularly disadvantaged pupils, helping them to engage with online learning. Prior to the pandemic, the DfE launched initiatives around its education technology strategy (DfE, 2019) that included targeting courses at teachers in need of training, and launching demonstrator schools to model and showcase best practices of technology in education.

The TIMSS 2019 data was collected before the launch of many of these programs but it does show that, at the time, the initiatives were sorely needed. Moving forward, professional development in

ICT for teachers in England should continue to be a high priority for policymakers. Not only is it relevant for reducing workload and building a skilled and agile teacher workforce, but ensuring that teachers are skilled in technology incorporation also helps to increase the viability of the delivery of remote learning and reduce barriers to engaging with learning online. This, in turn, helps to build an education sector that is much more flexible and resilient to future shocks.

Particular attention should be given to technology gaps for schools serving the most disadvantaged pupils

The pandemic has exposed important gaps in pupils' access to technology for home learning. However, it is clear from the TIMSS data that there is also a gap in the availability and use of computers for learning in school. This may be a result of intentionally different strategies being successfully adopted by different schools, rather than necessarily representing a deficit. Indeed, the approach to education technology in England historically has been of non-statutory guidance to schools on assessment of ICT infrastructure and procurement of ICT tools, and the provision of evidence on effective strategies, for example through the Education Endowment Foundation toolkit (EEF, 2019).

Responding to immediate challenges of remote learning, DfE implemented strategies to provide ICT tools for the homes of most disadvantaged children.[11] In the longer term, this should be paired with a more systematic strategy targeting schools in deprived areas, not only in terms of ICT infrastructure, but also providing additional support for using technology in evidence-informed ways to improve learning, reduce workload, and increase resilience in the system for all schools and learners, regardless of their background.

[11] https://www.gov.uk/guidance/laptops-tablets-and-4g-wireless-routers-provided-during-coronavirus-covid-19

References

Department for Education (2019). *Realising the Potential of Technology in Education: A Strategy for Education Providers and the Technology Industry* [online]. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791931/DfE-Education_Technology_Strategy.pdf [4 December, 2020].

Education Endowment Foundation (2019). *Digital Technology. Teaching and Learning Toolkit* [online]. Available: https://educationendowmentfoundation.org.uk/pdf/generate/?u=https://educationendowmentfoundation.org.uk/pdf/toolkit/?id=134&t=Teaching%20and%20Learning%20Toolkit&e=134&s= [4 December, 2020].

Falck, O., Mang, C. and Woessmann, L. (2015). *Virtually no effect? Different uses of classroom computers and their effect on student achievement* (IZA Discussion Paper, No. 8939) [online]. Available: http://ftp.iza.org/dp8939.pdf [4 December, 2020].

Hale, T., Angrist, N., Cameron-Blake, E., Hallas, L., Kira, B., Majumdar, S., Petherick, A., Phillips, T., Tatlow, H., Boby, T. and Webster, S. (2020). *Variation in Government Responses to COVID-19* (BSG Working Paper Series, BSG-WP-2020/032) [online]. Available: https://www.bsg.ox.ac.uk/sites/default/files/2020-11/BSG-WP-2020-032-v9.pdf [4 December, 2020].

Hanushek, E. A., & Woessmann, L. (2020). *The Economic Impacts of Learning Losses* (OECD Education Working Papers No. 25) [online]. Available: https://www.oecd-ilibrary.org/docserver/21908d74-en.pdf?expires=1607080580&id=id&accname=guest&checksum=CA99742047DDE30E360F7C167C33781F [4 December, 2020].

Hennessy, S. and L. London (2013). *Learning from International Experiences with Interactive Whiteboards: The Role of Professional Development in Integrating the Technology* (OECD Education Working Papers, No. 89) [online]. Available: https://www.oecd-ilibrary.org/education/learning-from-international-experiences-with-interactive-whiteboards_5k49chbsnmls-en [4 December, 2020].

Shank, S. (2019). *Will Technology Transform Education for the Better?* [online]. Available: https://www.povertyactionlab.org/sites/default/files/publication/education-technology-evidence-review.pdf [4 December, 2020].

Lucas, M., Nelson, J. and Sims, D. (2020). *Schools' Responses to Covid-19: Pupil Engagement in Remote Learning* [online]. Available: https://www.nfer.ac.uk/media/4073/schools_responses_to_covid_19_pupil_engagement_in_remote_learning.pdf [4 December, 2020].

Nelson, J. and Sharp, C. (2020). *Schools' Responses to Covid-19: Key Findings from the Wave 1 Survey* [online]. Available:

https://www.nfer.ac.uk/media/4097/schools_responses_to_covid_19_key_findings_from_the_wave_1_survey.pdf [4 December, 2020].

Organisation for Economic Co-operation and Development (2015). *Students, Computers and Learning: Making the Connection* [online]. Available: https://www.oecd-ilibrary.org/education/students-computers-and-learning_9789264239555-en [4 December, 2020].

Organisation for Economic Co-operation and Development (2020a). 'Teachers' training and use of information and communications technology in the face of the COVID-19 crisis', *Teaching in Focus*, **35** [online]. DOI 10.1787/696e0661-en.

Organisation for Economic Co-operation and Development (2020b). *PISA 2018 Results (Volume V): Effective Policies, Successful Schools* [online]. Available: https://www.oecd-ilibrary.org/education/pisa-2018-results-volume-v_ca768d40-en [4 December, 2020].

Sharp, C., Nelson. J., Lucas. M., Julius, J., McCrone. T. and Sims, D. (2020). *Schools' Responses to Covid-19: The Challenges Facing Schools and Pupils in September 2020* [online]. Available: https://www.nfer.ac.uk/media/4119/schools_responses_to_covid_19_the_challenges_facing_schools_and_pupils_in_september_2020.pdf [4 December, 2020]

UNESCO International Institute for Educational Planning IIEP (2019). *Brief 4: Information and Communication Technology (ICT) in Education* [online]. Available: https://learningportal.iiep.unesco.org/en/issue-briefs/improve-learning/curriculum-and-materials/information-and-communication-technology-ict#:~:text=Information%20and%20Communications%20Technology%20%28ICT%29%20can%20impact%20student,to%20communicate%2C%20create%2C%20disseminate%2C%20store%2C%20and%20manage%20information [4 December, 2020].

Methodology

For this analysis, we used two sources of data:

- The Grade 4 TIMSS 2019 almanacs and datasets from the student, teacher and school surveys, released on the 27th August 2020.
- The school closures dataset from the Blavatnik School of Government, which is publicly available at https://www.bsg.ox.ac.uk/research/research-projects/coronavirus-government-response-tracker

Researchers at BSG monitor government press releases and official documents to log the number and severity of restrictions on schools, workplaces, public spaces, etc. each day. To derive measures of the number of days of school closures, we extracted the variables pertaining to restrictions for schools and aggregated the number of days a country imposed any mandatory school closures, at any level,[12] between January 1, 2020 and October 22, 2020, the last day for which data is available for the whole sample of TIMSS countries.

Basic frequencies were consulted directly on the TIMSS 2019 almanacs. Subgroup analysis of the selected variables by socioeconomic composition of school (school-level variable) and teacher characteristics (gender, age, years of experience) was carried out on the IDB Analyser. For this purpose we matched i) student and school TIMSS 2019 datasets by school ID (analysis using student total weights), ii) teacher and school TIMSS 2019 datasets by school ID (analysis using teacher weights – science and maths), and iii) student and teacher TIMSS 2019 datasets by Student ID (analysis using student weights).

[12] An important caveat here is that the BSG School Closure data is unable to differentiate between primary/secondary schools and universities. While ideally we would focus exclusively on primary and secondary schools, mandated closures in primary/secondary schools and universities are almost certainly highly correlated and give an indication of relative closure intensity trends between countries.

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