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International comparisons:

Investigating cross-country differences in young people's skill development and identifying factors associated with high-performance

Working paper 7 of The Skills Imperative 2035: Essential skills for tomorrow's workforce

Megan Lucas, Luke Bocock, Dr Juan Manuel del Pozo Segura and Jude Hillary,
National Foundation for Educational Research

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The Skills Imperative 2035

Contents

Glossary 5
1. Introduction 6
2. Research design and methodology 9
3. Comparing skills outcomes in the UK / England relative to other countries 21
4. Features of high-performing countries: Common characteristics 39
5. Features of relatively high-performing countries: moderating system characteristics 44
6. Examining seven high-performing education systems 48
Austria 51
Canada 54
Estonia 57
Japan 60
Portugal 63
Sweden 66
Switzerland 69
Drawing insights from these seven case study countries 72
Bibliography 74

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Nuffield Foundation

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Glossary

Term	Our definition
Cognitive skills	Mental processing abilities, underpinned by language and literacy skills (which equip people to process information and communicate effectively) and numeracy skills (which underpin decision-making and the ability to interpret complex data).
Socio-emotional skills	Abilities to identify and regulate emotions and use them in decision-making for social situations.
Self-management skills	Abilities to establish and achieve goals by controlling and productively organising thoughts and behaviours.
Socio-emotional index score	Aggregate scores calculated based on young people's scores in PISA 2022 for assertiveness, co-operation, curiosity, emotional control, empathy, persistence and stress resistance (OECD, 2024c). These are calculated for the subset of PISA 2022 countries that gathered data on young people's social and emotional skills.
Numeracy skills	Abilities - as measured in the Survey of Adult Skills (PIAAC) - to access, use, and reason critically with mathematical content, information and ideas represented in multiple ways in order to engage in and manage the mathematical demands of a range of situations in adult life (Educational Testing Service, 2024).
Literacy skills	Abilities - as measured in the Survey of Adult Skills (PIAAC) – to access, understand, evaluate and reflect on written texts in order to achieve one's goals, to develop one's knowledge and potential and to participate in society (Educational Testing Service, 2024).
Problem solving skills	In PISA 2015, collaborative problem solving measured pupils' ability to solve a problem by sharing the knowledge, skills and effort with others to reach a solution (OECD, 2017c). PIAAC 2011/12 measured adults' abilities to understand, evaluate and use information in technology-rich environments (OECD, 2012), and PIAAC 2022/23 focused on adaptive problem solving, assessing the cognitive and metacognitive processes adults use when solving problems (Educational Testing Service, 2024).
Essential Employment Skills (EES)	A set of six skills identified earlier in The Skills Imperative 2035 as especially vital to the future workforce (Dickerson et al., 2023). These skills are a mix of cognitive skills (problem solving and decision making; information literacy; creative thinking), socio-emotional skills (collaboration; communication) and self-management skills (organising, planning and prioritising).

1. Introduction

Background context on The Skills Imperative 2035

The Skills Imperative 2035 is a five-year strategic research programme, funded by the Nuffield Foundation, which is investigating future skills needs, skills supply and skill development, with a particular focus on the 'Essential Employment Skills' (EES) that are projected to be most vital across the labour market in 2035.

Previous research for The Skills Imperative 2035 indicates that the structure of the labour market is likely to continue to change – slowly, but steadily and inexorably – impacting on the jobs that are available (Taylor et al., 2022; Wilson et al., 2022). This change is, first and foremost, driven by advancements in technology, which displace some jobs (because tasks are reallocated from humans to machines) and create or change other jobs to manage the new forms of technology (Carney, 2018; Costa et al., 2024). Demand for lower-skilled workers is projected to decrease whilst demand for higher-skilled workers will increase. Our analysis suggests that more than a million jobs could disappear from declining, lower-skilled occupations in the coming decade (Scott et al., 2024). These changes present opportunities and threats, both for adults in the workforce and for young people yet to join the labour market. In Working Paper 5 of The Skills Imperative 2035, we identified the workers at highest risk of being displaced and discussed the barriers to them successfully transitioning in the labour market (Scott et al., 2024). In this phase, we discuss the implications of changes in jobs and skills requirements for young people.

For highly skilled young people, job growth in professional occupations creates more opportunities for well-paying work. However, declining opportunities in low-skilled occupations also carry a threat for young people who leave the education system without the skills and qualifications to enter growth areas. Our previous research for The Skills Imperative 2035 suggests it will be especially vital they possess sufficient EES (Dickerson et al., 2023), but EES deficiencies are already widespread in the labour market (Bocock et al, 2024). There is a need for more young people to leave the education system with the skills (including EES) and qualifications required to enter growing occupations.

Consequently, in the last working paper from The Skills Imperative 2035 we focused on identifying the factors that are most predictive of young people's cognitive and behavioural outcomes as they progress through childhood, with our hypothesis being that these outcomes are antecedents for EES in young adulthood. We reaffirmed that skills development is highly cumulative, and that inequalities in children's cognitive and behavioural outcomes become more entrenched as they get older (Bocock, Del Pozo Segura and Hillary, 2025b). Differences in children's material, emotional and educational environments at home sow the seeds of these inequalities, which can then be further compounded by differences in the performance of schools they attend. Addressing future skills gaps is likely to require a systematic approach that addresses the structural and behavioural influences on children's development from the early years, both at home and at school.

In this Working Paper, we investigate cross-country differences in young people's cognitive, socio-emotional and self-management skills and identify education system factors associated with higher performance. In this paper, we use data from International Large Scale Assessments (ILSAs) to compare countries across a range of measures of young people's cognitive, socio-emotional and self-management skills. Based on these comparisons, we identify countries that are relatively high-performing on at least one of our skills measures, identify common features associated with higher skills outcomes in those countries and examine how these features are combined and implemented in seven 'high performing' countries. In Working Paper 7 Summary Report of The Skills Imperative 2035 – which accompanies this report but is intended for policy makers and education sector leaders - we explore the implications of our research for how future skills needs might be met in England, particularly the growing demand for EES.

Purpose and structure of this paper

Most education system leaders are keen to learn from other 'high performing' systems beyond their borders, given education systems, despite their differences, share some common objectives and grapple with some similar challenges. However, important gaps in the international, cross-country evidence base have, arguably, led to national and international institutions focusing on too narrow a range of cognitive outcomes and placing too great a focus on identifying 'best practice' and cherry picking features that appear to work effectively elsewhere. The positive effects of this may be limited without an in-depth understanding of the common features associated with high-performance across the existing literature, the inter-relationships between these features, how they can be combined differently, and how their effects are moderated by the contexts in which they operate.

In this paper we extend the existing evidence by:

1. **Comparing the performance of England/UK[1] to international comparator countries based on young people's average skill levels and skills inequalities at age 15/16, including socio-emotional skills recorded for the first time in PISA 2022.**
2. **Comparing England to international comparator countries based on young adults' skills development between the ages of 15/16 and 20-24, including for the first time using data from, PISA 2018 together with PIAAC 2022/23.**
3. **Reviewing the existing literature, assessing it for agreement in terms of the results reported, and distilling the common distinguishing features associated with high-performing education systems**
4. **Creating case studies of high-performing education systems which consider the interdependencies and complexities that exist between different education system features and broader contextual factors**
5. **Relating the findings of our research on high-performing education systems to earlier research from The Skills Imperative 2035 about future skills needs and gaps in England.**

We answer the following Research Questions (RQs):

RQ1. In which countries do young people have higher skills levels and lower skills inequalities than England, making them good candidates for England to learn from?

RQ2. What are the common distinguishing features of education systems that are identified as 'high performing' on the basis of their young people's cognitive skill development?

RQ3. In what ways do countries identified as 'high-performing', based on their young people's skill development, effectively combine and implement these common features?

1 *To compare the performance of 15/16 year olds, we utilise data from PISA 2022 (in which England was the only home nation that participated) and PISA 2018, 2015 and 2012 (in which Wales, Scotland and Northern Ireland also participated).*

Structure of this paper

This paper is structured as follows:

Section 2

Section 2 provides an overview of the research design and methodology.

Section 3

Section 3 compares skills outcomes in the UK / England to other countries.

Section 4

Section 4 identifies common characteristics of high-performing countries.

Section 5

Section 5 identifies moderating system characteristics in high-performing countries.

Section 6

Section 6 examines seven high-performing education systems, compiling case studies on each and summarising what we can learn from these cases.

2. Research design and methodology

This research uses a mixed methods-approach, comprised of the following stages:

Stage 1a: Quantitative analysis:

1. Using PISA (2018, 2022) data, we make cross-country comparisons of the average skills levels and skills inequalities of 15/16 year olds, across cognitive skills (reading, maths and science) and socio-emotional skills. We then assess the change in cognitive skills between 2012 and 2022. We also compare proficiency in collaborative problem solving in 2015 across countries.
2. Using data from PISA (2006, 2018) with PIAAC (2011/1, 2022/23), we approximate country-level changes in average numeracy and literacy skill levels and skills inequalities between the ages of 15/16 and 20–24, and then compare these skills outcomes across the countries that participated in PIAAC.
3. We identify countries that are 'high performing' based on their skills outcomes at age 15/16 and/or skill development outcomes between the ages of 15/16 and 20-24.
4. Our analysis is limited to the domains measured in PISA and PIAAC and we cannot rule out that, if other skills domains had been incorporated, the countries identified as high performing may have differed.

Stage 1b: Literature review:

1. We conducted a review of 25 cross-country comparative studies to identify the common features of education systems in high-performing countries. This review is best regarded as indicative of the evidence-base and does not claim to provide a definitive account of the factors affecting skills development.
2. These studies predominantly draw on data from international large-scale assessments, which typically measure a limited range of skills, and high-performance in other domains may be driven by different factors.

Stage 2: Case studies:

1. We undertook seven case studies of countries identified as 'high-performing' in at least one domain from the quantitative analysis, to better understand how features can be combined and the compromises made by high-performing countries.
2. The case studies drew on literature and desk-research alongside semi-structured interviews with key education leaders and stakeholders in case-study countries.

We address the following research questions within each of our three overarching RQs:	We answer each RQ using a different method:
1. In which countries do young people have higher skills levels and lower skills inequalities than England, making them good candidates for England to learn from? a. How do average skill levels and skills inequalities in England / the UK[2] at age 15/16 compare to OECD averages across a range of cognitive, socio-emotional and self-management skills? b. How does numeracy and literacy skill development in England between the ages of 15/16 and 20-24 compare to other similarly developed countries that have participated in PIAAC? c. How have these comparisons changed over time? d. What countries are the 'highest performers', and therefore candidates for England to learn from?	**RQ1:** Analysis of quantitative data from ILSAs on numeracy, literacy, science and problem solving skills at age 15/16 and on numeracy and literacy skill development between the ages of 15/16 and 20-24, to compare average skill levels and skills inequalities in England to other countries, and to identify high performing countries.
2. What are the common distinguishing features of education systems that are identified as 'high performing' on the basis of their young people's cognitive skill development? a. What system and contextual features have been identified in the existing literature as contributing to cross-country variation in average skills levels and skills inequalities? b. Which are the common features of education system that are relatively high-performing in terms of their young people's skill development? c. Which contextual factors may moderate the effects of these features on skills development?	**RQ2:** A review of existing cross-country comparative evidence, focussing on large-scale academic studies that identify common features of education systems which perform relatively highly in terms of young people's skill development
3. In what ways do countries identified as 'high-performing', based on their young people's skill development, effectively combine and implement these common features? a. What key success factors contribute to their relative success? b. What are the trade-offs / compromises that they are making?	**RQ3:** Case studies of seven countries identified as high performing on different skills outcomes. We examine how countries adopt and enact common features associated with high performance, the trade-offs entailed, and the wider contextual factors that may be contributing to their performance.

The focus of our research is on education in England, however the lessons we draw will carry implications for other countries, particularly other UK nations, and, consequently, where data on the UK is published, we make use of this. We make clear throughout when we have analysed data for UK and where we have analysed data for England.

This remainder of this section provides a summary of how we conceptualise and categorise 'skills', following by the outcomes, data and analyses we use to address the above RQs.

2 *Analysis of PISA 2022 data compares England to international comparators, whereas analysis of PISA 2018, 2015 and 2012 compares the UK to international comparators. This is because England was the only home nation that participated in PISA 2022, but all four home nations participated in PISA 2018, 2015 and 2012.*

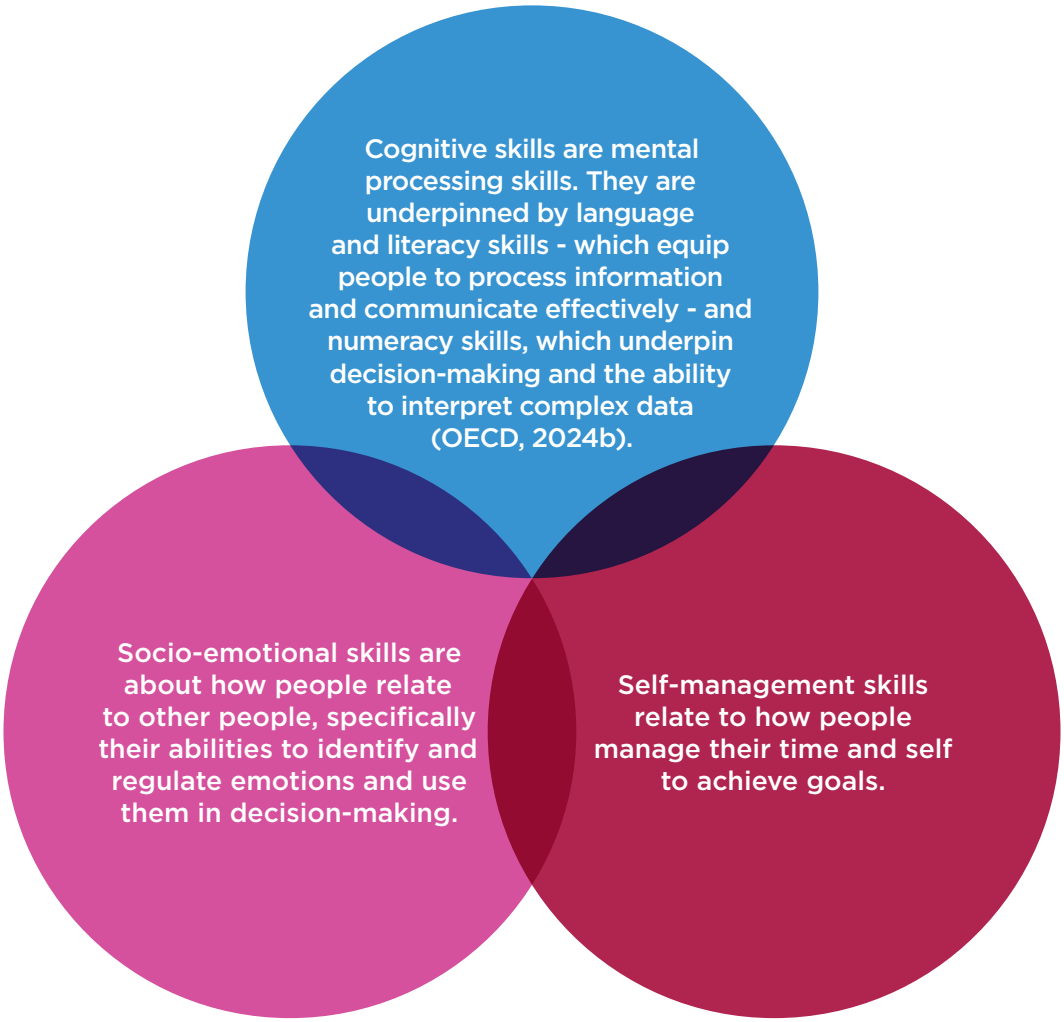
Conceptualising and categorising 'skills'

The primary focus of The Skills Imperative 2035 research programme concerns the future demand for and supply of EES, which are a set of transferable skills projected to be the most heavily utilised skills across the labour market in 2035. However, internationally comparable data on five of these six transferable skills (the exception being problem solving and decision making) is not collected. Our focus in this stage of the programme is, therefore, instead on the factors which explain cross-country variation across a broader set of related cognitive and socio-emotional skills, in line with our hypothesis that young people's cognitive and socio-emotional skills are antecedents for their EES in early adulthood. These EES then, in turn, are likely to have a significant bearing on young people's ability to enter, or progress into, growing, predominantly professional, occupations

Skills are part of a holistic concept of competency that includes cognitive skills, socio emotional skills, self-management skills (and physical and practical skills). To illustrate the relationship between these attributes and EES, we revisit the working model for conceptualising and categorising skills we put forward in Working Paper 6, shown in Figure 1 below. This model is intended to help readers relate the findings from our research into cross-country variation in skill development to future skills needs and skills supply in England, particularly the growing demand for EES.

Our model draws inspiration from Bloom's taxonomy, a framework developed in the 1950s and revised in the 1990s that classifies learning and development into domains, with levels of complexity within each domain that represent a continuum from basic recall of facts / knowledge to higher-order thinking skills such as evaluating and creating (Anderson et al., 2001). Unlike Bloom's taxonomy, we break each domain down into sub-domains. We detail the data sources for measuring people's skills in each sub-domain that we make use of in this study (Working Paper 7) and the last report (Working Paper 6) from The Skills Imperative 2035. We highlight the skills measures that we utilise in this paper.

Our model comprises three distinct but inter-related domains – cognitive skills, socio-emotional skills and self-management skills – which are developed around a set of relatively more stable, constant character traits (values, behaviours and attitudes)[3]:



3 *Psychomotor skills – which require physical as well as mental processes – are not covered in our model*

The distinctions between these three skill domains are not clear-cut, and development in one can complement development in the others. Existing research reaffirms that young people's socio-emotional skills, cognitive skills, self-management skills and transferable 'essential skills' are inter-related and evolve jointly over time, although the complex web of causal relationships between these attributes is extremely difficult to unpick.

There is considerable evidence that socio-emotional skills, including emotional intelligence and behaviour control, are related to cognitive skills, including those measured through academic attainment (Welsh et al., 2001; Payton et al., 2008; Gutman and Schoon, 2013; Duckworth et al., 2019; Sánchez-Álvarez, Berrios Martos and Extremera, 2020). For example, a meta-analysis of the relationship between emotional intelligence and academic performance reaffirms that outcomes across these domains are correlated; whilst correlation is weak for self-assessed emotional intelligence it is much stronger when emotional intelligence is measured through performance-based assessment (Sánchez-Álvarez, Berrios Martos and Extremera, 2020). There is also considerable evidence that conscientiousness / diligence, and resilience / grit are associated with cognitive performance (Mammadov, 2022; O'Connell and Marks, 2022; Gutman and Schoon, 2013). Combined with that, there is evidence that socio-emotional skills and other attributes such as conscientiousness are related to essential skills, akin to our EES, and predict success in school, the labour market and life (e.g. Heckman and Kautz, 2012; Kashefpakdel and Ravenscroft, 2021). This wealth of evidence supports our hypothesis that young people's literacy, numeracy and problem solving skills, as measured in PISA and PIACC, are likely to be closely associated with their EES in young adulthood. We make recommendations for further research in this area. We will also return to examining the relationships between EES and cognitive skills in a subsequent report for this research programme.

Figure 1: Working model for categorising skills into domains and sub-domains

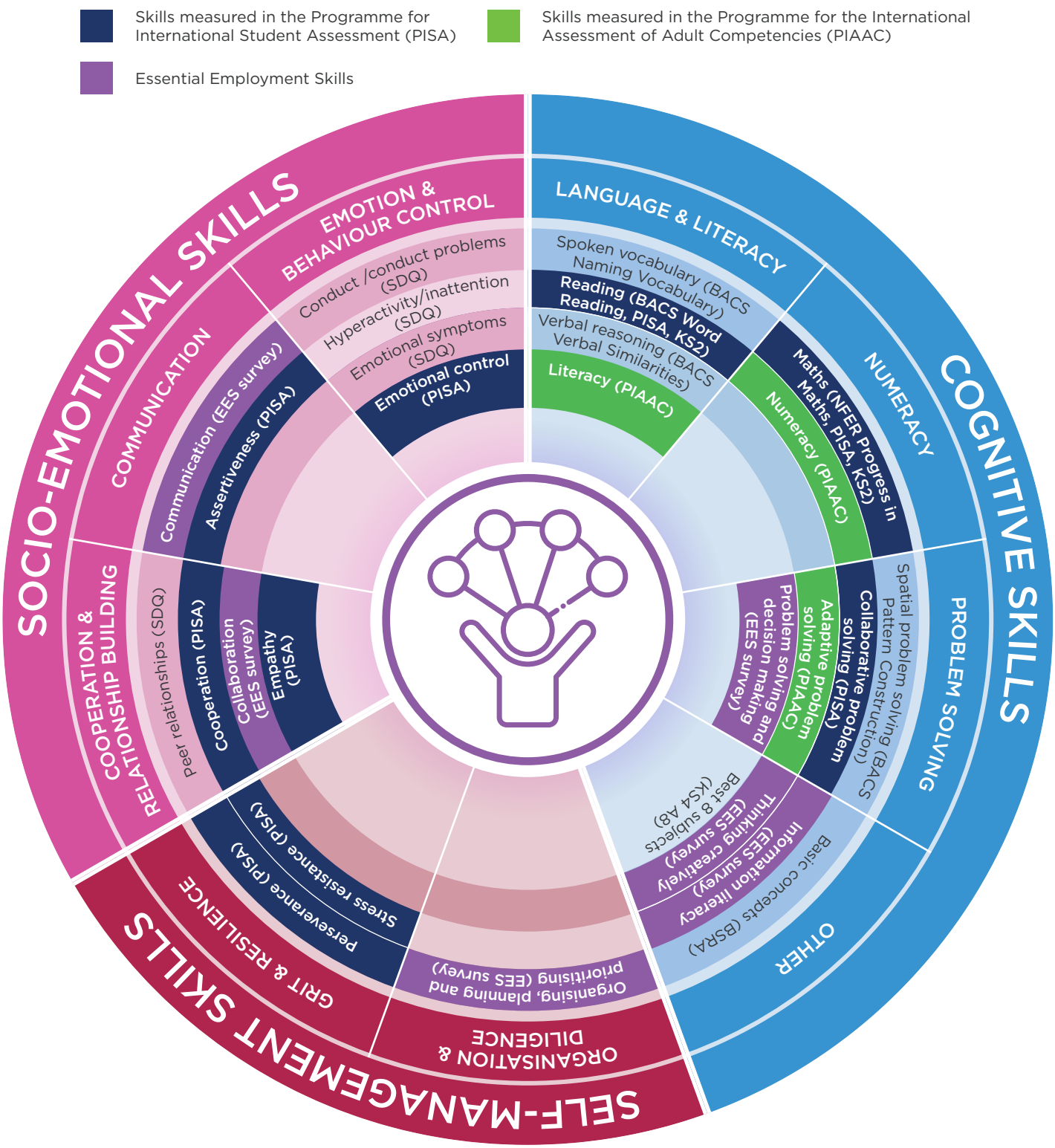


Figure 1 above illustrates how we conceptualise the six EES, which is as a bundle of skills spanning all three domains, including: Socio-emotional skills (1. Communication; and 2. Collaboration), Self-management skills (3. Organising, planning and prioritising) and Cognitive skills (4. Problem solving and decision making; 5. Information literacy; and 6. Creative thinking). In this stage of The Skills Imperative 2035, we identify and examine high-performing countries across a broader set of cognitive, socio-emotional and self-management skills, in line with the hypothesis that these skills are antecedents for EES in early adulthood. Figure 1 above also highlights the measures of children's cognitive, socio-emotional and self-management skills that we use from PISA and PIAAC.

Stage 1a: quantitative analysis

We utilise data from the OECD's Programme for International Student Assessment (PISA) and Programme for the International Assessment of Adult Competencies (PIAAC) to compare skills outcomes in this country with other countries and to identify countries that are relatively 'high performing' on one or more of our skills measures.

The focus of our research is on education in England, but the lessons we draw will carry implications for other countries, particularly other UK nations. Consequently, where data is available on the UK, we make use of this. We make clear throughout when we have analysed data for UK and where we have analysed data for England.

Comparing countries' skills outcomes at the end of lower secondary education

Using PISA data, we compare across countries the average skills outcomes of 15/16-year-olds in reading, maths, science, collaborative problem solving and socio-emotional skills. These are the skills for which internationally comparable PISA data is available. PISA assessments in reading, maths and science measure how well young people can reproduce knowledge, extrapolate from what they have learnt and apply that knowledge in unfamiliar settings (OECD, 2025). In 2022, PISA also assessed pupils' ability to perform tasks, regulate emotions, engage with others, be open minded and collaborate (OECD, 2024d). In 2015, PISA assessed 'collaborative problem-solving', measuring pupils' ability to solve a problem by sharing the knowledge, skills and effort with others to reach a solution (OECD, 2017c). There is no internationally comparable data on young people's levels of EES (with the exception of problem solving skills), which are the focus of The Skills Imperative 2035, and so we examine internationally comparable data on a broader set of related cognitive, socio-emotional and self-management skills, for the reasons outlined in the previous section.

We compare countries' skills outcomes based on their:

1. Average skills levels at age 15/16 in 2022 in reading, maths and science.

2. Inequalities in skill levels at age 15/16 in 2022 in reading, maths and science.

3. Changes in the average skill levels and skills inequalities of 15/16 year olds in reading, maths and science, between 2012 and 2022.

4. The percentage of low achievers at age 15/16 in collaborative problem solving in 2015.

Where we use PISA 2022 data, we compare England to international comparator countries, whereas we compare the UK to other countries where we use PISA 2012, 2015 and 2018 data. This is because all four home nations participated in PISA 2012, 2015 and 2018, but only England participated in PISA 2022.

For reading, maths and science, we calculate four outcome measures and compare the UK's performance on these measures to that of other countries. These measures are: (1) average skill level at age 15/16, (2) change in average skill levels at age 15/16 over time, (3) inequality in skills outcomes at age 15/16, and (4) change in skills inequalities at age 15/16 over time (see Table 1). Average skill levels are calculated as the mean of the standardised scores of all pupils in each country in PISA 2022, which is the most recent cycle of PISA. Changes in average skill levels are calculated as the difference in mean standardised scores for each country in 2022 compared to 2012. Inequalities in skills outcomes are calculated as the difference between the median and tenth percentile of the

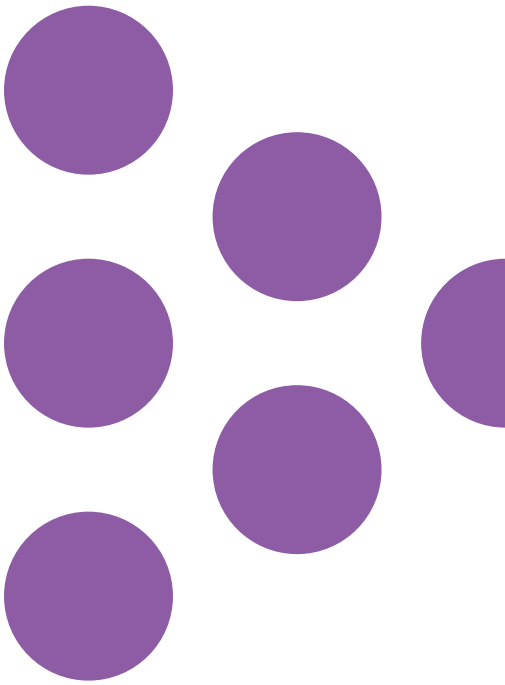
distribution of standardised scores of all pupils in each country in PISA 2022[4]. Change in skills inequalities amongst young people aged 15/16 are calculated as the difference in our skills inequality measure between 2012 and 2022.

Unlike in previous research by Andy Green and colleagues (Green and Pensiero, 2016a; Pensiero and Green, 2018a), we base our measure of skills inequalities on the difference between percentiles of the skills distribution rather than on a relative measure of dispersion such as the Gini coefficient. The Gini coefficient is an indicator that is often used to measure the inequality in the distribution of income within countries, and which has been used in previous research by Green and colleagues to measure skills inequalities. However, our analysis of post-16 skill development relies on comparisons between standardised test scores at age 15/16 and age 20-24, and research suggests relative measures of dispersion are meaningless for interval scales such as standardised test scores (Lee, 2018). This is because increasing the mean and keeping the standard deviation of a scale constant will decrease the Gini coefficient, whilst keeping the mean of the scale constant and increasing the standard deviation will increase the Gini coefficient.

In 2022, PISA also gathered data from a subset of participating countries on the socio-emotional skills of children aged 15/16. Students were asked to respond to questions about their behaviours and feelings to derive scores for their assertiveness, co-operation, curiosity, emotional control, empathy, persistence and stress resistance. From individuals' scores in these domains, we create an aggregate socioemotional index score and then use this to calculate mean standardised scores and skills inequalities for each country, based on the difference between the fiftieth and tenth percentile of the distribution of pupils' standardised socio-emotional index scores. Finally, we calculate the percentage of 15/16 year olds in 2015 that were low performing in collaborative problem solving based on the proportion that fall below level two on a six level scale. We do this because data on proficiency levels in problem solving is publicly available, but raw scores are not. We compare the UK's performance to other countries on these measures.

To compare countries' performance on (1) average skill levels at age 15/16 and (2) inequalities in skills outcomes at age 15/16, for each of reading, maths and science, we plot average skill levels (x-axis) against skills inequality scores (y-axis). We then divide the plot into quadrants based on countries' average skill level and skills inequalities relative to England. This enables us to identify countries with higher average skill levels and lower skills inequalities than England in each domain. We also check the sensitivity of our findings by replicating our analyses using PISA 2018 data to show that the countries we identify are not dependent on the use of 2022 data (which will have been affected by the Covid-19 pandemic). We then examine (3) change in average skill levels at age 15/16 between 2012 and 2022, and (4) change in skills inequalities at age 15/16 between 2012 and 2022.

Our plots capture the impact of pupils' socio-economic, emotional and educational environments (both in and outside of school) from birth to age 15/16. It is not possible to discern how much high-performing countries owe their relative success to features of their education system, or how much this is driven by wider family, societal and economic factors. However, our case studies and our review of the existing evidence base provide some clues as to the contribution that wider societal factors may be making to countries' success.



4 *To check the sensitivity of our findings to the measure of inequality used, we replicated our analysis using the interquartile range of the score distribution and the difference between the median score and the score of pupils at the 25th percentile. These measures and the measure we chose - difference between the median score and the score of pupils at the 10th percentile - were highly correlated (>0.9) for all subjects.*

Comparing countries' skills outcomes between the end of lower secondary education and after the completion of upper secondary education

We then explore how young people's literacy and numeracy skills develop between the ages of 15/16 and 20-24. We initially do this using data from PISA 2006 together with PIAAC 2011/12. PISA 2006 contains the skill levels of students who are aged 15/16 in 2006 and PIAAC contains the skill levels of 20-24 year olds in 2011/12, some of whom would have been in the birth cohort who were 15/16 in 2006. The birth-cohort of 15/16 year olds in PISA 2006 is only roughly matched to the birth cohort of 20-24 year olds in PIAAC 2011/12; PISA data collection was in March to August 2006, which would make 15/16 year olds in this sample roughly 20-22 at the time PIAAC round 1 data was collected between August 2011 and March 2012. However, this is the best match possible from freely available PIAAC data.

Once PIAAC 2022/23 data was made available from December 2024, we repeated this exercise using data on 15/16 year olds in PISA 2018 (collected April to May 2018) and data on 20-24 year olds in PIAAC 2022/23 (collected between August 2022 and June 2023). Again, birth cohorts are only roughly matched across the age bands in these two datasets.

In both cases, we include all countries that participated in both PISA and PIAAC. However, it is important to note that the countries which participated in PISA 2006 and PIAAC 2011/12 differ from the countries that participated in PISA 2018 and PIAAC 2022/23. This means caution is needed when contrasting cross-country skills comparisons from 10-15 years ago with skills development comparisons from more recent data.

PIAAC assesses adults' information-processing skills in literacy, numeracy and problem-solving. In literacy, PIAAC assesses adults' ability to understand, evaluate, use and engage with written text related to a range of contexts (OECD, 2012). In numeracy, PIAAC assesses adults' ability to access, use, interpret and communicate mathematical information and ideas as well as their ability to engage in and manage the mathematical requirements of a range of situations (OECD, 2012). In problem-solving, PIAAC Cycle I measured the ability of adults to understand, evaluate and use information in technology-rich environments (OECD, 2012), whereas PIAAC Cycle II focused on adaptive problem solving, assessing the cognitive and metacognitive processes adults use when solving problems.

To capture the effects of each country's post-16 education and training system on the development of young people's literacy and numeracy outcomes (which are the only domains measured in both PISA and PIAAC), we compare skill development across the countries that participated in PIAAC in terms of the:

- Change in average numeracy and literacy skill levels between 15/16-year-olds in PISA and 20–24 year olds in PIAAC 4-6 years later.
- Change in numeracy and literacy skills inequalities between 15/16-year-olds in PISA and 20–24 year olds in PIAAC 4-6 years later.

PIAAC data is provided for England only, which restricts our comparisons of post-16 skill development to England and other PIAAC participating countries.

For each country, we calculate measures of average skill levels and skills inequalities, in the same way we did for 15/16-year-olds using PISA data (summarised in Table 1). We then replicate this for 20–24-year-olds specifically, producing the same plots we did for 15/16-year-olds in PISA. This was initially done using data from PIAAC 2011/12 but was replicated at the end of the project using data from PIAAC 2022/23 (published in December 2024). To make cross-country comparisons of average skill development between the ages of 15/16 and 20-24, we calculate the difference between the mean standardised scores of 15/16 year olds in PISA and the mean standardised scores of the same / a similar cohort of 20–24-year-olds in PIAAC 4-6 years later, in both maths/numeracy and reading/literacy. We use this comparison to estimate the skill development of cohorts of young people. We initially do this for 15/16-year-olds in 2006, most of whom would be in the 20-24 age band in PIAAC 2011/12 (Cycle 1). Later, we replicate this for 15/16 year olds in 2018, most of whom would be in the 20-24 age band in PIAAC 2022/23 (Cycle 2).

To compare countries' performance, we plot the change in average skill levels between 15/16 and 20-24 against the change in skills inequalities, for maths/numeracy and reading/literacy. Once again, we divide our plots into quadrants to show countries' progress relative to both England and the average across PIAAC participating countries. From these, we identify the countries that appear to be highest performing at increasing average skill levels (between the ages of 15/16 and 20-24) and narrowing skills inequalities.

This method for calculating and comparing changes in countries' average skill levels and skills inequalities has significant limitations which call for caution when interpreting the results:

1. Our selection of case studies was informed by our initial analysis, which used data from PISA 2006 and PIAAC 2011/12. This data was collected over a decade ago and, therefore, does not capture the impact of policy changes in England since 2011/12. Our later analysis of data from PISA 2018 and PIAAC 2022/23 did not inform our case study identification.
2. We do not have access to longitudinal data on individuals' skill development. It is clear from the literature that PISA and PIAAC have differences in design features and standardised PISA and PIAAC scores are not directly comparable (e.g. Hanushek and Woessmann, 2010; Gal and Tout, 2014), however previous research in this area has concluded it is possible to compare results of the same / similar birth cohorts at different ages whilst acknowledging the limitations of this approach (e.g. Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022).
3. Some countries in PIAAC did not disclose the age of respondents in years; to maximise the number of countries in our analysis, using data in the public domain, we compare the skill levels of 15/16-year-olds (in 2006 and 2018) and 20-24 year olds (in 2011/12 and 2022/23, respectively). The latter age bracket does not correspond perfectly with the end of upper secondary (and, where relevant, higher) education and many of those in the 20-24 age bracket in PIAAC 2011/12 and PIAAC 2022/23 would have been older than 15/16 year in PISA 2006 and 2018, respectively.
4. PISA measures respondents' maths and reading performance, whereas PIAAC measures numeracy and literacy skills; these are not precisely the same, but the two surveys draw on similar constructs of literacy and numeracy and the existing literature suggests test-scores across the two surveys are highly correlated (Rindermann, 2007; Hanushek and Woessmann, 2012).

As a consequence of these limitations, our analysis should be interpreted only as an approximation of average skill development between the end of lower secondary education and after the completion of upper secondary (and, where relevant, higher) education.

Table 1: Summary of skills outcome measures

Outcome measures	Domain(s) measured	How was this measured?
Average skill level at age 15/16	Reading Mathematics Science Socioemotional index	Mean standardised score on the relevant PISA proficiency assessment(s) in 2022.
Change in average skill levels at age 15/16 over time	Reading Mathematics Science	Difference in the mean standardised score on the relevant assessments in PISA 2012 and PISA 2022.
Skills inequality at age 15/16	Reading Mathematics Science Socioemotional index	Difference in scores between pupils with the median standardised score compared to pupils scoring at the 10th percentile.
Change in skills inequality at age 15/16 over time	Reading Mathematics Science	Difference in skills inequalities (as defined above) between PISA 2012 and PISA 2022.
The percentage of low performing pupils	Collaborative problem solving	The percentage of pupils within each country who did not achieve Level 2 as defined by the PISA proficiency scale in PISA 2015.
Average skill level at age 20-24	Literacy Numeracy	Mean score on the relevant PIAAC proficiency assessment, in PIAAC 2011/12 and PIAAC 2022/23.
Progress in average skill levels between age 15/16 and age 20-24	Literacy Numeracy	Difference in mean score on the relevant assessments between pupils aged 15/16 in PISA (2006 and 2018) and adults aged 20-24 in PIAAC (2011/12 and 2022/23, respectively).
Skills inequality at age 20-24	Literacy Numeracy	Difference in scores between adults with the median score compared to adults scoring at the 10th percentile, in PIAAC 2011/12 and PIAAC 2022/23.
Progress in skills inequality between age 15/16 and age 20-24	Literacy Numeracy	Difference in skills inequalities (as defined above) in PISA (2006 & 2018) and PIAAC (2011/12 & 2022/23, respectively).

Stage 1b: Literature review

Next, we conduct a review of cross-country comparative studies to identify the common features of high-performing education systems. We adopted an iterative and exploratory approach to literature searching aiming for a balanced range of studies across jurisdictions, phases and topics to give a broad indication of the evidence base. This involved:

1. Initial searches of databases (ERIC, BEI, AEI, Google Scholar and NFER's in-house database), peer review publishers' platforms (Taylor & Francis and Wiley) and websites of international organisations for comparative studies (OECD, Eurydice, Cedefop, NCEE), referencing 'high performing' or 'successful' education systems.
2. Targeted journal and author searches based on key works identified above.
3. Using the reference lists from the above to identify other relevant studies.
4. Country-specific searches across databases, journals and websites.
5. Targeted searches to fill identified gaps.
6. Asking experts for recommendations.

Initial sifting of the search results produced a 'longlist' of 53 items of literature that were assessed by a team of researchers based on the abstract/summary. Quality assurance checks were conducted by an NFER research director on coded items to ensure a consistent and robust approach. This screening process resulted in a shortlist of items that were taken forward for appraisal.

A total of 25 items of literature were then fully appraised, which involved summarising the content and evaluating the quality and relevance of each item. We then synthesised the evidence from the literature into themes to draw out the features associated with skills outcomes, the direction and magnitude of the relationships between features and skills outcomes, the interaction between features and the extent of variability of evidence within each theme. This review was limited in terms of the breadth, depth and assessment of the existing evidence base. For example, focusing on more recent studies means that many older studies which may have been relevant have been excluded.

Attempting to cover a broad range of topic areas in a short time means that many findings are based on a small number of studies. This review also deliberately included studies using a variety of designs which means that evidence from large-scale quantitative studies is included alongside more exploratory, qualitative research. This review is probably best regarded as indicative of the evidence-base and does not claim to provide a definitive account of the factors affecting skills development. It should also be noted that much of the evidence highlights associations and evidence of causal effects is limited.

Finally, it should also be noted that most cross-country comparatives studies reviewed were based on ILSA data such as PISA and PIAAC. As such, the evidence examined was biased towards the cognitive outcome measures most commonly collected through ILSAs, rather than socio-emotional skills that were not measured through PISA until 2022.

Stage 2: Exploratory case studies

The second stage of our methodology involves undertaking seven case studies of education systems in countries whose young people have comparatively higher levels of skills development and/or reduced inequalities when they leave education. The countries were selected based on quantitative analysis completed in Stage 1, which identified clusters of countries that appear to performed more highly in one or more skill domain.

The seven countries selected from this long list as case studies were chosen to maximise the diversity of the education system types examined – we selected at least one country from each type of system as defined by Green and colleagues (Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022). We did this because Green and colleagues show that 'Type 4' systems[5], of which England is one, typically perform relatively poorly in terms of post-16 skill development and skills inequalities. Every case study country selected is different to England in some regard (such as by size, culture or level of devolution and localisation). Practical constraints such as the availability of documentation about the education system in English were also considered when selecting case study countries.

The case studies drew on literature and desk-research alongside structured interviews with key education leaders and stakeholders in case-study countries. Together with the findings from the literature review, these findings identify learning for policymakers and other stakeholders in England to support increased skills development outcomes.

We adopt a systems theory approach to examine education systems in their entirety and consider the contexts in which they operate, accounting for the interdependencies and complexities that exist within large, evolving systems such as education systems (Montouri, 2011). We consider factors within the environment within which they operate. General systems theory allows for the study of the interconnections within and between systems and considers the ways in which systems interact with their environment (Montouri, 2011).This approach better enables us to understand the trade-offs that high-performing countries are making, as well as the implications of insights from high-performing countries for policy makers in England.

Limitations of the research design

Whilst EES are the primary focus of The Skills Imperative 2035, these skills have not been measured in ILSAs, which limits our quantitative analysis to a broader set of related cognitive and social-emotional skills. Our analysis of skill development through upper secondary and higher education and entry to the labour market is limited to cognitive skills. The existing cross-country studies that we review also identify countries that are relatively 'high-performing' based on their outcomes in ILSAs, which have historically focused on cognitive outcomes. Measures of young people's socioemotional skills at age 15/16 were first recorded in PISA 2022 and so do not feature in any of the cross-country comparative studies we reviewed. We cannot rule out that, if other skills domains had been incorporated, the countries identified as high performing may have differed.

Furthermore, it is challenging to define what constitutes a high performing country. For example, higher performance on outcomes at age 15/16 does not equate to higher performance post-16, nor does higher average skill levels equate to higher early labour market outcomes. Similarly, higher performance in some domains (such as mathematics or reading) may come at the cost of lower performance in other domains or greater skills inequalities. In this research, we define high-performing countries as those that either (i) achieve the highest average skills levels and lowest inequalities across a range of cognitive and socio-emotional skills at age-15/16, and/or (ii) make the greatest progress at improving numeracy and literacy skills levels and narrowing inequalities after young people complete lower secondary education.

5 *Type 4' education systems are characterized by a high degree of diversity in both school-based and employment-based programmes of learning.*

3. Comparing skills outcomes in the UK / England relative to other countries

In this chapter, we compare skills outcomes across countries, with the intent of identifying improvement opportunities for England and identifying clusters of high-performing countries that England may be able to draw insights from.

We compare the UK/England's performance to other countries on three sets of outcomes:

1. Pre-16 cognitive skills (England and the UK[6]).
2. Pre-16 socio-emotional skills (England[7]).
3. Post-16 cognitive skills development (England[8]).

We identify groups of countries that perform highly on these skills outcomes, before selecting seven 'high performing' case study countries.

6 *Utilises data from PISA 2022 (England only), and data from PISA 2018, 2015 and 2012 (England, Scotland, Wales and Northern Ireland).*
7 *Utilises data from PISA 2022 (England only)*
8 *Utilises data from PISA and also PIAAC 2011/12 and PIAAC 2022/23 (England only).*

Key Findings:

Pre-16

England has low average levels of socio-emotional skills (curiosity, persistence, emotional control, stress resistance, assertiveness, empathy and co-operation) and high inequalities in these domains relative to other OECD countries.

In England / the UK, average skill levels in reading, maths and science are above the OECD average for pupils aged 15/16, but inequalities in these skills are also marginally higher than average and have not narrowed, relative to other countries, over the past decade.

Four countries (Canada, Estonia, Japan and Macau) appear to have developed education systems that consistently yield higher average skills levels and lower inequalities in maths, reading and science than England / the UK. These countries also had a smaller proportion of 'low achievers' in problem solving than the UK in 2015.

Post-16

Historic data suggests that the average numeracy and literacy skill levels of 20-24 year old adults in England used to be relatively poor, but more recent data suggests this may have changed and 20-24 year olds in England have literacy and numeracy levels that are similar to the average across countries in PIAAC.

Whilst data from 10-15 years ago suggests young adults in England used to make relatively little progress in terms of their literacy and numeracy skill development between the ages of 15/16 and 20-24, more recent data suggests this is no longer the case. The numeracy and literacy skill development of young adults is now better than average in England.

Our analysis identified a cluster countries, including Japan, Austria and Sweden, that are relatively high-performing on the basis of their young people's skills development between the ages of 15/16 and 20-24.

Pre-16 cognitive skills outcomes

Our analysis suggests maths, reading and science skill levels in England in 2022 (and the wider UK in 2018) were relatively high on average, but inequalities in these skills were also marginally higher than the OECD average. In 2022, the average skill levels of 15/16 year olds in England, across reading, maths and science, were above the 75th percentile (based on countries that participated in PISA) and higher than the OECD average. This is roughly in line with what might be expected given the proportion of gross domestic profit (GDP) that the UK spends on education relative to other countries.

Figure 2 presents mean skill scores and skills inequalities for reading, maths and science by country, with the England average shown in red and the OECD average shown in orange. Countries are assigned to quadrants based on their average skill levels and inequalities relative to England. Across all three subject domains, average skill levels in England are higher than the OECD average. However, skills inequalities are also slightly higher than the OECD average, based on data from PISA 2022. In maths and science, England falls in the quartile with the highest levels of inequality when ranked based on skills inequalities alone. We repeated this analysis using data for the UK in PISA 2018, which yielded very similar results, indicating that England / the UK's levels of skill inequality have remained persistently higher than average and this is not an effect of the Covid pandemic.

Figure 2a: Mean reading skill score by level of skill inequality for pupils age 15/16 in PISA 2022 by country

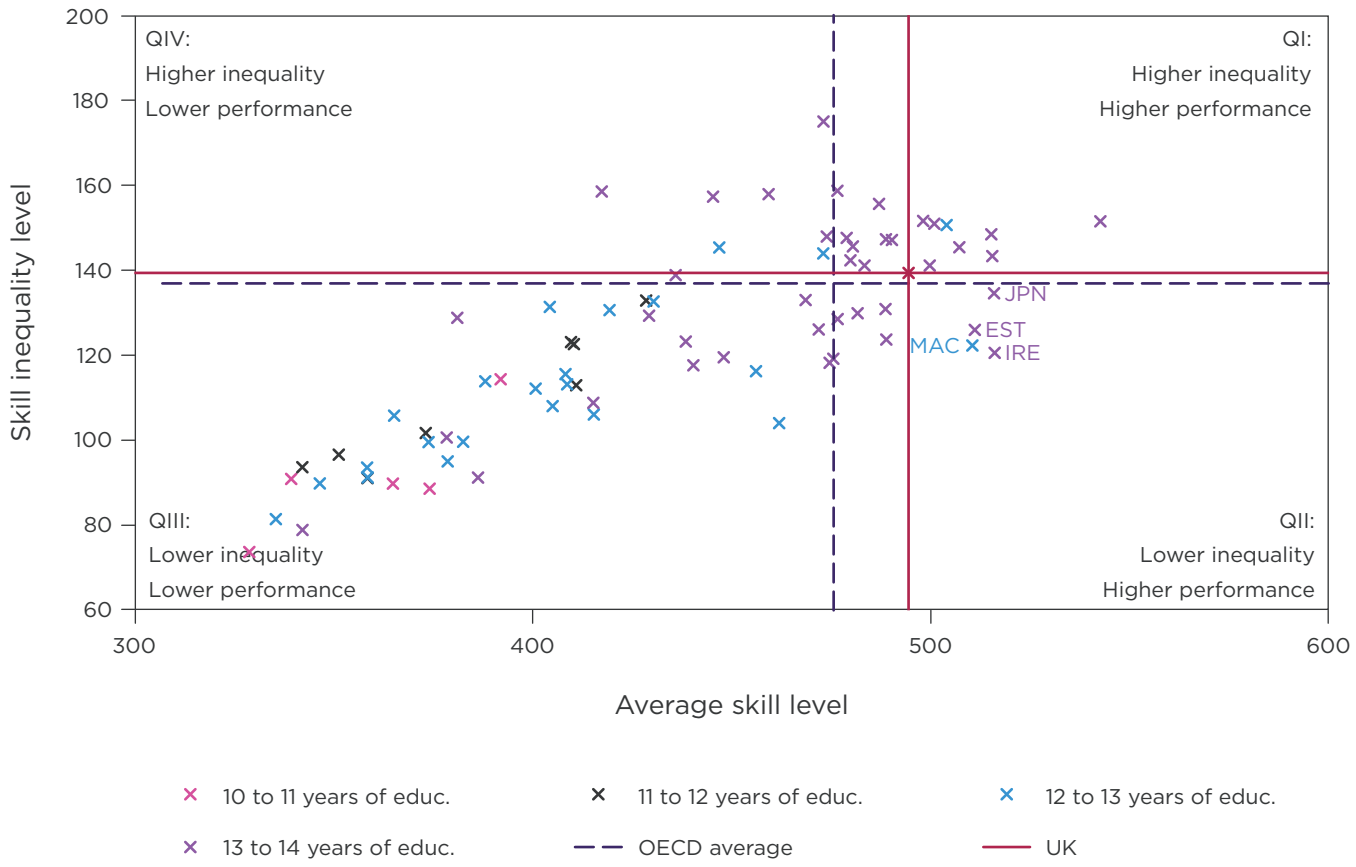


Figure 2b: Mean maths skill score by level of skill inequality for pupils age 15/16 in PISA 2022 by country

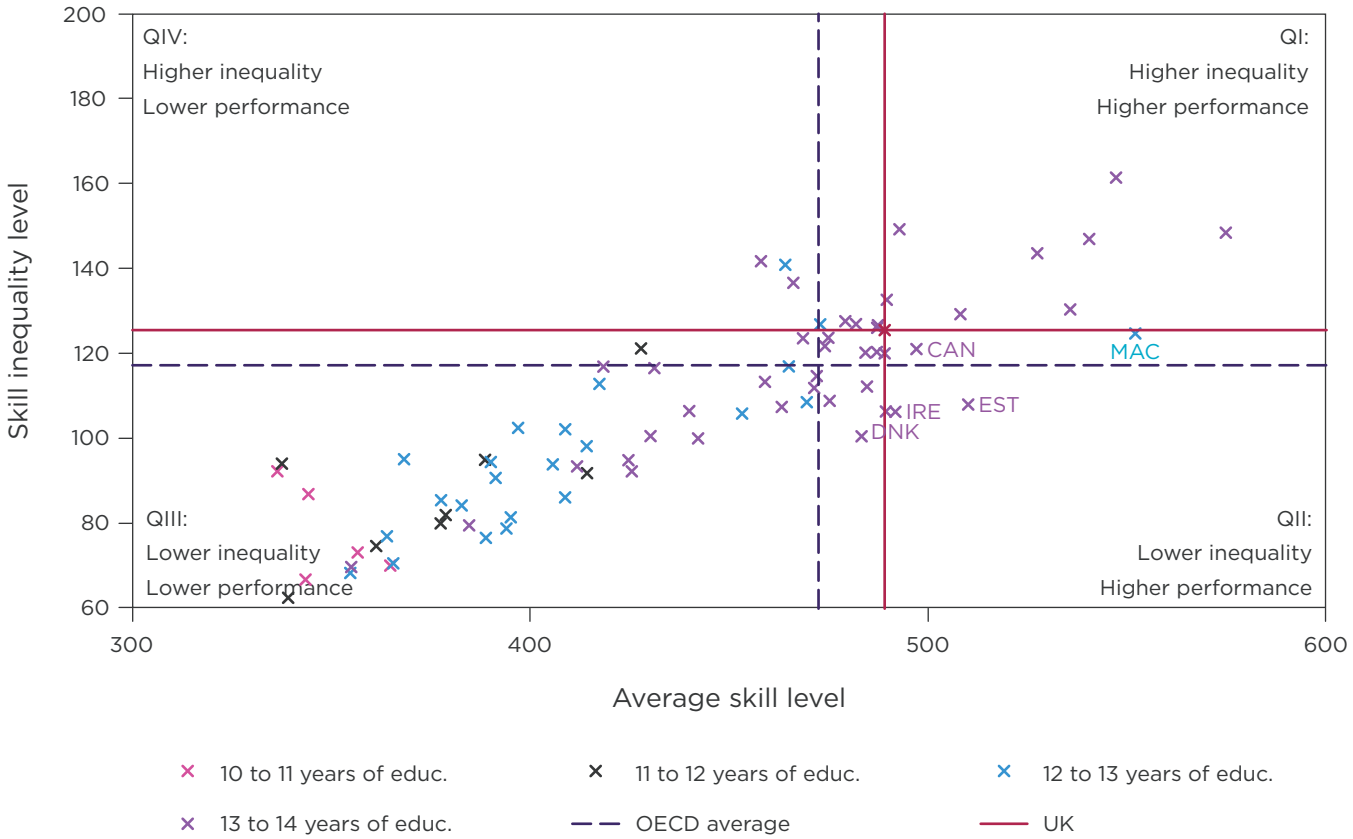
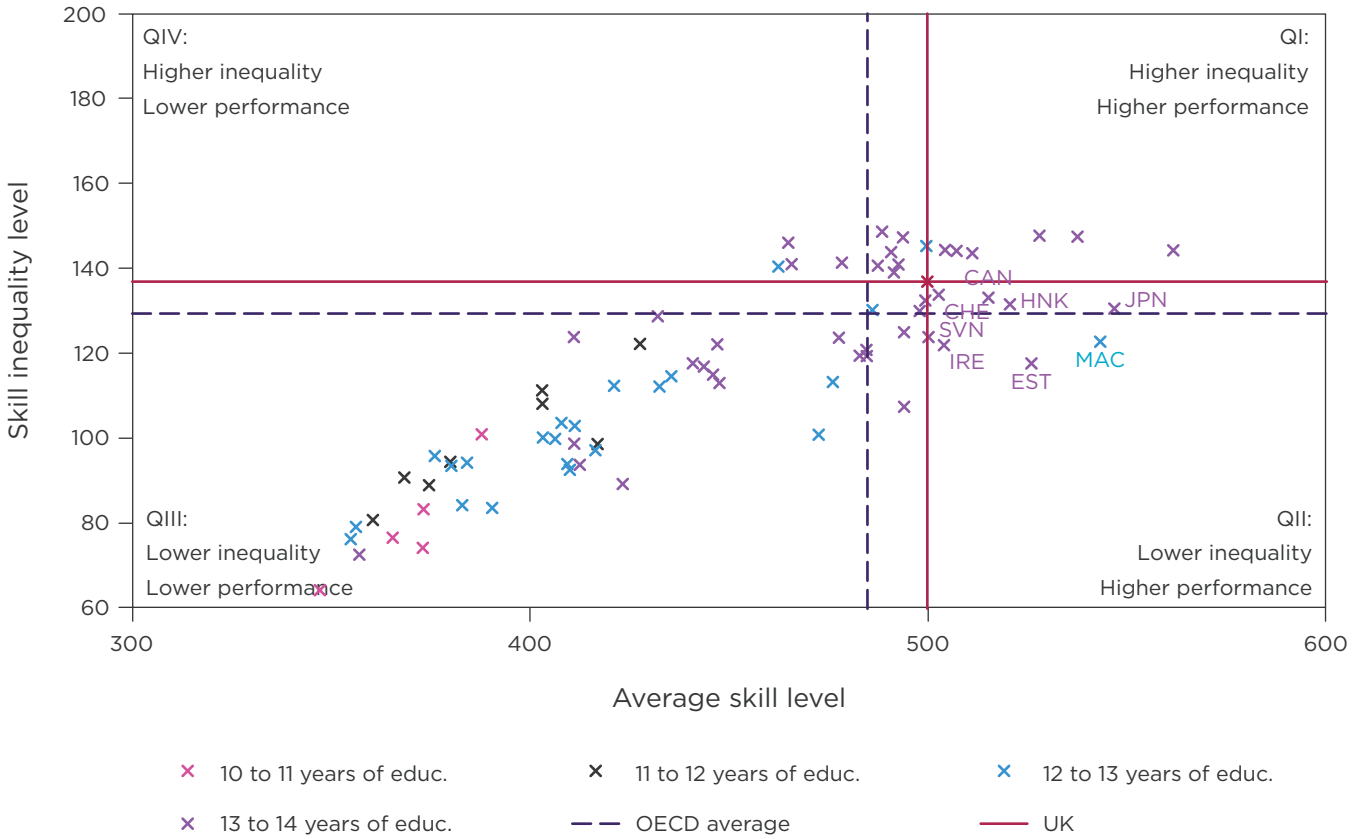


Figure 2c: Mean science skill score by level of skill inequality for pupils age 15/16 in PISA 2022 by country



There is a small cluster of countries that appear to have higher average skills levels and lower inequalities than England in reading, maths and science.

There is a small cluster of countries with both higher average skill levels and lower skills inequalities (at age 15/16) than England across reading, mathematics and science (shown as the countries labelled in quadrant II of Figures 2a, 2b and 2c above). These are summarised in Table 2. The five countries that emerge as having higher average skills levels and lower inequalities than England in 2022 across at least two of these three cognitive domains are: Canada, Estonia, Ireland, Japan and Macau. When this analysis is repeated using PISA 2018 data (in which all four UK nations participated), four of these five countries (Canada, Estonia, Japan and Macau) again emerge as having higher average skills levels and lower inequalities than England / the UK across multiple subjects. This suggests that the factors contributing to their relative success on these skills outcome measures may be attributable to mature, embedded features of their education system and/or wider society (rather than being attributable to recent innovations or policy initiatives).

Table 2: Countries with higher average skills levels and lower inequalities than in the UK by subject*

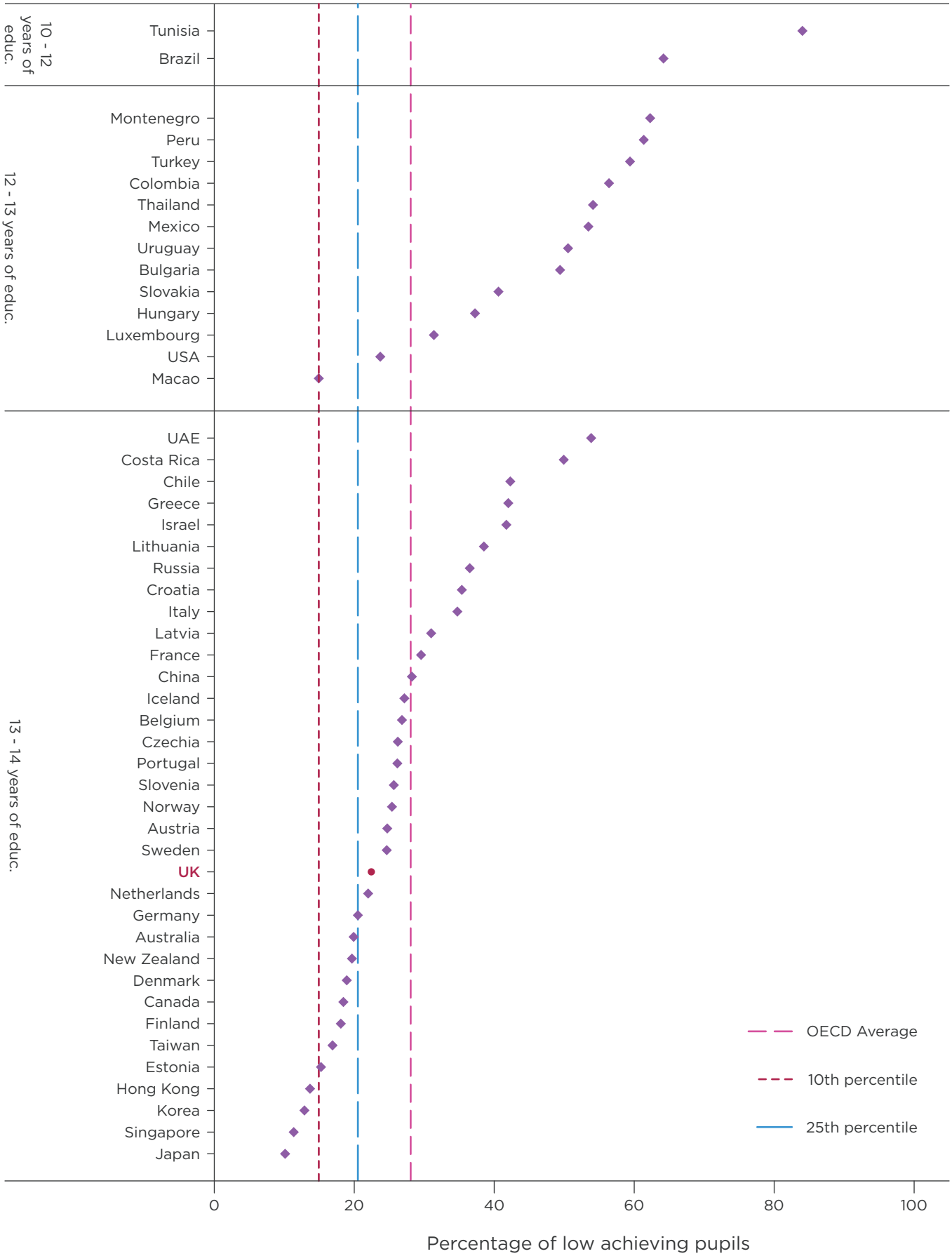
Reading	Maths	Science
Estonia	**Canada**	**Canada**
Ireland	Denmark	**Estonia**
Japan	**Estonia**	Hong Kong
Macau	**Ireland**	**Japan**
	Macau	**Ireland**
		Macau
		Slovenia
		Switzerland

**countries with higher average skills levels and lower inequalities than in the UK across multiple subject domains are indicated in bold.*

Canada, Estonia, Japan and Macau also had a smaller proportion of 'low achievers' in problem solving than the UK in 2015.

Figure 3 shows the proportion of low achieving pupils in Collaborative Problem Solving in PISA 2015 for each participating country, with the percentage for the UK shown in red. Low achieving pupils are defined as those who did not achieve Level 2 or higher according to PISA's proficiency scale. The proportion of pupils with low achievement in Collaborative Problem Solving in the UK was below the OECD average (22.4 per cent and 21.1 per cent respectively). In addition, four of the countries identified above as having higher average skill levels and lower inequalities than England in at least two cognitive domains in PISA 2022 also had fewer low achieving pupils in collaborative problem solving in PISA 2015 (Canada, Estonia, Japan and Macau). No data is available for Ireland on pupil's proficiency in problem solving.

Figure 3: Percentage of low achieving pupils in Collaborative Problem Solving in 2015 by country



The UK is not making progress in narrowing skills inequalities at age 15/16

There was a small decline in mean skill score across all three cognitive domains in the UK / England between 2012 and 2022, although this decline was smaller than the OECD average and is largely attributable to the impact of the Covid pandemic on results in 2022. Most OECD countries participating in both PISA 2012 and 2022 saw a decline in their mean skill score between 2012 and 2022 due in large part to the pandemic's effects on pupils' learning. Overall, the mean score across 81 participating countries declined by 16 points in maths and 11 points in Reading between PISA 2012 and 2022, which equates to around half a year of learning (Major et al., 2024). Over this period, mean maths scores in England declined by 12 points and mean reading scores declined by nine points, reflecting this global downward trend[9] (Major et al., 2024). Between 2012 and 2022, skills inequalities in reading, maths and science widened in England / the UK, as they did across the OECD.

Most of the countries that have been able to narrow skills inequalities amongst 15/16 year olds, whilst also improving average skill levels, are developing countries with fewer average years of education, suggesting that those countries with consistently lower skills inequalities and higher average skill levels are more likely to owe their relative success to embedded features of their education systems, rather than to recent policy initiatives or innovations.

Pre-16 socio-emotional skills

In England, average socio-emotional skill levels across pupils age 15/16 are well below the OECD average and inequalities are well above the OECD average

Figure 4 below shows that, in England, average levels of socio-emotional skills across pupils age 15/16 are well below the OECD average. Digging deeper, our analysis suggests that skill levels in England are lower than average in each of the seven socio-emotional skills used to construct socio-emotional index scores. The UK ranks in the bottom ten countries (of 31 countries that measured socio-emotional skills in PISA 2022) on curiosity, perseverance, emotional control, stress resistance, empathy and cooperation (though not assertiveness). Figure 4 also shows that inequalities in socioemotional skills are higher in England than any of the other 31 participating countries. This result appears to be largely driven relatively large skills inequalities in England in emotional control, stress resistance, assertiveness and perseverance.

The relatively low socioemotional skills level of children in England is likely to be a source of concern for policy makers, given existing research suggests socio-emotional are positively associated with attainment outcomes, and that strong socio-emotional skills can improve individuals' labour market outcomes, including employment prospects and earnings In addition, self-control, locus of control and self-efficacy, emotional intelligence, social problem-solving, empathy, assertiveness and cooperation are identified as skills with a high level of evidence of both teachability and predictive value for other outcomes (Steponavičius, Gress-Wright and Linzarini, 2023). Furthermore, earlier analysis for The Skills Imperative 2035 identified socioemotional skills (specifically communication and collaboration) amongst the six EES likely to be the most heavily utilised skills across the labour market in 2035.

9 *It should be noted that in PISA 2022 the sample of participating pupils in England was not representative of the population nationally and so the estimated decline in scores may constitute an under-estimate.*

Figure 4: Mean socio-emotional skill score by level of skill inequality for pupils age 15/16 in PISA 2022 by country

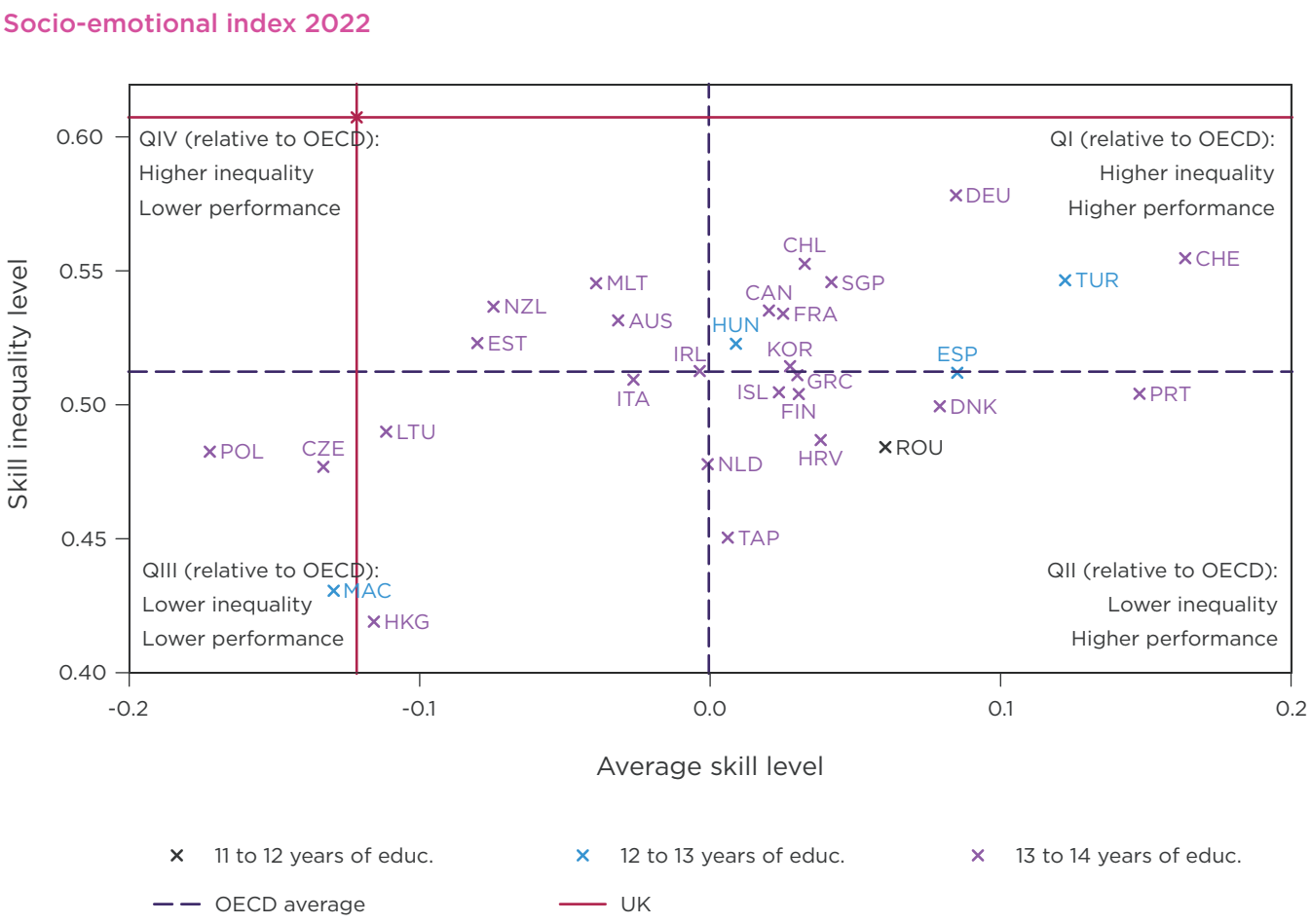
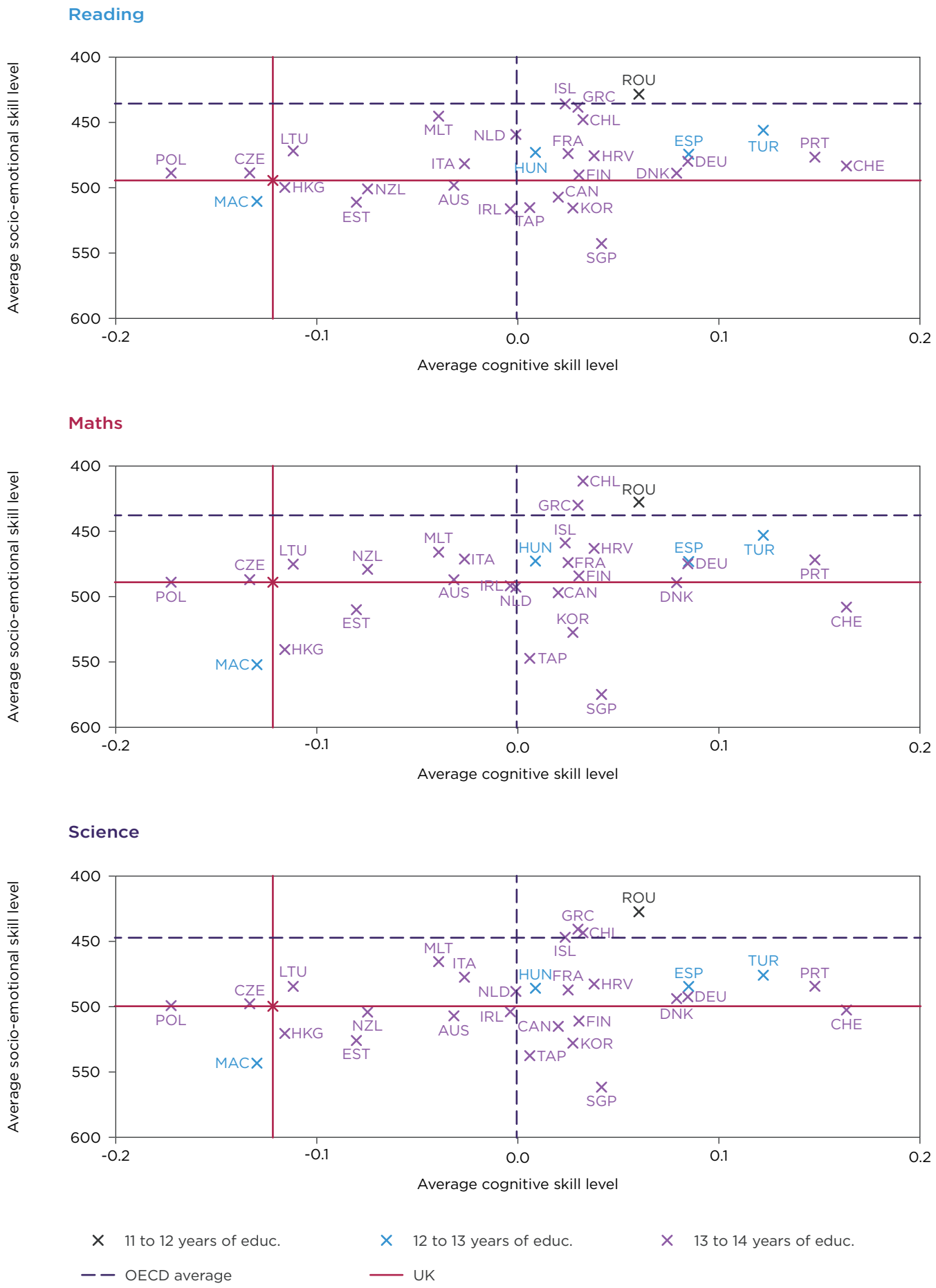


Figure 4 also shows that the countries with the highest average levels of socio-emotional skills have lower inequalities than England. The two countries with the highest average socio-emotional skill levels, which both also have lower skills inequalities than England, are Switzerland (CHE) and Portugal (PRT). These countries differ from the five countries identified earlier as highest performing on the basis of their 15/16 year olds' cognitive skills outcomes. This is perhaps unsurprising when we consider that Figure 5 below suggests countries' average socio-emotional index scores are not correlated with their average reading, maths or science scores. Whilst individual children's socio-emotional index scores are significantly correlated with their reading, maths and science scores, these correlations are weak[10]. These findings suggest that the determinants of children's skill development vary by domain, and that the education system factors associated with high performance in cognitive skills may differ from the factors associated with high performance in socio-emotional skills. This complements earlier research for The Skills Imperative 2035, which showed that the home and school background factors most strongly associated with children's socio-emotional and cognitive development differ (Bocock, Del Pozo Segura and Hillary, 2025b).

10 *Correlations, using pooled individual-level scores across countries: Reading vs socio-emotional index score: corr=0.119; SE=0.005; N=219,006. Maths vs socio-emotional index score: corr=0.150; SE=0.004; N=219,006. Science vs socio-emotional index score: corr=0.144; SE=0.005; N=219,006.*

Figure 5: Correlation between average socio-emotional skill levels and average cognitive skill levels

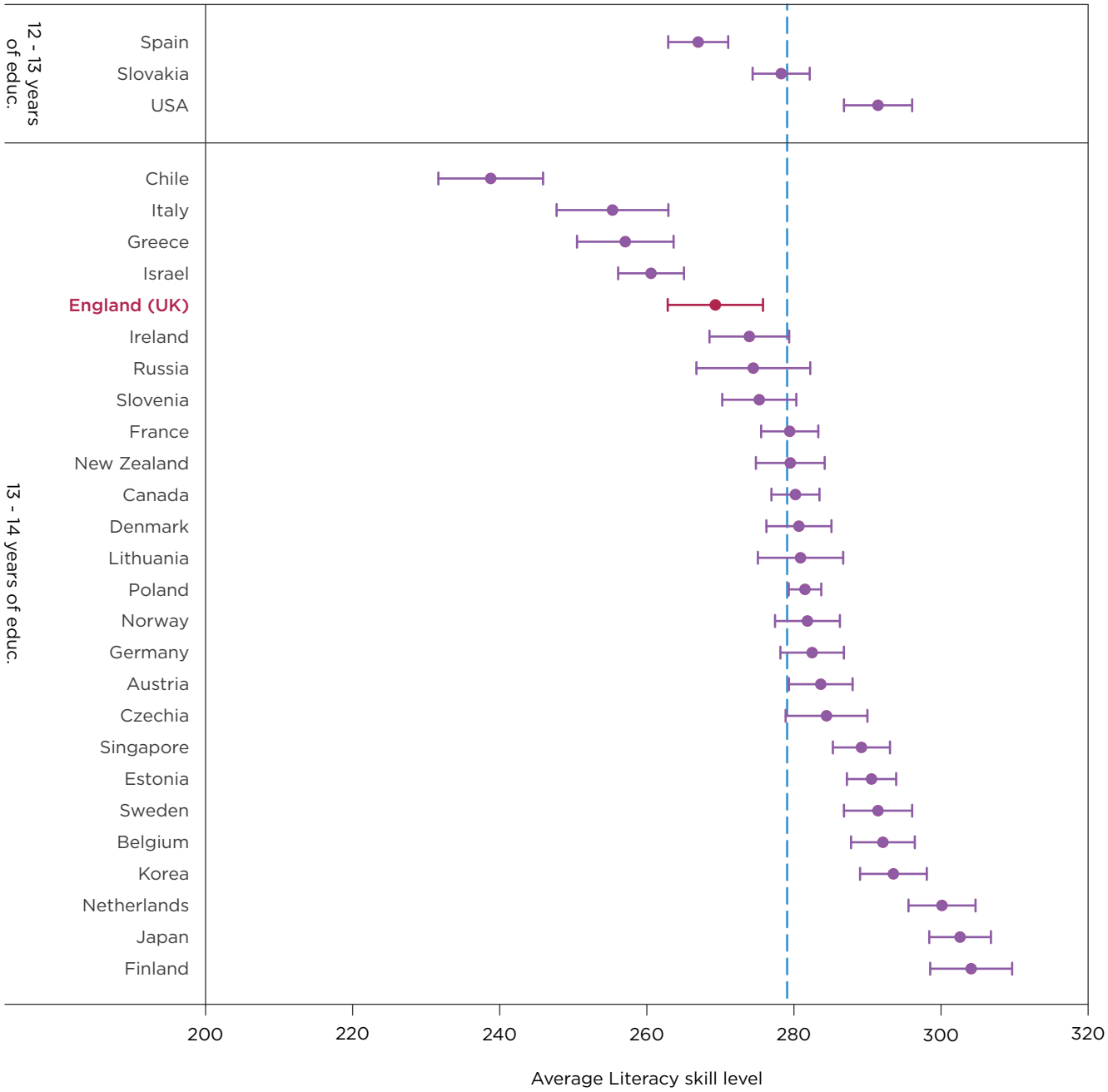


Post-16 cognitive skill development

Amongst 20-24 year olds, average skill levels in numeracy and literacy in England were significantly below the OECD average in 2011/12. However, more recent data from 2022/23 suggests the literacy and numeracy scores of 20-24 have improved significantly in this country.

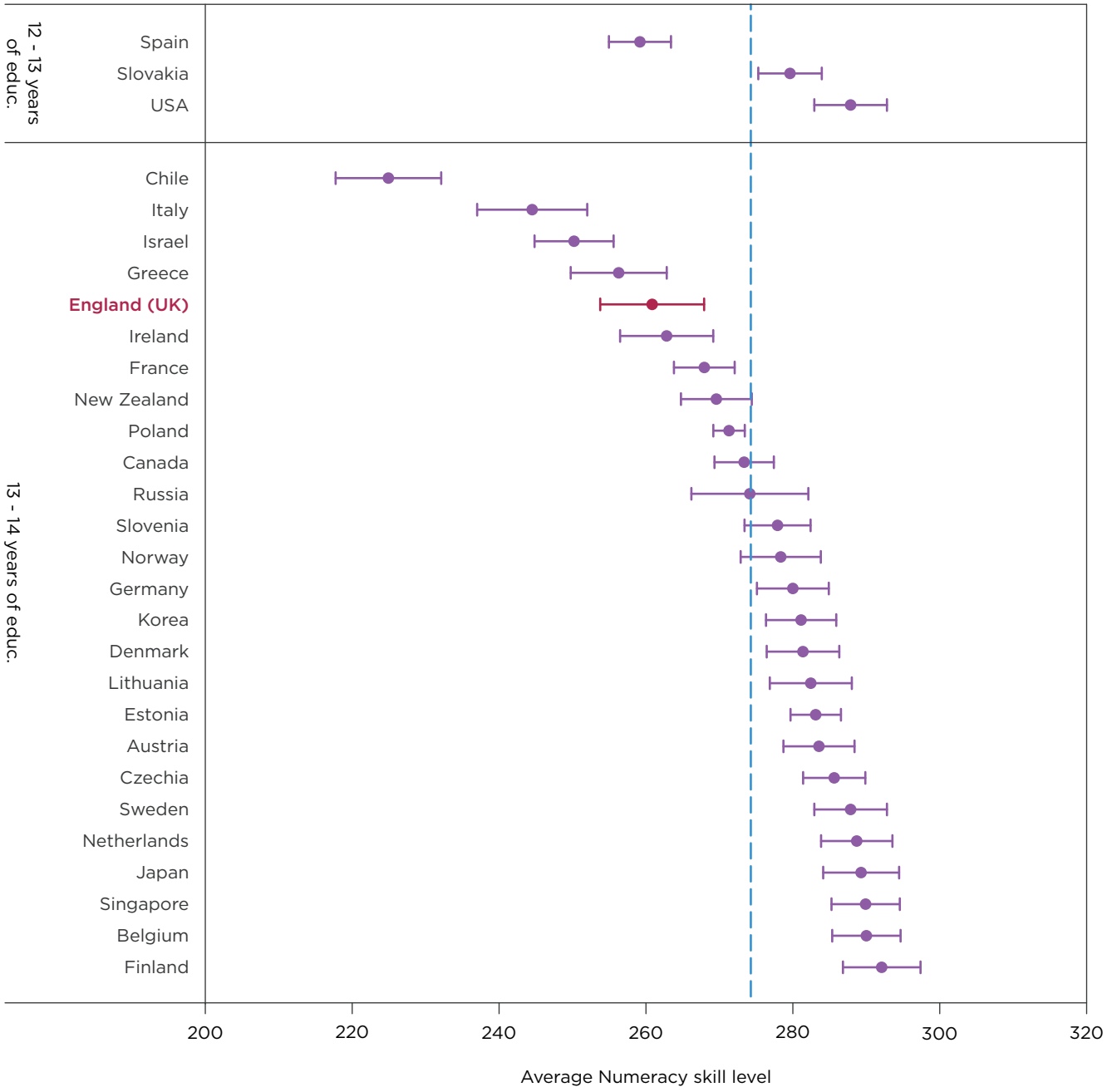
PIAAC 2011/12 data showed that 20–24-year-olds in England had average literacy and numeracy skill levels well below the OECD average, despite young people's average skill levels at age 15/16 in reading and mathematics being above the OECD average. This is shown in Figure 6 (for literacy) and Figure 7 (for numeracy) below.

Figure 6: Mean score in literacy among adults aged 20-24 in PIAAC 2011/12 by country



Note: Blue dashed lines correspond to the average skill level across all the countries shown. All countries, except Northern Ireland and Singapore, are in the OECD.

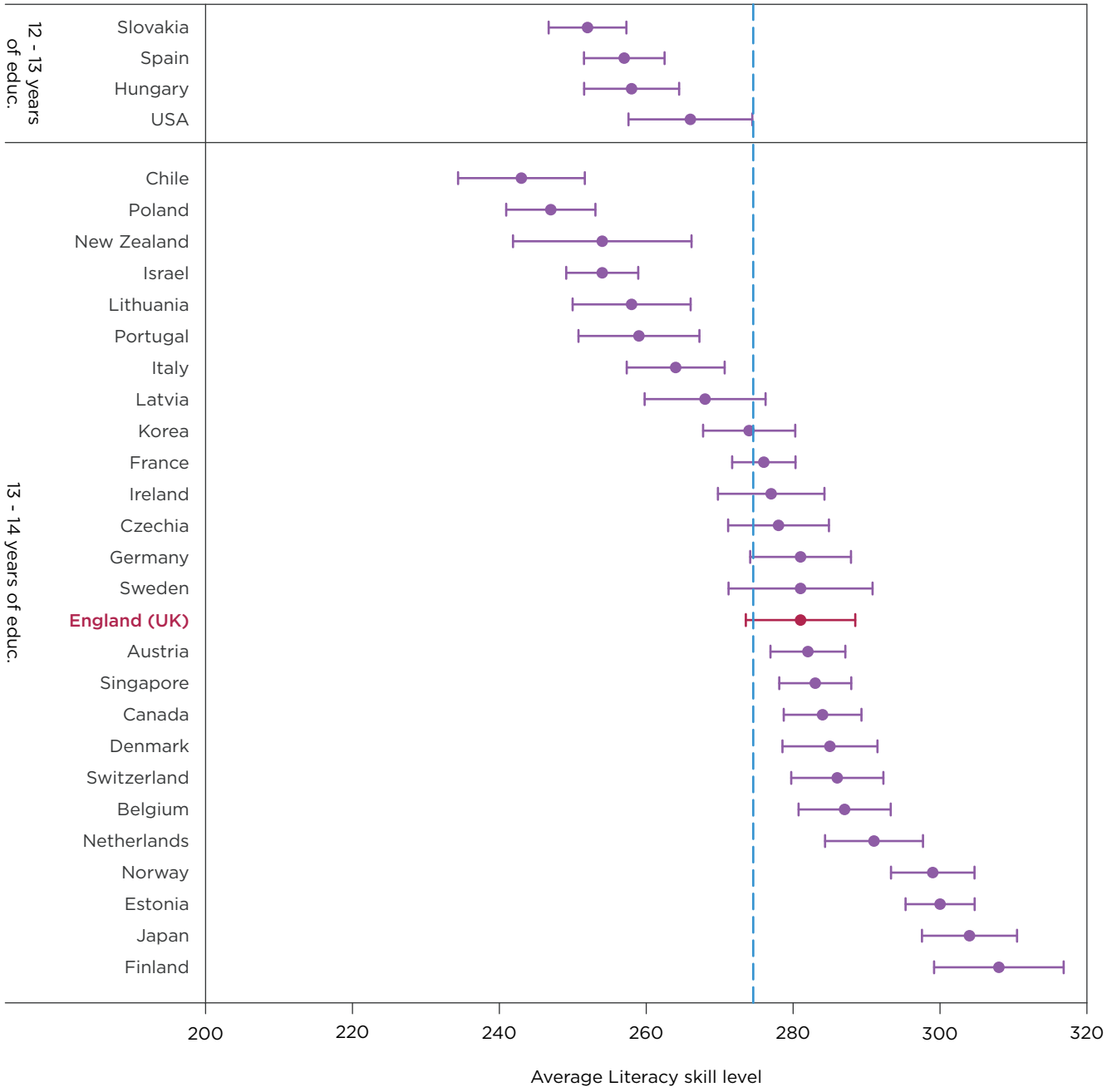
Figure 7: Mean score in numeracy among adults aged 20-24 in PIAAC 2011/12 by country



Note: Blue dashed lines correspond to the average skill level across all the countries shown. All countries, except Northern Ireland and Singapore, are in the OECD.

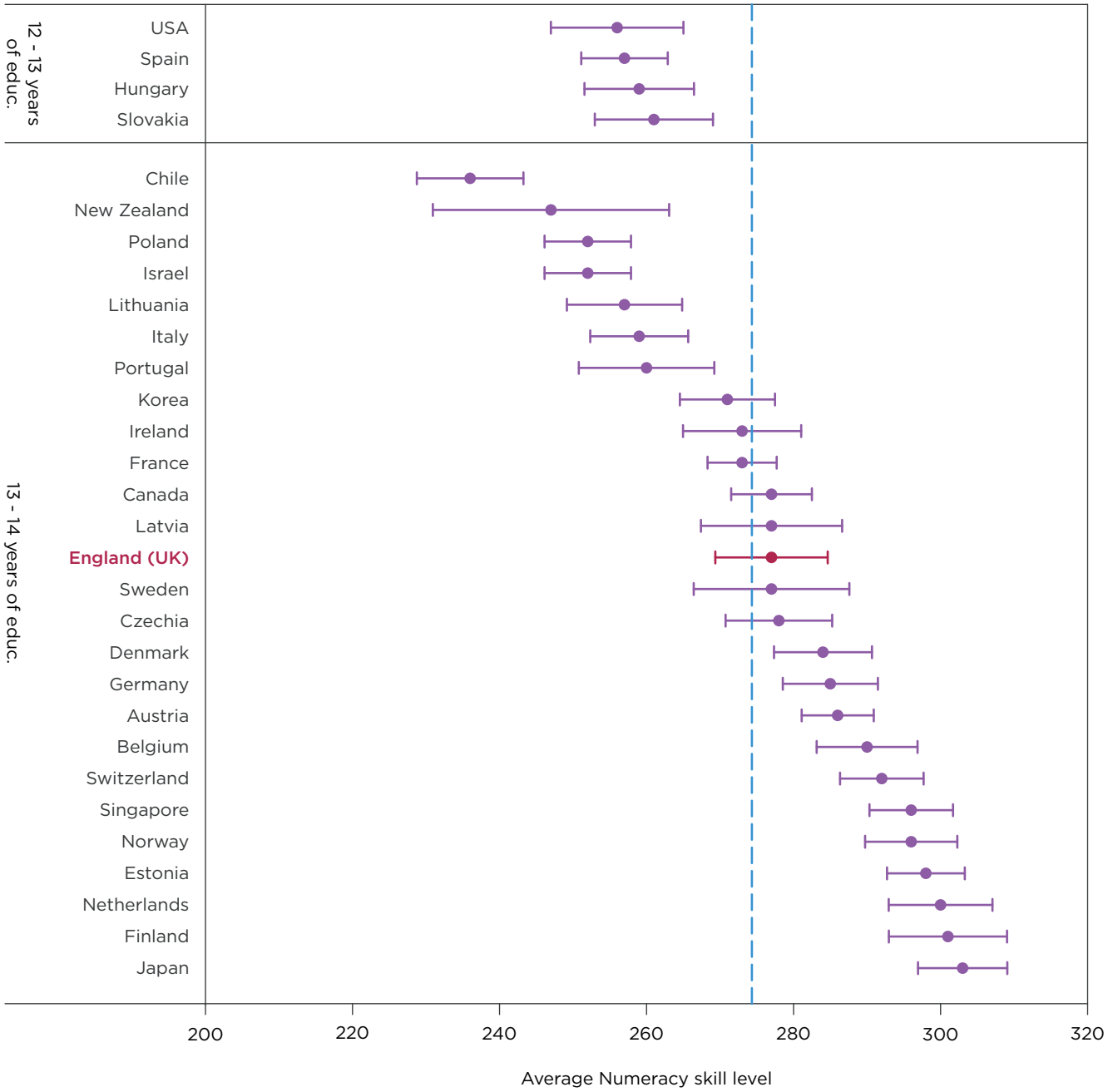
These results, when first published, were widely accepted as evidence that the post-16 education system was failing to sufficiently develop young people's literacy and numeracy skills, despite large proportions of adults progressing to tertiary education (Kuczera, Field and Windisch, 2016; Green and Pensiero, 2016). This helped spur considerable policy focus on developing these skills through upper secondary education, including making maths and English GCSE resits a requirement for those who had not attained strong passes at 16. Recently published data from PIAAC 2022/23 now suggests that young adults in England have significantly improved literacy and numeracy scores compared with their counterparts in 2011/12 (Wheater et al., 2024). Average literacy and numeracy skills amongst 20-24 year olds are now higher (although not significantly different) to the average across countries participating in PIAAC, as shown in Figure 8 (for literacy) and Figure 9 (for numeracy) below.

Figure 8: Mean score in literacy among adults aged 20-24 in PIAAC 2022/23 by country



Note: Blue dashed lines correspond to the average skill level across all the countries shown. All countries, except Croatia, Russia and Singapore, are in the OECD.

Figure 9: Mean score in numeracy among adults aged 20-24 in PIAAC 2022/23 by country



Note: Blue dashed lines correspond to the average skill level across all the countries shown. All countries, except Croatia, Russia and Singapore, are in the OECD.

Historic data suggests that numeracy and literacy skill development between the ages of 15/16 and 20-24 was poor in England and skills inequalities widened. However, recent data presents a much more positive picture.

Historic data on the literacy and numeracy skills of 15/16 year olds in 2006 and similar birth cohorts aged 20-24 year olds in 2011/12 suggests that post-16 skill development used to be relatively low in England and inequalities widened. This is shown in Figure 10 below, which presents the relative differences in mean standardised score and inequalities between 15/16 year olds in PISA 2006 and 20-24 year olds in PIAAC 2011/12. Similar evidence previously provided the impetus for a policy focus on improving numeracy and literacy proficiency through upper secondary education.

Figure 10: The relative differences in mean standardised scores and skills inequality at age 15/16 in PISA 2006 compared to age 20-24 in PIAAC 2011/12, by country

Note: Purple dotted line is drawn at value = 0, which is very close to the average across all countries in the sample.

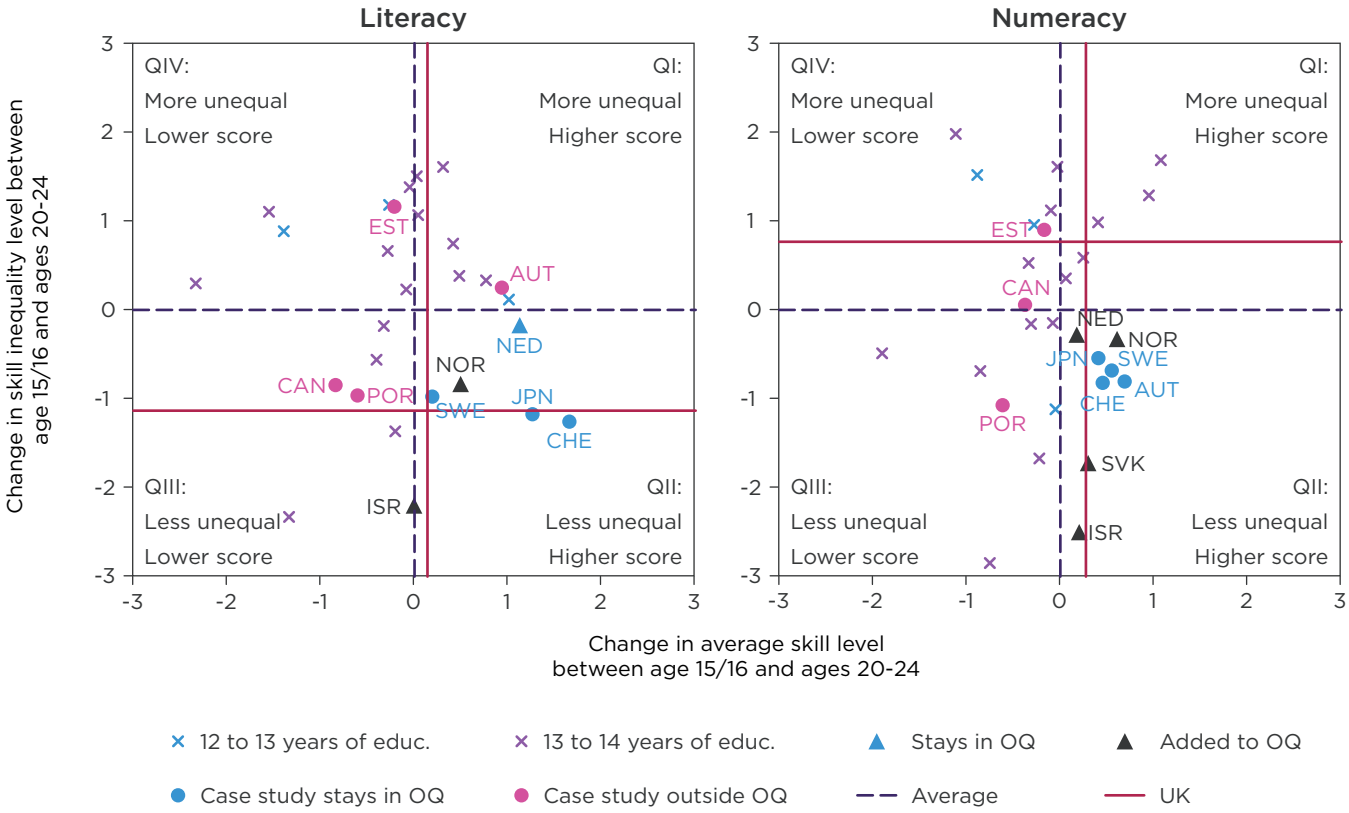
Figure 10 above also highlights the countries where average numeracy and literacy skill development is better than average and skills inequalities narrow between the ages of 15/16 and 20-24. In literacy, these are; Austria, Belgium, Czech Republic, France, Germany, Japan, Netherlands, Sweden, Slovakia. In numeracy they are; Austria, Belgium, Czech Republic, Japan, Lithuania, Russia, Slovenia, Sweden, USA. Only five countries that participated in PIAAC 2011/12 and PISA 2006 achieved this across both literacy and numeracy (Austria, Belgium, Czech Republic, Japan and Sweden).

However, replicating this analysis using more recent data, comparing relative differences in mean standardised score and inequalities between 15/16 year olds in PISA 2018 and 20-24 year olds in PIAAC 2022/23 (as shown in Figure 11 below), suggests that young people's post-16 literacy and numeracy skill development in England is now higher than average and skills inequalities narrow in literacy (although not in numeracy). Explanations for this turnaround require further research, but could be at least partly attributable to policy changes over the last decade, such as the raising of the participation age to 18 in 2015 and 'condition of funding' rules that were introduced in 2014 to made English and maths a compulsory requirement to age 18 for students without strong GCSE passes at age 16.

Figure 11 highlights which countries (using country codes) see average skill levels increase and skills inequalities narrow. These are the countries marked in the bottom right quadrant (QII), which we refer to as the Optimal Quadrant (OQ). Blue markers show which of these countries were also in the OQ in our analysis of PISA 2006 and PIAAC 2011/12 data[11]. Black markers indicate those countries that are now in the OQ based on recent data, but were not based on data from 10-15 years ago. Circular markers highlight our selected case study counties (see 'Case study selection' below) and triangular markers indicate countries in the OQ that were not selected as case studies. The purple line indicates the average across countries participating in PIAAC and the red line aids comparison with England's results. Figure 11 below, when compared to Figure 10 above, suggests that there are now fewer countries which have higher average levels of post-16 skills development than England and which also narrow skills inequalities. Of our case study countries, Japan and Switzerland have higher average levels of literacy skill development than England and skills inequalities narrow more than in England. Japan, Sweden, Norway, Austria and Switzerland have higher average levels of numeracy skill development than England and skills inequalities also narrow (whereas they do not in England).

11 *It is important to remember that countries' performance in analysis of PISA 2006-PIAAC 2011/12 and analysis of PISA 2018-PIAAC 2022/23 are not directly comparable, for example because the countries in the first sample do not exactly match the countries in the second sample.*

Figure 11: The relative differences in mean standardised score and level of skills inequalities at age 15/16 in PISA 2018 compared to age 20-24 in PIAAC 2022/23, by country



Note: Purple dotted line is drawn at value = 0, which is very close to the average across all countries in the sample. 'OQ' stands for Optimal Quadrant (QII: Higher average, lower inequality). Labels 'Stays in OQ', 'Added to OQ' and 'Case study stays in OQ' refer to whether these countries were also in the Optimal Quadrant in analysis of earlier data, (PISA 2006 together with PIAAC 2011/12).

Case study selection

Case study countries were selected on the basis that they either have:

1. **Higher average cognitive skill levels and lower inequalities than England at age 15/16 (in at least two of: reading, science, maths).**

2. **Higher average socio-emotional skill levels and lower skills inequalities than England at age 15/16**

3. **Historically[12], better improvements in average numeracy and literacy skills and skills inequalities between the ages of 15/16 and 20-24 when compared to England.**

Shortlisted countries are summarised in Table 3 below:

Table 3: Initial case study country shortlist

Pre-16 cognitive outcomes	Pre-16 non-cognitive outcomes	Post-16 cognitive outcomes
Estonia	**Portugal**	**Austria**
Canada	**Switzerland**	Belgium
Ireland		Czech Republic
Japan		**Sweden**
Macau		**Japan**

Seven case study countries were selected from this shortlist: Austria, Canada, Estonia, Japan, Portugal, Sweden and Switzerland (highlighted above). Portugal and Switzerland were selected because they had the highest average socio-emotional skill levels in PISA 2022. Estonia and Canada were selected because of their pre-16 cognitive skills. Japan was selected because of both its pre- and post-16 outcomes, and Sweden and Austria were selected on the basis of their post-16 cognitive skill development. The seven case study countries selected from the above shortlist were chosen to maximise the diversity of system types considered, with practical constraints such as the availability of documentation in English also playing a role.

They all differ from England in a variety of ways (such as size, culture and level of devolution or localisation) and none of these countries is universally high performing across all the outcome measures analysed, reinforcing the need for cautious interpretation of findings from the case studies.

Of those countries selected on the basis of their post-16 outcomes, updated analysis on the relative differences in mean standardised score and levels of inequality between 15/16 year olds in PISA 2018 compared to 20-24 year olds in PIAAC 2022/23 (which was conducted after the case studies were created) suggests that Japan, Austria and Sweden continue to outperform England. In Japan, changes in average literacy

12 *Due to the timing of case study data collection, case study countries were selected based on our initial analysis of the relative differences in mean standardised score and levels of skills inequalities at age 15/16 in PISA 2006 compared to 20-24 year olds in PIAAC 2011/12, whereas analysis of PISA 2018 and PIAAC 2022/23 data was completed later.*

and numeracy skills and skills inequalities between the ages of 15/16 and 20-24 continue to compare favourably to England. In Austria, changes in average numeracy skills and skills inequalities compare favourably to England, and in literacy Austrians average progress in literacy is greater than England, although inequalities widen. In Sweden, average literacy outcomes are similar to England but average numeracy skills are higher, and skills inequalities narrow in both literacy and numeracy (whereas they only narrow in literacy in England). Table 5 summarises the performance of each of the seven case study countries.

In six of our seven case study countries (all except Austria), analysis of PIAAC 2022/23 data suggests that average literacy and numeracy skill levels are higher than the OECD average across almost all age groups in the adult population (Figure 12). One potential explanation for this is that the average skill levels of young people entering the labour market have been consistently higher than the OECD average in these countries over a sustained period. This motivates the focus of our case studies on embedded features and structures of these education systems (as well as facilitating features of the wider societal, cultural and economic context), rather than on recent policy changes or innovations.

Figure 12: Mean standardised score for literacy and numeracy in PIAAC 2022/23 by age group by country

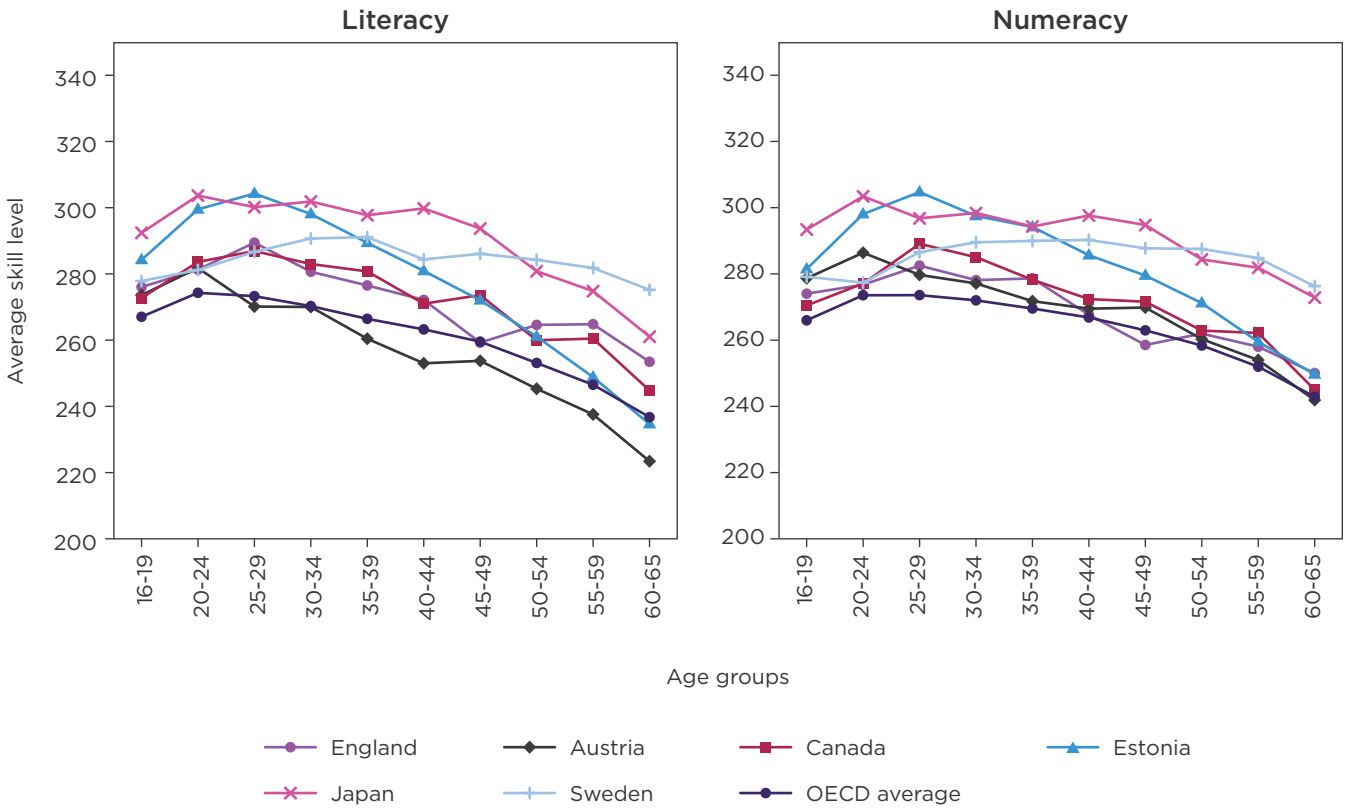


Table 4: Performance of each country against the pre- and post-16 skills outcome measures*

Case study country	Pre-16					Post-16	
	Reading (2022)	Maths (2022)	Science (2022)	Collaborative problem solving (2015)	Socio-emotional skills (2022)	Literacy development between 15/16 and 20-24 (PISA 2018 & PIAAC 2011/12)	Numeracy development between 15/16 and 20-24 (PISA 2018 and PIAAC 2022/23)
Austria	Average skill levels, but relatively high skills inequalities	Relatively high skill levels (top quartile), but high skills inequalities	Average skill levels, but relatively high skills inequalities	Fewer low achievers than average	No data	Above average skill development and skills inequalities remain similar	Higher than average skill development and skills inequalities narrow
Canada	Relatively high skill levels (top decile), but high skills inequalities	Relatively high skill levels (top quartile), but above average skills inequalities	Relatively high skill levels (top decile), but high skills inequalities	Fewer low achievers than average (top quartile)	Average skills levels and skills inequalities	Below average skill development but skills inequalities narrow	Below average skill development and skills inequalities remain similar
Estonia	Relatively high skill levels (top decile) and well below average skills inequalities.	Relatively high skill levels (top decile) and well below average skills inequalities.	Relatively high skill levels (top decile) and well below average skills inequalities.	Fewer low achievers than average (top quartile)	Lower than average skill levels (bottom quartile) and average skills inequalities	Average skill development but skills inequalities widen	Average skill development but skills inequalities widen
Japan	Relatively high skill levels (top decile) but average skills inequalities.	Relatively high skill levels (top decile) but above average skills inequalities	Relatively high skill levels (top decile) but average skills inequalities	Fewest low achievers of any country recorded	No data	High skill development and skills inequalities narrow	Above average skill development and skills inequalities narrow
Portugal	Average skill levels, but skills inequalities well below average.	Average skill levels and skills inequalities.	Average skill levels, but skills inequalities well below average	Fewer low achievers than average	Second highest average skill level and skills inequalities below average	Below average skill development; favourable change in skills inequalities	Below average skill development but skills inequalities narrow
Sweden	Relatively high skill levels (top quartile) and relatively high skills inequalities (top decile).	Average skills levels, but relatively high skills inequalities (top quartile)	Average skills levels, but relatively high skills inequalities (top decile)	Fewer low achievers than average	No data	Average skill development and skills inequalities narrow	Average skill development and skills inequalities narrow
Switzerland	Relatively high skill levels (top quartile) and above average skills inequalities.	Relatively high skill levels (top quartile) and relatively high skills inequalities (top quartile)	Relatively high skill levels (top quartile) and relatively high skills inequalities (top quartile)	No data	Highest average skill level and relatively high skills inequalities (top quintile)	High skill development and skills inequalities narrow	High skill development and skills inequalities narrow

**Note: Average skill levels and inequalities are compared to either OECD averages (in the case of pre-16 outcomes) or averages across all participating countries, most of whom are in the OECD (in the case of post-16 outcomes). Post-16 outcomes are given based on revised analysis of PISA 2018 and PIAAC 2022/23 (rather than the analysis of PISA 2006 and PIAAC 2011/12 that informed the case study selection).*

4. Features of high-performing countries: Common characteristics

In this chapter, we distil the common characteristics of relatively high-performing countries, based on a review of 25 high-quality cross-country comparative studies and case study evidence. We discuss evidence on the impact of early childhood education and care (ECEC), curriculum, tracking (also known as differentiation) and vocational education on cognitive skills attainment and inequalities. Finally, we identify features of education systems that appear not to be important determinants of skills outcomes. As discussed in the methodology (Section 2: Research design and methodology), the available literature typically draws on data from ILSAs and so largely examines the relationship between system characteristics and cognitive skills, typically across reading/literacy, maths and science.

Key Findings:

Regular attendance at ECEC settings with a high quality workforce and standard of provision may be beneficial to pupils' outcomes later in life.

Compulsory provision of maths and literacy throughout upper secondary education across all routes, including vocational, helps reduce inequalities in numeracy and literacy skills outcomes.

Higher proportions of young people studying numeracy and literacy throughout upper secondary also helps reduced inequalities in numeracy and literacy.

Tracking contributes to greater inequalities in skills development and lower outcomes for pupils from lower SES families. However, this can be offset by other features of education systems, including curriculum standardisation.

Greater regard for vocational pathways as alternatives to academic qualifications which offer good outcomes for participating students supports improved skills outcomes and reduced inequalities, particularly in the context of tracked systems.

High-performing education systems have clearly defined accountability and assessment systems but no specific approach to accountability or assessment appears to be associated with improved skills development.

Early years provision: making a good start

Attending ECEC may be beneficial to pupils' outcomes later in life, with the quality of both the provision and workforce in ECEC settings key to improving outcomes.

Two studies included in our literature review provided evidence on the relationship between skills outcomes and ECEC. Balladares and Kankaraš (2020) conclude that attending ECEC at ages 2/3 was associated with a significantly higher reading score than that for pupils who did not attend ECEC until one year later at ages 3/4, and these differences were similar for maths scores and science scores.

Existing research also suggests a higher quality ECEC workforce is associated with higher outcomes. For example, Balladares and Kankaraš (2020) found that pupils who had attended an ECEC where they were supervised by trained staff (e.g. those holding pedagogical qualifications for educators) scored between 15-20 points higher across their reading, mathematics and science outcomes than pupils who had been supervised by untrained staff. Similarly, a literature review conducted by the (Brown et al., 2023) found that requiring higher education qualifications among the ECEC workforce was associated with better child outcomes, particularly for children from low-income families. They suggest that this is because more highly qualified staff are able to provide a higher standard of provision to children. The review found countries with a high-quality ECEC workforces typically used three key approaches: raising initial qualification requirements, improving salaries and benefits available to staff and ensuring staff access ongoing professional development. In the UK, Early Years Educators are required to hold a level 3 qualifications (A-levels or equivalent), while Early Years Practitioners are required to hold a level 2 qualifications (DfE, 2024). They also found increasing the staff to children ratio is associated with better quality provision within ECEC settings as it allows staff to provide more responsive care to each child. This appears to particularly benefit disadvantaged children who may be behind in areas of their social, behavioural and/or language development compared to their peers (Brown et al., 2023).

There is mixed evidence on the extent to which ECEC may reduce inequalities among pupils from different socio-economic backgrounds.

Evidence from Balladares and Kankaraš (2020) found that ECEC attendance alone did not appear to reduce the gap in outcomes between advantaged and disadvantaged pupils, possibly because pupils from more affluent families are likely to access higher quality ECEC provision than pupils from disadvantaged families. However, evidence from Brown et al. (2023) suggests that ECEC can help to narrow inequalities where disadvantaged families are targeted for high-quality ECEC provision and by incentivising disadvantaged families to enrol their children in ECEC. In the UK, children aged two or younger are less likely to participate in childcare if they come from a family in the bottom income tertile than the top tertile (32 per cent compared to 59 per cent). This participation gap is notably larger than the OECD average (27 percentage points compared to 19 percentage points) (OECD, 2024a).

Curriculum: maths and literacy provision

The literature suggests that compulsory study of maths and literacy during upper secondary education and/or higher rates of participation in these subjects are associated with higher outcomes and reduced inequalities.

Three studies in our review provided evidence on the relationship between maths and literacy provision and attainment outcomes in these domains. Collectively, the existing evidence highlights the important role that increasing the duration of study and proportion of pupils studying maths and literacy through to the completion of upper-secondary education plays in increasing pupil attainment and mitigating inequalities in skills development in these domains. Quantitative evidence from Green and Pensiero (2016a) and Pensiero and Green (2018a) found that the mandatory provision of maths and national language study across all upper secondary education programmes significantly reduces inequalities in skill outcomes and improves average skills levels. Pensiero and Green (2018a) found that compulsory maths and national language at upper secondary is associated with a highly significant improvement in national literacy and numeracy rankings, compared to countries where neither maths nor language is compulsory. In addition, (Green and Pensiero, 2016b) found that increasing the proportion of pupils studying maths in upper secondary education significantly reduced skills inequalities in numeracy and, to a lesser extent, literacy. Similarly, Pensiero and Green (2018a) found that the proportion of students in upper secondary education studying maths had a highly significant positive effect on national ranking position for both literacy and numeracy outcomes. Finally, (Chiu, 2015) detected a small but highly significant positive effect between the number of hours spent studying maths each week and maths

achievement at age 15. In England, maths and literacy is compulsory for all pupils until the completion of Key Stage 4, when pupils take GCSEs (GOV.UK, 2024b). While it is mandatory for all pupils to remain in education or training until age 18, only full-time pupils aged 16-18 who have not achieved grade 4 or above at GCSE in these subjects must study maths and/or literacy as part of their programme, with this being a condition of the funding given to post-16 education providers (GOV.UK, 2024a).

Vocational education: the effects of tracking and of disparities in the regard for different tracks

The evidence base suggests that sorting pupils into different education or curriculum pathways or tracks contributes to greater inequalities between disadvantaged pupils and their peers.

Four studies in our review provided evidence on the impact of tracking on skills inequalities. Tracking refers to the practice of sorting pupils into different types of education or curriculum pathways (Bol et al., 2014; Heisig and Solga, 2015; Strello et al., 2021; Bodovski et al., 2024). There was consensus across this literature that tracking pupils into educational pathways increases outcome inequalities and attainment gaps between disadvantage pupils and their more affluent peers, primarily by magnifying the effect of socio-economic status (SES) on pupils' outcomes (Bol et al., 2014; Heisig and Solga, 2015; Strello et al., 2021; Bodovski et al., 2024). For example, Heisig and Solga (2015) found that higher degrees of external differentiation (defined as the extent to which learning takes place in separate programs or tracks) are associated with an increase in the skills gaps between less- and intermediate-educated adults, largely due to lower mean skills attainment among less-educated adults. This likely reflects less-educated adults having been negatively impacted by selection and ability grouping effects (Heisig and Solga, 2015). Similarly, Bol et al. (2014) detected a significant positive interaction effect between tracking and SES on maths outcomes and found that for each one-point increase on the scale of tracking, the predicted effect of socio-economic status on performance in maths increases by 1.8 points. In England, tracking commences at the end of Key Stage 4, at which point pupils choose whether to complete academic and/or vocational qualifications or apprenticeship training during the upper secondary education phase (OECD, 2023i).

The effect of tracking may be offset by other features of the system such as high levels of participation in vocational education or standardising the curriculum across different tracks during upper-secondary education.

Studies by Bodovski et al. (2017) and Green and Kaye (2022) have shown that curriculum standardisation during upper secondary education is associated with a reduction in inequalities in literacy and numeracy scores. Both studies conclude that standardisation across vocational and academic tracks alleviates the negative effect of tracking by helping to create greater equity in the regard with which each pathway is held. For example, Green and Kaye (2022) found that curriculum standardisation during upper secondary was significantly associated with a reduction in inequalities of 0.3 standard deviations (SDs) in literacy and 0.24 SDs in numeracy scores. Similarly, (Bodovski et al., 2017) found a significant positive association between standardisation and inequalities in literacy and numeracy outcomes, and that in highly differentiated countries a higher degree of standardisation increases average levels of attainment.

In addition, four of the reviewed papers found that having high rates of participation in vocational education during upper secondary education is associated with improved skills outcomes and reduced inequalities (Heisig and Solga, 2015; Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022). Increased participation in vocational education helps mitigate the negative influence of tracking by creating greater equity in perceptions of academic and vocational tracks.

Finally, there is evidence that central examinations may help mitigate the negative effects of tracking. As discussed above, Bol et al. (2014) detected a significant positive interaction between tracking and SES, indicating that more tracking within a system exacerbates the effect of SES on student maths attainment outcomes. However, they found that the effect of a three-way interaction between the presence of central examinations, SES and tracking was negative, suggesting the relationship between tracking and inequality is attenuated when central exams are present. The authors conclude that central examinations help mitigate pupil selection into tracks based on SES rather than ability.

Collectively, this evidence highlights the role of curriculum standardisation and increasing participation in vocational education in contributing to greater equity between academic and vocational programmes, which in turn can help mitigate the negative effects of tracking within an education system (Heisig and Solga, 2015; Green and Pensiero, 2016a; Bodovski et al., 2017; Pensiero and Green, 2018a; Green and Kaye, 2022). It also illustrates the importance of understanding how different factors within education systems interact with one another.

A more equal regard for vocational and academic pathways is associated with improved skills outcomes and lower skills inequalities.

Four of the reviewed papers highlighted the benefits of greater equity in perceptions of vocational and academic pathways. The evidence suggests that systems with relatively high literacy and numeracy skills outcomes and reduced inequalities (including systems that commence tracking early) tend to be characterized by greater 'parity of esteem' between academic and vocational pathways. This is typically measured based on the proportion of pupils in upper secondary education enrolled in vocational programmes. Having a greater proportion of pupils enrolled on vocational programmes in upper secondary education within an education system is associated with improved skills outcomes and/or significantly lower skills inequalities (Heisig and Solga, 2015; Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022). Green and Kaye (2022) suggest that systems that have very low rates of participation in vocational education may be less able to narrow skills gaps compared to systems where participation rates are high.

Case study evidence suggests that vocational pathways which offer good educational and/employment outcomes, and which are perceived to be high-quality, are key to greater 'parity of esteem' between vocational and academic pathways. It is not clear how this is best achieved, but case studies suggest that some of the ingredients are; ensuring VET courses offer a clear choice of progression routes for learners into higher/further VET, higher education and/or employment; high levels of employer engagement in the design and delivery of VET programmes; and ensuring government funding for VET programmes is sufficient in absolute terms (which may also have implications for how funding is apportioned between academic and vocational programmes). In the UK, there is generally a low understanding and perceived value of technical and vocational qualifications, particularly among employers (YouGov, 2023). In 2022, only 32 per cent of employers and 58 per cent of learners agreed that vocational and technical qualifications were good preparation for work (YouGov, 2023). Similarly, 31 per cent of employers and 56 per cent of learning agreed that vocational and technical qualifications were trusted qualifications (YouGov, 2023).

Socio-emotional skills development

Making socio-emotional skills explicit within the curriculum and competency development frameworks may support improved social and emotional development.

Case study evidence suggests that the countries we identified with the highest average socio-emotional skill levels at age 15/16 make the development of non-cognitive skills an explicit priority within their educational objectives and curriculum frameworks. For example, in Switzerland, socio-emotional skills are explicitly covered in the curriculum frameworks for primary and lower secondary education in each language region throughout there are national guidelines for the assessment of these skills (OECD, 2015c). For example, Curriculum 21 – which is a framework that has been implemented across the German-speaking cantons (which make up the majority of Swiss cantons) - explicitly outlines socio-emotional competencies that schools should seek to develop in pupils, such as persistence, emotion identification and regulation and self-reflection (Lehrplan21, 2016). Similarly, in Portugal, guidelines for the progression and development of socio-emotional skills from pre-school to the end of secondary education have been published to support schools to develop these non-cognitive skills (Figueira et al., 2021). Furthermore, personal and social development forms its own curriculum area throughout primary and secondary education and is supported by cross-curricular activity to develop these skills (Cefai et al., 2018). However, it remains unclear from our case studies how this curriculum intent is enacted in schools, or whether the making these skills explicit in the curriculum is a necessary condition for a country's success in this area.

Features that do not appear to be associated with skills outcomes

The literature suggests that cross-country differences in approaches to assessment and accountability do not appear to be related to variation in skills development between countries.

Accountability

Three papers provide qualitative evidence on the relationship between accountability systems and skills outcomes. There is consensus across the papers that high-performing education systems have well defined accountability systems, often incorporating assessment in some fashion, but that the approach taken to accountability varies greatly across the high-performing countries examined in this literature (Creese, Gonzalez and Isaacs, 2016; Greatbatch and Tate, 2019; Suto and Oates, 2021). For example, Creese, Gonzalez and Isaacs (2016) found that across six high performing countries, the accountability systems were structured very differently – some relied on internal mechanisms within schools while others utilised national assessments. It is common for these systems to have assessment-based accountability policies, but again these systems vary. The authors highlighted that there are trade-offs to each type of accountability system. For example, assessment-based accountability systems are often considered the fairest and most objective measure of performance but can risk teaching to the test. Collectively, these papers give no indication that a single approach to accountability is inherently better suited to improving skills outcomes.

Assessment

Two qualitative papers included in our review provide evidence on the use of assessment in high-performing education systems and show that high-performing education systems typically incorporate a range of assessment methods, which are often linked to accountability systems (Creese, Gonzalez and Isaacs, 2016; Suto and Oates, 2021). However, Creese, Gonzalez and Isaacs (2016) highlight that while most jurisdictions used a combination of formative and summative assessment, the emphasis and structure of these assessments varies. For example, in Finland and Japan assessments are largely formative and school-based whereas in Singapore and the US the use of high-stakes summative testing is widespread. In addition, Suto and Oates (2021) note that some countries use external assessment (such as national or regional examinations), often for progression purposes into upper secondary education, while others use forms of internal assessment (such as ongoing teacher assessment or school-designed examinations). The authors highlight that it is common for these assessments to remain high-stakes for pupils, meaning they inform their transition into the next phase of education. In some countries, assessments were used to inform the selection of subjects studied in upper secondary education. Together, these papers suggest there is no single approach to assessment that is more closely associated with improved skills development.

5. Features of relatively high-performing countries: moderating system characteristics

In this chapter we discuss the role of contextual characteristics in moderating the effects of system-level characteristics on skill development. The existing literature emphasises the important role of the education workforce and system-level funding for education, as well as the impact of the wider socio-economic and cultural context. As discussed in the methodology, the available literature typically draws on data from ILSAs and so largely examines the relationship between system characteristics and cognitive skills, typically across reading/literacy, maths and science.

Key Findings:

There is evidence across the literature showing that it is fundamental to ensure there is high-quality teaching workforce in order to improve outcomes.

The wider literature suggests that there are multiple mechanisms through which a high-quality workforce can be achieved, including increasing teacher pay and ensuring access to ongoing high-quality CPD.

Increased public spending on education may help mitigate inequalities between disadvantaged pupils and their peers.

While countries with greater wealth typically have higher outcomes, high levels of economic inequality reduce average skill levels and widen inequalities.

The literature shows that demographic characteristics (such as pupil SES and immigrant status) impact pupils' outcomes and embedded inequalities prior to entry to, and for the duration of their progression through, the education system.

There is some evidence that cultural context may modify the relationship between demographic and familial characteristics and outcomes.

Teaching workforce

There is consistent evidence that that having a high-quality workforce is associated with higher pupil outcomes.

There is consistent evidence that having a high-quality workforce is associated with higher pupil outcomes (Hanushek and Woessmann, 2006; OECD, 2017d; Tonga et al., 2022; Brown et al., 2023). For example, quantitative evidence from Hanushek and Woessmann (2006) found the teacher cognitive skill is strongly associated with pupil maths and reading performance. This study found that a one SD increase in teacher numeracy skills significantly increases student math performance by almost 0.15 SD and a one SD increase in teacher literacy skills increases students' literacy skills by 0.009 SD. It also found that the effect of teacher cognitive skill on outcomes is significantly larger for pupils from a low-SES background than for pupils from a high-SES background. Similarly, evidence from the (OECD, 2017d) shows that teacher certification is moderately positively associated with students' performance in science – countries that performed above the OECD average in science attainment had a higher percentage of fully certified teachers (92 per cent) compared to other countries (76 per cent). Finally, qualitative evidence from Tonga et al. (2022) highlighted that high performing countries typically require new teachers to be graduates and take part in a comprehensive admissions process. The authors also suggest that the level of education accomplished by teachers is directly proportional to the quality of education delivered and in turn pupils' outcomes.

There appear to be multiple mechanisms through which a high-quality workforce can be achieved, including increasing teacher pay and ensuring access to high-quality CPD.

Evidence from Hanushek and Woessmann (2006), Dolton and Marcenaro-Gutierrez (2011), and Greatbatch and Tate (2019) highlights the role of teacher pay in creating a high quality workforce and improving pupils' skill outcomes. Dolton and Marcenaro-Gutierrez (2011) found that a 15 per cent increase in real pay increased standardised scores by 0.2 SDs, equivalent to an eight per cent increase in pupil performance. Hanushek and Woessmann (2006) suggest that teacher pay is associated with teacher cognitive skill levels because increased pay raises the prestige of teaching and attracts teachers from higher segments of the tertiary education skill distribution. They found that a ten percentage point increase in teacher pay is associated with an increase in teacher cognitive skill of about 0.1 SD. In the UK, between 2015 and 2023, teachers' salaries decreased in real terms by five per cent in England compared to an average increase of four per cent across OECD countries where data is available (OECD, 2024a).

Evidence from the OECD (2017d), Greatbatch and Tate (2019) and Tonga et al. (2022) suggests that high-quality ongoing CPD for teachers in also key for improving the quality of the workforce. Tonga et al. (2022) and Greatbatch and Tate (2019) highlight that high-performing education systems have strong professional development systems that require teachers and leaders to update and improve themselves and provide ongoing CPD to facilitate this improvement. In Japan, teachers are provided with CPD by their education boards and boards are required to monitor the abilities and achievements of teachers throughout their careers. The MEXT implement a policy in 2009 requiring teachers to renew their teaching certificates every ten years (Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, 2015). Similarly, the OECD (2017d) found that in countries that perform above the OECD average in science, a significantly higher proportion of students attend schools that deliver CPD to staff and/or schools where teachers collaborate with each other. This analysis found that pupils from schools in which teachers co-operate by exchanging ideas or materials score nine points higher in science compared to pupils from schools where staff do not co-operate.

System funding and investment

Increased public spending on education may help mitigate inequalities between disadvantaged pupils and their peers.

To combat inequalities in outcomes, the evidence suggests higher educational spending may help reduce inequalities in outcomes between disadvantaged pupils and their peers and raise attainment (Bodovski et al., 2017, 2024; Tonga et al., 2022). For example, Bodovski et al., 2024) found a negative interaction between SES and government spending on education for both math and science achievement, which suggests that the disadvantage of low-SES students is attenuated in countries with higher levels of government spending on education. This is also reflected in evidence from Brown et al., 2023) in the context of ECEC provision, which found that countries seeking to improve the quality of ECEC had significantly increased public spending in this sector. In the UK, public spending on ECEC relative to GDP decreased by 13 per cent between 2015 and 2021, whereas on average across the OECD public spending on ECEC increased by nine per cent over this period (OECD, 2024a). Collectively this evidence highlights the importance of government investment in education as a means of narrowing inequalities.

Broader contextual factors

While countries with greater wealth typically have higher outcomes, high levels of economic inequality reduce average skill levels and widen inequalities.

Evidence from (Chiu, 2015; Bodovski et al., 2017) shows that national wealth is broadly positively related to pupil outcomes, with students in wealthier countries performing better than their counterparts in less affluent countries. However, the evidence also shows that countries with greater economic inequality and/or greater economic wealth tend to have greater achievement gaps between disadvantaged pupils and their peers (Bodovski et al., 2017, 2024). For example, increases in a country's Gini coefficient (a measure of income inequality) were significant negatively associated with average maths achievement and significantly positively associated with SES achievements gaps in maths, suggesting that higher levels of economic inequality contribute to lower average attainment while simultaneously widening inequalities between disadvantaged pupils and their peers (Bodovski et al., 2017).

Demographic characteristics

Demographic characteristics impact pupils' outcomes and embed inequalities prior to entry, and for the duration of their progression through, the education system.

Six papers included in our review provide evidence on a range of demographic and familial characteristics that influence pupils' average skill levels and inequalities, including SES background, household composition, immigrant background and parental education.

Socio-economic background and family resource

Evidence shows that pupils from higher SES backgrounds typically have higher reading, maths and science outcomes, though the SES gradient in scores may vary between countries (Chiu and McBride-Chang, 2010a; Bol et al., 2014; Chiu, 2015; Dräger et al., 2023; Münch and Wieczorek, 2023; Bodovski et al., 2024). For example, Bol et al., (2014) found a significant positive relationship between SES and pupil attainment. Similarly, Chiu and McBride-Chang (2010) found that pupils from a higher SES background outperformed those from lower

SES backgrounds in reading. Likewise, pupils with more books in the home score significantly more highly than their peers.

Chiu and McBride-Chang (2010) also demonstrate that children with fewer family members in the household have higher outcomes, most likely because a higher proportion of family resources can be focused on supporting their development and education. Students with more siblings scored lower in reading for every extra sibling.

Further, Dräger et al., (2023) found that parental education and income are both associated with the SES gradient in maths and literacy outcomes at age 6-8 across high performing countries. The analysis found that parental education is a stronger predictor of the SES gradient than parental income (Dräger et al., 2023). Crucially, Dräger et al., (2023) found that the SES gradients observed at age 6-8, when most pupils have entered primary education, persisted largely unchanged to age 15.

This evidence reinforces the findings from Working Paper 6 of The Skills Imperative 2035, which showed that large inequalities in young people's cognitive and behavioural outcomes emerge early in life, influencing later skills gaps, and that much of the variation in children's early outcomes is associated with differences in their home environments, which has a persistent and enduring impact on their development as they grow up (Bocock, Del Pozo Segura and Hillary, 2024).

Immigration status

The literature also suggests that immigrant pupils have lower maths and science outcomes than their native peers (Chiu and McBride-Chang, 2010; Bol et al., 2014), and previous research for The Skills Imperative 2035 suggests this is also true for young people's EES (Bocock, Del Pozo Segura and Hillary, 2024). For example, Bodovski et al, (2024) found that first- and second-generation immigrant pupils (those born outside the country and those born inside the country with at least one parent born outside of the country, respectively) had significantly lower outcomes than their native peers (those born in the country with both parents also born inside the country) in both maths and science at age 14. This analysis also found that second-generation pupils performed better than first-generation immigrant pupils. Similarly, Bol et al., (2014) found that first- and second-generation immigrants had significantly lower maths outcomes on PISA than native students at age 15.

Cultural context

There is some evidence that cultural context may modify the relationship between demographic and familial characteristics and outcomes.

There is some evidence that culture modifies the strength of the relationship between familial variables and reading outcomes. Chiu and McBride-Chang (2010a) found that in more egalitarian countries (where society tends to teach members to view, value and act toward one another as equals, such as Norway) the positive association between SES and literacy outcomes was stronger than more hierarchical countries (where society promotes clear, fixed hierarchical roles and teaching citizens to obey authority, such as Albania). They also found that in collectivist countries (where society tends to favour group interests over individual interests, such as South Korea) the impact of SES and household composition on literacy outcomes was weaker than individualist countries (where society favours individual interests over group interests, such as Australia).

Collectively the evidence shows that broader contextual factors associated with lower outcomes and increased inequalities are 'baked in' to the system and impact pupils prior to entry to education system. It highlights the importance of considering education systems within the socio-economic and cultural context they operate, and that efforts to improve outcomes and reduce inequalities must be made system-wide/across pre-16 and post-16 education and recognise the moderating role played by the broader context beyond the education sector.

6. Examining seven high-performing education systems

In the last chapter, we identified common features of high-performing countries. However, education systems are more than a set of features; they are defined by the relationships between these features and how they are implemented, within the wider socio-economic and cultural context (Montouri, 2011). In this section, we examine, in greater depth, seven high-performing education systems, draw out insights from these case studies, and discuss their implications for England. We identify the key success factors and distinctive features that may help explain their relative success, as well as the trade-offs being made to achieve those outcomes.

Key Findings:

High performing countries have coherent education systems underpinned by an implicit vision and set of values for education which is closely aligned with the socio-cultural and economic context in which they operate.

High performing education systems demonstrate that success in some areas of skills development come with trade-offs and compromises in other areas of development or the wider education system.

In practice, studying and understanding large, open systems is complex and subjective. Existing cross-country comparative studies on education systems have not determined causality, which means that we do not know which factors within an education system actively contribute to skills outcomes and which are causally redundant. The impact of individual factors is also likely to vary depending on context (e.g. socio-economic and cultural context). Inter-dependencies between factors within education systems, and between the education system and other external factors (e.g. the socio-economic context) complicate efforts to identify the factors that drive comparatively high levels of skill development. There may also be multiple causal pathways at play in any given education system. Furthermore, success in some domains may come at the expense of other outcomes not captured in the ILSA data that we have used to identify high-performing countries and which underpin most cross-country comparative studies.

However, we can start to understand how differences between education systems might be associated with differential outcomes by first grouping countries with similar characteristics together and comparing the outcomes of country 'types'. This has previously been done by Green and colleagues, who categorise all OECD countries into one of four types (Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022).

These are:

Type 1 – differentiated school-based systems (such as Japan or Estonia):

These systems typically have general academic and vocational provision in different types of upper secondary settings, with separate apprenticeship systems. Programmes are broadly organised around groups of subjects specific to a discipline / vocation and usually require pupils to pass a range of subjects.

Type 2 – comprehensive school-based systems (Sweden, Norway, US and Canada):

These systems offer academic and vocational provision in the same settings, either through a standardised core programme (such as in North America) or in programmes with distinctive subject specialisms but substantial overlap in core general education (such as in Norway and Sweden). Type 2 systems share some characteristics with Type 1 but usually have a higher degree of curriculum and assessment integration. Due to differences in how the systems are governed, the US and Canada are considered type 2a, while Norway and Sweden are considered type 2b.

Type 3 – Dual system of academic and vocational provision (Austria, Germany and Switzerland):

These systems see participation distributed relatively evenly between school-based general education and employment-based dual systems of apprenticeships, which are generally held in relatively equal regard. They are exclusively found in social market political economies. In these systems, general and vocational education pathways are distinct, with differences in their regulation, curricula and assessment.

Type 4 – mixed systems (such as England and Australia):

These systems have many different school- and employment-based programmes which differ in length and quality. Academic tracks dominate these systems and there are pronounced status gaps between academic and vocational programmes. Curriculum and assessment are typically not standardised between programmes. Assessment typically occurs by single subject and maths and national language passes are not always required.

Type 2b and Type 3 systems may be the most effective at developing young people's literacy and numeracy skills and reducing inequalities during upper-secondary education.

Research by Green and colleagues suggests that the comprehensive school-based systems found in Sweden and Norway (Type 2b), and the dual systems of academic and vocational provision found in Austria and Germany (Type 3), are more effective at improving skill levels and reducing skill inequalities during upper secondary education, relative to Type 1 systems (Green and Kaye, 2022; Pensiero and Green, 2018b; Green and Pensiero, 2016b). Green and Kaye (2022) observed notable reductions in skills inequalities[13] for Type 1, 2b and 3 systems between age 15/16 and 18-20, but suggest that this reduction is particularly substantial for Type 3 systems which had the highest levels of inequalities at age 15/16 but by age 18/20 see lower levels of inequalities than Type 2a and 4 systems and similar levels of inequalities to Type 1 and 2b systems. This highlights the importance of examining education systems as a whole, rather than considering pre- and post-16 education separately, in order to understand the trade-offs that exist and which may account for why Type 3 systems see some of the highest levels in skills inequalities by age 15/16 but some of the lowest levels of inequality at the end of upper secondary education. The relative success of Type 2b and 3 systems in post-16 skill development appears to be primarily due to curriculum standardisation in key areas (such as mandatory literacy and numeracy provision and consistency of course length) and a more equal regard between academic and vocational pathways, particularly in Type 3 systems (Green and Kaye, 2022; Pensiero and Green, 2018b; Green and Pensiero, 2016b).

Type 4 and 2a systems are less effective at reducing inequalities through upper-secondary education and Type 4 systems also appear to see declines in skills outcomes during this phase

Research by Green and colleagues suggests that comprehensive school-based systems found in North America (Type 2a) and mixed systems (Type 4) are less effective at reducing skills inequalities during upper secondary education than Type 1 systems. Type 4 systems also see a relative decline in average skill levels over this period (Green and Kaye, 2022; Pensiero and Green, 2018b; Green and Pensiero, 2016b). The authors suggest that Type 2a systems are less effective at reducing inequalities because of the relative absence of vocational learning within the upper secondary education system (Green and Pensiero, 2016a; Green and Kaye, 2022). In the case of Type 4 systems, the authors suggest these systems are less effective at reducing inequalities and experience declines in skill levels due to institutional fragmentation and lack of curriculum standardisation during the upper secondary phase. They also note that Type 4 systems typically have a large status gaps between academic and vocational pathways, often due to the perceived low quality of vocational programmes and low participation levels in these programmes. This likely perpetuates skills inequalities throughout post-16 education and training (Green and Kaye, 2022; Pensiero and Green, 2018b; Green and Pensiero, 2016b).

The existing evidence suggests that some types of system are associated with better skills outcomes in numeracy and literacy, and it offers some explanation as to the factors that may contribute to the relative success of these system types. However, it does not consider the interdependencies within or context surrounding these education systems. Similarly, it does not consider the trade-offs made in systems that perform highly on numeracy and literacy outcomes, nor does it consider potential reasons for the variation in performance within different education system types. The following case studies build on the existing evidence by considering the interdependencies between the features associated with high performance, by exploring the different ways in which these features can be combined and implemented, and by considering the trade-offs that high performing systems might be making (either implicitly or explicitly).

13 Measured by Gini coefficients of inequality for scores in reading/literacy and maths/numeracy by system type (PISA – 15-year-olds and SAS – 18-20-year-olds (Green and Kaye, 2022).

Austria

Austria is a Type 3 education system with a dual system of academic and vocational education (Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022). Austria was selected as a case study because our analysis suggests post-16 skill development is higher than average and skills inequalities narrow in numeracy, as shown in Table 4. Pre-16 outcomes are more mixed; whilst maths performance places Austria in the top quartile and the proportion of low achieving pupils in collaborative problem solving is below average, the average reading and science levels of pupils in Austria are similar to the OECD average and skills inequalities at age 15/16 are relatively large.

In Austria, school is compulsory for all children from the age of 6 until the age of 15, although young people are obliged to be in some form of education or training programme until the age of 18 and upper secondary attainment is seen as the minimum qualification level for labour market participation (OECD, 2017a, 2022a; Cedefop, 2022a; OECD, 2023b). Prior to entering compulsory schooling at age 6, children may attend Kindergarten, which caters to children between 3 and 5 years of age. Half-day attendance at kindergarten is obligatory in the year prior to children entering primary school (Cedefop, 2022a).

The post-16 education system in Austria is complex, with pupils able to choose from a wide range of academic and vocational programmes from age 15/16 (including apprenticeships and a range of intermediate and higher VET programmes) (OECD, 2017a; Cedefop, 2022a). These upper secondary level programmes are typically completed by age 18/19 and in turn allow progression to higher level courses at university (including universities of applied sciences and teacher education) as well as higher level VET programmes and schools for master craftsmen (OECD, 2017a).

Key Success Factors

Employers are highly invested in the provision and design of VET programmes.

Country experts highlighted the importance of the strong 'social partner system' that exists between Austrian employers (through Austrian Economic Chambers), workers (through Chambers of Labour and the Austrian Trade Union Federation), young people and the education system, with bodies representing employers and workers in particular generally feeling a stronger sense of ownership over the VET system than is evident in many other countries. Young people are recognised as employers' future workforce and so companies invest in their development to meet their future needs as employers, and Chambers of Labour and unions similarly have a strong focus on the skills system. This strong social contract is supported by policy initiatives such as 'The Youth Guarantee', which provides an implementation framework for ensuring that all young people are able to access training until age 18 and aims to improve co-ordination between ministries, regional authorities and employers to facilitate the provision of training to young people (Eurydice, 2023a). These values are also reflected in the design of VET in Austria, where work-based learning is central to all VET programmes (Cedefop, 2022a). For example, apprenticeships require 80% of training time to take place in a company, while school-based VET requires learning in workshops, labs and training facilities (such as training restaurants and practice firms) and is complemented with mandatory work placements in companies. Companies also often set or carry out project and diploma assignments required as part of the final exam for five year school-based VET programmes (Cedefop, 2022a). Furthermore, VET programmes are typically adapted to regional economic conditions and skills needs to ensure pupils develop in a way that aligns with the labour market (Cedefop, 2022a). Training regulations mandate that all apprenticeships must be reviewed and modernised every five years (Cedefop, 2022a). These factors may contribute to the high regard for VET programmes. This suggests that, in England, efforts to further galvanise greater employer engagement in the design, delivery, assessment and funding of vocational programmes may help increase participation rates in vocational education, and alter perceptions of VET as a high-quality alternative to academic education. Policy makers in England might also wish to consider how to cultivate greater engagement in vocational education and training from worker representative bodies, given the positive role that Chambers of Labour and unions play in Austria.

VET programmes enable young people to successfully transition into higher education, higher VET programmes or the labour market, facilitating social mobility.

Upon entry to upper secondary education, there are a range of VET programmes available to pupils alongside general education programmes. There are clear routes of progression between different levels of VET and into higher education.

These are summarised below.

Pre-VET (1-2 years) – these provide general education and basic vocational skills in preparation for further VET and apprenticeships (Cedefop, 2022a).

School-based VET (3-4 years) – these provide general education alongside occupational competencies and qualifications needed for mid-level jobs. Pupils who opt for these programmes can go on to complete further VET programmes or sit higher education entrance exams to progress to higher education (Cedefop, 2022a).

School-based VET (5 years) – these provide occupational training alongside general education, leading to double qualifications for senior positions in industry and access to higher education (Cedefop, 2022a).

Apprenticeships (2-4 years) – these programmes are available across 230 occupations for pupils who have completed compulsory education, leading to qualifications for mid-level positions. Graduates can progress to qualify as a master craftsperson or undertake further work experience, add-on VET programmes and/or exams to access higher education or tertiary VET programmes (Cedefop, 2022a).

Healthcare VET (1-3 years) – these are delivered separately to school-based VET and provide access to tertiary-level training in related fields (Cedefop, 2022a).

Post-secondary VET programmes (2-3 years) – these programmes provide high level professional training in various specialist areas (Cedefop, 2022a).

Country experts highlighted that the clear progression routes each of these programmes offer helps contribute to the perceived value of VET programmes and, therefore, to greater equity between academic and VET programmes. By contrast, young people in England may have less clarity and certainty about how VET programmes help them access higher education, higher VET programmes and/or the labour market.

VET programmes are regarded as high quality alternatives to academic upper secondary and tertiary education programmes.

Country experts highlighted that VET programmes in Austria are widely perceived to provide high quality education and training. The Ministry of Education sets out the educational objectives and content of VET at the upper secondary level via a curriculum framework, which includes subject-related competencies as well as interdisciplinary competencies such as teamwork, digital skills and entrepreneurial skills (Cedefop, 2022a). At least one foreign language is also mandatory (Cedefop, 2022a). Programme content is regularly reviewed to ensure that it aligns with the knowledge and skills currently needed within the labour market. Maths and native language are also mandatory across all routes, including in apprenticeships. This was highlighted by experts as mitigating against the widening of inequalities in maths and literacy skills during upper secondary education. This suggests that one way to improve perceptions of the quality of vocational education in England might be to standardise some of the curriculum content across all upper secondary programmes, potentially making maths and literacy compulsory in some form across all pathways.

Most young people participate in VET programmes after compulsory education.

Country experts commented that, in Austria, VET programmes, including apprenticeships, have been normalised as the primary upper secondary education pathway chosen by Austrian young people. Academic education routes are not the mainstream choice for young people as they are in most other countries, including the UK. In Austria, around 70% of each age cohort enter a VET programme at the end of compulsory education (Cedefop, 2022a). Around result, Austria has the highest proportion, around 54%, of 25-34 year olds holding a VET qualification as their highest level of attainment among all OECD countries. Grants and subsidies are available to support participation in VET, particularly apprenticeships (Cedefop, 2022a). This reflects the perceived quality and value of VET programmes as well as the strong social contract that is embedded between Austrian employers and young people.

Key compromises

Pupils enter academic or vocational education routes at age 10 and it is very hard thereafter to move from a vocational to an academic track or vice versa.

In Austria, tracking commences at age 10 as pupils enter either a gymnasium academic secondary school), which has a focus on preparing students for academic upper-secondary programmes and university, or a Mittelschule (middle general school), which also provides a general education but with a greater focus on practical skills. Children are tracked based on their academic achievement and teacher feedback (OECD, 2017a). Country experts highlighted that, once tracked, it is very difficult for pupils to transfer between pathways. As such, pupils are set on a track at a very young age, with their family socio-economic status and education history playing a role in the route they get tracked onto as well as their academic performance. Once pupils enter upper secondary education, the number of pathways expands (Cedefop, 2022a) and country experts highlighted that choice of pathways is also strongly influenced by the availability of academic / vocational routes in their locality. They noted that different regions in Austria may have a stronger emphasis on particular routes (e.g. apprenticeships rather than school-based VET) and that pupils in rural areas are often unable to access some educational programmes (for example, apprenticeships are often less readily available in rural areas).

As discussed, the literature suggests that early tracking such as that in Austria contributes to greater inequalities between disadvantaged pupils and their peers. Thus, early tracking may partly explain the high levels of skill inequalities observed at age 15/16 in Austria. However, skills inequalities narrow during upper secondary and higher education, which might be partly because of the perceived quality, value and participation rates in VET provision, and the degree of standardisation that exists across education pathways.

Canada

Canada is a Type 2a comprehensive school-based education system, where general and vocational post-16 provision is in one institution (Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022). Canada was identified as high-performing based on its above average reading and science scores at age 15/16 (which place it in the top decile) and the low proportion of low achievers in collaborative problem solving, as shown in Table 4. However, cognitive skills inequalities in Canada at age 15/16 are above the OECD average, socioemotional skill levels and inequalities are fairly average, and post-16 skills development outcomes are mixed.

Education is decentralised, with responsibility for the organisation and delivery of education held by regional provinces and territories throughout compulsory, upper-secondary and post-secondary non-tertiary level education (OECD, 2015a; The Council of Ministers of Education, Canada, no date). Across most jurisdictions, school is compulsory from age 5/6 to 16-18, depending on the jurisdiction (OECD, 2015a; The Council of Ministers of Education, Canada, no date). Across jurisdictions, there are significant differences in curricular, assessment approaches and accountability policies (The Council of Ministers of Education, Canada, no date).

Pupils typically attend elementary school from around age 5/6 to age 12, then progress to middle school or junior high school from around age 12-14 to complete their primary and lower secondary education (EduCanada, 2024). Pupils then attend high school from around age 14 to age 18 for their upper secondary education (EduCanada, 2024). Upon completion of upper secondary education, a range of post-secondary and tertiary education routes are available to pupils including: short technical and vocational programmes, apprenticeship programmes, further education programmes at college or university programmes (OECD, 2015a). Pupils are able to transfer from college programmes to university programmes if they desire.

Key Success Factors

Canada has a comparatively highly skilled Early Years (EY) workforce.

Country experts suggested that relatively high qualification requirements for the EY workforce plays an important role in raising skill-levels across the sector and improving outcomes for pupils. Each jurisdiction has publicly-funded pre-primary education (kindergarten) for 5 year olds and in Ontario this pre-primary education provision extends to 4 year olds (OECD, 2015a). While Kindergarten is not compulsory in all 13 jurisdictions, 97 per cent of children of eligible age attend (The Council of Ministers of Education, Canada, no date). Having a high-quality EY workforce is perceived as a key avenue through which child development can be supported and improved. Across all jurisdictions, individuals teaching children in ECEC settings are typically required to be qualified Early Childhood Educators or fully qualified Kindergarten teachers (Employment and Social Development Canada, 2021). Early Childhood Educators are staff who have completed post-secondary training in early childhood, with most completing a two-year college programme in Early Childhood Education or similar. All jurisdictions in Canada have developed their curriculum frameworks with the intention that these be delivered by staff with a post-secondary education in child development and early childhood pedagogy (Employment and Social Development Canada, 2021)

This demonstrates the value of developing a high-skilled EY workforce through high entry and training requirements to underpin the quality of EY provision for all children. It also highlights the need for England to ensure the quality of the EY workforce is maintained or improved over the coming years at a time when the sector is facing significant recruitment and retention challenges while simultaneously needing to expand to accommodate the demand brought by new childcare entitlements (Public Accounts Committee, 2024).

Pupils receive above average hours of teaching in reading, writing/literature and mathematics and typically study maths and national languages (English and/or French) until age 18.

Across primary and lower secondary education, Canadian pupils receive a total of 8,305 hours of instruction time across nine grades (compared to an OECD average of 7,634 hours over nine grades) (OECD, 2023a). While Canada is one of few OECD countries that does not prescribe a fixed share of instruction time to be spent on reading, writing / literature or mathematics at either of these levels (OECD, 2023a), the instruction time pupils receive is higher than the OECD average (OECD, 2015a). Furthermore, across most school districts and jurisdictions in Canada, pupils are required to study mathematics and a national language (English and/or French) in order to graduate and receive their high school diploma, which is needed for progression to further or higher education (Government of British Columbia, 2023; Ontario Ministry of Education, 2024; Government of Manitoba, no date). As discussed, increasing the duration and amount of study in maths and literacy likely contributes to increase pupil attainment and helps mitigate inequalities in skills development in these domains. This evidence again suggests it may be beneficial in England to make the study of maths and English compulsory across all programmes until age 18.

Key compromises

While the decentralisation of education may allow Canadian jurisdictions to tailor delivery to their locality and better respond to the needs of a diverse, heterogenous society, it also creates local disparities in funding, provision and outcomes for pupils.

In Canada, education is decentralised across 13 jurisdictions, made up of 10 provinces and three territories. Each jurisdiction is responsible for the organisation, delivery and assessment of the education system at primary, secondary and post-secondary non-tertiary level, including technical and vocational education (OECD, 2015a; The Council of Ministers of Education, Canada, no date). This localised approach to system design is intended to enable each jurisdiction to establish policies and practices that best reflect the history, culture and educational needs of its population (The Council of Ministers of Education, Canada, no date). Country experts noted that having a highly localised approach helped local governments respond to local needs more effectively and kept inclusion and diversity at the heart of the design of the education system. However, they also highlighted that a localised approach leads to significant disparities within and between jurisdictions. For example, funding is set by provincial and territorial governments for each district based on pupils numbers, needs and location each year, resulting in significant variation in funding for schools in different districts and different jurisdictions (OECD, 2015a).

Vocational programmes are not held in very high regard, which may be at least in part because of the limited availability of upper-secondary VET programmes.

Country experts said that VET courses at upper-secondary and specialist higher VET programmes are not perceived nearly as highly as academic pathways leading to university. They suggested that the lack of regard for vocational programmes may be, at least in part, because vocational courses are perceived as pathways for struggling pupils, which creates a stigma around VET programmes and professions. In addition, the decentralisation of education means there is variation in the extent to which VET courses are available. Canadian pupils typically undertake general upper secondary education at high schools that offer both academic and vocational courses. At upper secondary level, only a very small proportion of pupils are enrolled in vocational programmes. In 2012, just six per cent of pupils were enrolled in vocational programmes at upper secondary level (compared to an OECD average of 44 per cent) (OECD, 2015a). This reflects the lack of prominent vocational tracks and programmes available during secondary education in almost all jurisdictions, with the exception of Quebec where pupils can opt to attend specialised VET programmes during upper secondary education (OECD, 2015a; The Council of Ministers of Education, Canada, no date). For most pupils, specialised VET programmes are primarily offered at the post-secondary level, once they have completed high school at age 18 (OECD, 2015a; The Council of Ministers of Education, Canada, no date). The uneven provision and emphasis on VET across Canada may contribute to negative perceptions of vocational education. It demonstrates the importance of ensuring vocational education is equally accessible to all pupils in England, especially in a context of increasing devolution of skills and post-16 education.

Estonia

Estonia is a Type 1 differentiated school-based education system (Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022) and was identified as high performing based on its outcomes at age 15/16. Average reading, maths and science skill levels are high, placing it in the top decile, and inequalities are well below average, as shown in Table 4. It also has fewer low achievers in collaborative problem solving that average. However, in Estonia, socio-emotional skill levels are below average and after the age of 15/16 skills inequalities in literacy and numeracy widen.

School is compulsory between the ages of 7 and 16, during which time children complete their basic education (OECD, 2020c, 2023d; Ministry of Education and Research, Estonia, no date). Basic education schools cover both primary and lower secondary level education. Upon completion of their basic education, pupils receive their leaving certificate and can then enter upper secondary education (OECD, 2020c, 2023d). The Estonian Ministry of Education and Research has responsibility for education policy, standards, curriculum and funding across the education system (OECD, 2020c).

Once pupils complete compulsory education at age 16, they can choose to continue with general upper secondary education or commence vocational secondary education, which gives pupils their upper secondary leaving certificate or certificate of vocational secondary education respectively, and allows progression into tertiary and post-secondary education. Pupils can also choose to study short vocational courses, but these do not allow for progression into higher or further education. Pupils with the appropriate qualifications at age 19 can progress to university, institutes of professional higher education/university college and post-secondary VET programmes (OECD, 2020c).

Key Success Factors

There is a strong emphasis on the provision of high quality ECEC to all young children and this is reflected in above average investment in ECEC.

In Estonia, ECEC settings provide pre-school education to children between the ages of 18 months and seven years and all children in this age group have been legally entitled to pre-primary education since 2014 (OECD, 2023d; Ministry of Education and Research, Estonia, no date). As such, each municipality must guarantee a place in a pre-school institution for all children of the eligible age (Ministry of Education and Research, Estonia, no date). Children attending ECEC attend creche until age 3 and pre-school until age 7 (OECD, 2023d, p. 2).

Country experts highlighted that ECEC is highly valued in Estonian society and that the Government has introduced policies to ensure it is accessible to all families. As such, participation in ECEC in Estonia is very high. Around 64% of 2 year olds, 87% of 3 year olds, 92% of 4 year olds and 93% of 5 year olds are enrolled in ECEC (OECD, 2023d). Parents pay an attendance fee to attend pre-school institutions, but this is capped at 20% of the minimum wage set by the Estonian Government (Ministry of Education and Research, Estonia, no date). The Estonian Government also consistently invests an above average proportion of resources in ECEC (OECD, 2020c). For example, Government spending in Estonia on ECEC as a share of GDP was 1.17% in 2015 and 1.16% in 2016, which is above the OECD average of 0.8% (OECD, 2020b). In contrast, public spending on education in England as a share of GDP was 0.7% (OECD, 2020a), whereas private expenditure on ECEC has been exceptionally high. Prior to the recently announced reforms to childcare entitlements, around 40 per cent of total expenditure on ECEC in England came from private sources (compared to an OECD average of 15 per cent) (OECD, 2023i), which was the highest of all OECD countries.

In Estonia, to ensure that ECEC provision is high-quality, pre-school education settings offer a formal curriculum, as formulated by the Government, which is delivered by qualified teachers (OECD, 2023d; Ministry of Education and Research, Estonia, no date). Children then receive a pre-school certificate upon completion of pre-school which records their development and indicates whether they have met each of the curriculum standards (Ministry of Education and Research, Estonia, no date). Children who do not attend pre-school will obtain these from regional advisory centres (Ministry of Education and Research, Estonia, no date). Parents are then required to submit this certificate to the school their child is enrolled to attend at age 7, the start of compulsory education (Ministry of Education and Research, Estonia, no date).

This evidence highlights the importance of ensuring that EY provision in England is high-quality and appropriately funded, particularly with the expansion of childcare entitlements, as high-quality EY provision provides a crucial foundation for children's development prior to their entry to compulsory schooling.

Estonia has a highly qualified teaching workforce, including ECEC and VET teachers, and provides ongoing CPD and training to maintain professional standards and drive career progression.

Candidates wishing to work as teachers in primary and secondary education must hold a master's degree in a specialised programme, while those becoming ECEC and VET teachers must hold a bachelor's degree (OECD, 2020c, p. 202). Teachers are then provided with CPD by their education setting in accordance with the professional standards set by the Ministry of Education and Research. Internal teacher appraisal and non-mandatory teachers certification processes have been put in place to allow for career progression among teachers (OECD, 2020c, p. 202).

Key Compromises

While Estonia invests an above average proportion of resources in ECEC, expenditure on upper secondary education is below average, which may contribute to the widening of skills inequalities after the completion of lower secondary education.

In 2020, Estonia spent 5% of their GDP on primary to tertiary education, which is similar to the OECD average of 4.8% of GDP (OECD, 2023d). However, Estonia invests below average levels of funding into upper secondary education. 6% of all funding for educational institutions is spent on general upper secondary education and 6% on vocational upper secondary education (compared to 11% and 10% respectively on average across the OECD) (OECD, 2023d). As discussed, the evidence suggests that higher levels of government spending help to attenuate the disadvantage gap between students from lower SES backgrounds and their peers. As such, the comparatively low level of investment in upper secondary education in Estonia may go some way to explaining why skills inequalities in literacy and numeracy widen after the age of 15/16. While investment in upper secondary education as a whole in the UK is similar to the OECD, funding per upper secondary student is significantly higher than the OECD average for academic programmes but significantly lower for vocational programmes (David Robinson and Gerard Dominguez-Reig, 2020). In the UK, in 2016, the funding per upper secondary student was 23% lower for vocational compared to academic programmes, whereas across the OECD funding per student was 16% higher for vocational programmes. This may be contributing to large differences in the regard with which vocational and academic pathways are held in England.

There are low participation rates in vocational education, which is perceived as something for low-attaining pupils looking to progress directly into the labour market.

Upon completion of compulsory education, Estonian pupils are able to choose between entering VET programmes or continuing with academic / general education. In Estonia, the proportion of pupils entering VET pathways is below the OECD average. Around 40% of the 15-19 year old age group are enrolled in general upper secondary education and 15% in vocational upper secondary education, with a further 27% enrolled in lower secondary programmes and 5% in tertiary programmes. This compares to an OECD average of 37% enrolled in general upper secondary programmes, 23% in vocational upper secondary programmes, 12% in lower secondary programmes and 12% in tertiary programmes (OECD, 2023d).

The relatively low participation rate of Estonian pupils in vocational education may, at least in part, be a consequence of the perception that these programmes only offer progression into the labour market (rather than higher education) and that only low-attaining pupils do these programmes (Musset et al., 2019). In Estonia, of basic school graduates with very low grade point averages (below 3.3), about 70% enter VET tracks (their choices on this point may be limited), while of those with top scores in GPA (above 4.6), only 2% opt for VET (Ministry of Education and Research, Estonia, 2022). Similarly, in a survey of attitudes towards VET, 70% of respondents in Estonia agreed that students with low grades are directed towards vocational education (Murasovl, 2018). Therefore, although in Estonia the choice between academic/general or VET programmes is formally up to the student, the effects are highly selective, with most low-performing students strongly concentrated in the VET track.

While participation in vocational upper secondary education is similar to the OECD average (21 per cent compared to 23 per cent) (OECD, 2023i), England faces a similar challenge in terms of poor perceptions of vocational education. For example, in the same survey on attitudes towards vocational education, 69 per cent of respondents in the UK agreed that students with lower grades were directed towards vocational education (UK NARIC, 2017). In addition, 74 per cent of VET students surveyed felt that general education has a more positive image than vocational education (UK NARIC, 2017).

Japan

Japan is a Type 1 differentiated school-based education system that was identified as high-performing based on its performance at both age 15/16 and ages 20-24 (Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022). As shown in Table 4, Japan had above average skill levels at age 15/16 across reading, maths and science (which place it in the top decile), although skill inequalities were broadly similar to the OECD average. It also had the lowest proportion of low achievers in collaborative problem solving of any country recorded. Post-16 skill development in Japan is above average in literacy and numeracy, and inequalities in these domains also narrow.

In Japan, school is compulsory for all pupils between 6 and 15 years of age. Pupils attend elementary school between the ages of 6 and 12 before moving into lower secondary school until age 15 (OECD, 2022b; Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, no date). At this stage, pupils can then enrol in upper secondary education, where they typically choose between general secondary education, specialised vocational school or colleges of technology (OECD, 2015b). Pupils may then choose to progress to tertiary or post-secondary education, including university, professional training college or Junior colleges (OECD, 2015b). Short post-secondary courses are also available (OECD, 2015b). Japan's Ministry of Education, Culture, Sports and Science and Technology (MEXT) is responsible for education from ECEC to upper secondary schools in addition to higher education. The Ministry of Health, Labour and Wealth is responsible for VET (OECD, 2015b).

Key Success Factors

There is strong alignment between the socio-cultural expectations of equity and homogeneity within Japanese society and the structure of the Japanese education system.

Country experts highlighted that in Japanese society there is a strong emphasis on equity and equality and that there is little appetite for choice throughout compulsory education. This is reflected in the uniformity of structure of the school system. For example, throughout elementary and lower secondary education, school choice is limited, with no tracking and no grade repetition taking place (OECD, 2015b). MEXT sets standards for all schools and ensure a fixed standard of education throughout the country, including setting national curriculum standards across elementary and lower secondary school (Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, no date).

This uniformity is also present in the training and management of the teaching workforce. Initial teacher education in Japan typically lasts around 4 years at a university for primary and general lower secondary teachers (OECD, 2022b). Once certified, teachers must take a competitive selection examination to enter employment and complete a teaching induction (OECD, 2015b). Teachers are then employed by local municipalities, rather than individual schools, and these municipalities make the decision about where individual teachers are deployed (OECD, 2015b). Teachers are provided with CPD by their education boards and boards are required to monitor the abilities and achievements of teachers throughout their careers. Teachers must also renew their teaching certificates every ten years (Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, 2015). The country experts commented that this approach to training and managing the workforce can help ensure that high quality teachers are more evenly distributed across schools and accessible to more pupils. This suggests it is important to ensure that the vision, ethos and values that underpin an education system align with those held more widely by society, in order to maintain system coherence.

There is a strong emphasis on maths, national language and English provision throughout the education system, particularly for facilitating entry to higher education.

In Japan, mathematics and Japanese are compulsory throughout the compulsory school and in upper secondary school curriculums (NCEE, 2024). English is also compulsory during lower and upper secondary education (NCEE, 2024). Country experts commented that the strong emphasis on these core subjects in society, as well as within the education system is, at least in part, driven by the prestige of attending university and the highly competitive selection processes for entry into both academic upper secondary and higher education settings. For example, Japanese universities use pupils' scores on the National Center Test for University Admissions, known as the "Center Test," as well as their performance on the individual exams administered by each university (National Center for University Entrance Examinations, Tokyo, 2024; NCEE, 2024). This test assesses candidates in five fields: Japanese language, foreign language (commonly English), math, science, and social studies. Country experts explained that this generates a strong culture of competition among families and pupils to perform well in this narrow group of subjects and to invest highly in private tuition to improve their outcomes in these areas. The country experts also noted that this highly competitive culture and emphasis on maths, Japanese and English had some important trade-offs for other areas of development and perpetuating disadvantage gaps. These are discussed further in the following section. That said, this provides further evidence that skills development in England may be better supported if maths and English courses were compulsory until the age of 18.

Japan invests heavily in tertiary education, reflecting strong societal expectations on achieving university-level education.

In 2019, public spending on primary to tertiary education represented around 8% of total government expenditure, with Japan spending around 4% of their GDP on primary to tertiary education. Furthermore, in Japan many families invest in private education and/or tuition. Private expenditure accounts for 7% of spending at primary to upper secondary education level and 67% of expenditure on tertiary education level (which is more than double the OECD average) (OECD, 2022b). Country experts highlighted that this investment in post-16 education reflects the prestige and expectation on young people to achieve a university education. Around half of 25-34 year olds hold a tertiary education, which represents a 17 percentage points increase between 2000 and 2021 (OECD, 2022b). This level of financial investment, both by Government and individuals, in conjunction with the emphasis on achieving tertiary education likely helps explain the high levels of skills development observed post-16 in Japan. However, Japan's highly competitive culture has some important trade-offs that are discussed in more detail below.

Key Compromises

The strong emphasis on maths, national language and English provision and highly competitive culture reduces curriculum breadth and fosters dependence on private tuition, which may hinder efforts to reduce socio-economic inequalities.

Country experts highlighted that the strong emphasis on a narrow range of academic subjects and obtaining a university education in Japan has diluted focus on other subjects and created fierce competition during compulsory schooling to excel in these subjects, in order to access the best upper secondary and higher education destinations. They suggested that this has generated a financial pressure on parents and carers to ensure their child(ren) is able to access private education/training, especially in maths, national language and English (such as after-school tutoring schools), to support their progress in these subjects and improve their chances of being selected into their desired schools and universities. This risks perpetuating disadvantage gaps.

Country experts also noted that this competitive culture often results in pupils focusing on a comparatively narrow curriculum and comes at the cost of other subjects (such as the arts) and areas of wider development (such as non-cognitive development and wellbeing), which are less well supported.

Policies such as increasing the number of teaching hours pupils receive have been introduced in an effort to reduce dependence on private education resources among pupils and competitive pressures for entry to university (OECD, 2015b) (OECD, 2023e). However, private education settings remain a key feature of the Japanese education landscape, despite these policy efforts.

Vocational education programmes are not held in high regard, with the exception of Colleges of Technology (Kosen), and VET participation rates are low.

Entry to upper secondary school sees the start of tracking in the Japanese education system with four categories of courses available to pupils: academic high school, specialised vocational high schools, specialised training colleges and colleges of technology (OECD, 2015b; NCEE, 2024; Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan, no date). Most pupils attend academic programmes and comparatively few attend vocational education (relative to other OECD countries) (OECD, 2015b). Country experts commented that there is a stark difference in the perceived value and prestige of attending academic and vocational pathways, with vocational education seen as the pathway for low attaining pupils.

Colleges of Technology (Kosen) are an exception to this. These are specialist colleges of technology that offer specialised five-year training programmes in a variety of technical and engineering programmes leading to an associate degree (OECD, 2015b; NCEE, 2024). Students who complete these programmes can opt to complete an additional two years of study to convert this to a full bachelor's degree. While only a very small number of students currently enter these training programmes, country experts highlighted that these programmes are perceived to be high-quality and offer students favourable education and employment outcomes (including entry to higher education or entry to high paying, high skilled careers in industry) (NCEE, 2024). As such, these programmes are held in high regard and have a highly competitive admission process with similar entry requirements to academic high schools.

Portugal

Portugal is a Type 1 differentiated school-based education system. It was identified as high performing as it had the second highest socio-emotional skill levels of all countries reported and skill inequalities in this domain were below average at age 15/16, as shown in Table 4. It also had fewer low achieving pupils in collaborative problem solving than average. Across reading and science outcomes at age 15/16, skill levels were similar to the OECD average and inequalities were well below average. For maths, skill levels and inequalities were average. Post-16 literacy and numeracy skill development is below average, although skills inequalities narrow.

In Portugal, it is mandatory for all children to attend school from the age of six until age 18 (OECD, 2020d, 2023f; Eurydice, 2024). Pupils attend primary schools until age 12, followed by lower secondary education until age 15 (OECD, 2020d, 2023f; Eurydice, 2024). At this stage, pupils can enrol in upper secondary education and may then choose to progress either to general upper secondary education or vocational upper secondary education. These programmes are typically completed at age 18, at which stage pupils may opt to pursue short technical specialisation courses, post-secondary polytechnic programmes or university programmes (OECD, 2023f). The Ministry of Education in Portugal has responsibility for pre-school, compulsory, upper secondary education and shared responsibility for VET along with the Ministry of Labour, Solidarity and Social Security (Eurydice, 2024). The Ministry of Science, Technology and Higher education has responsibility for Higher Education (Eurydice, 2024).

Key Success Factors

Social and emotional skills are explicit within curriculum and competency development frameworks for schools.

In Portugal, social and emotional skills are explicit developmental competencies that pupils are expected to develop with support from schools. The Ministry of Education has published education guidelines that provide schools with a framework for progressing the development of pupils' social and emotional skills from pre-school to the end of basic education (Figueira et al., 2021). Furthermore, social and emotional skills competencies are expected skills for pupils when they complete compulsory education, including self-regulation, empathy, critical thinking and creative thinking (Educacao Para A Cidadania, 2017; Centre for Psychological Research and Social Intervention, 2023). Schools take a cross-curricular approach to developing these skills, but primarily address the development of social and emotional skills in physical and health education, civic and citizenship education, moral/religious education and personal and development education (OECD, 2015c). Social and emotional skills are explicitly covered in report cards used to assess pupils' skills at primary and lower secondary education level (OECD, 2015c). This suggests that it may be beneficial in England to ensure socio-emotional skill development is sufficiently explicit across the national curriculum and regulatory frameworks.

Portugal has developed a highly qualified teaching workforce.

All teachers in Portugal working across pre-school up to upper secondary education (including VET teachers) are required to hold a master's degree level teaching qualification (Cedefop, 2021; Eurydice, 2024). Candidates obtain these qualifications by completing an initial teacher training course offered at higher education institutes and universities (Eurydice, 2024). This is then supported by providing teachers with ongoing CPD that aims to consolidate and build key skills and competencies (Eurydice, 2024). While this is not mandatory, it is incentivised by making participation in CPD a pre-requisite for promotion or salary increases (OECD, 2020d). Below-average teaching hours, comparatively high salaries and average classes sizes may contribute to the creation of favourable working conditions that help attract candidates to enter teaching and retain a high-quality workforce (OECD, 2020d). The high quality of the Portuguese teaching workforce likely helps underpin Portugal's outcomes at age 15/16. As already discussed, this again highlights the importance of ensuring that a sufficient supply of high quality teachers is built and maintained in England.

Key Compromises

While the design of upper secondary education is intended to ensure all programmes provide a pathway to higher education and allows for mobility between pathways, this is inhibited by the fragmented organisation and administration of these programmes.

Upper secondary education in Portugal is compulsory, commences at age 15 and lasts for three years, with pupils able to choose between general upper secondary education programme or vocational upper secondary education programmes (including apprenticeships) (OECD, 2020d, 2023f; Eurydice, 2024). All VET programmes at this level lead to a dual school leaving certificate, with pupils completing academic and vocational courses (OECD, 2020d; Eurydice, 2024). The design of these programmes is intended to be permeable to allow pupils to move between programmes if they desire, including general programmes (OECD, 2020d; Eurydice, 2024). It also ensures that all pupils are able to access higher education, irrespective of which upper secondary programme they complete (Eurydice, 2024). This design helps to promote social mobility among pupils and helps generate greater equity of regard between VET and general education programmes at upper secondary education level. However, the ability of pupils to take advantage of this permeability and transition into higher education may be inhibited by the fragmented way in which these programmes are organised and administered to pupils (Liebowitz et al., 2018). For example, professional VET programmes are overseen by the Ministry of Education and delivered in schools, while apprenticeships are overseen by the Ministry of Labour, Solidarity and Social Security and are delivered in training centres (Liebowitz et al., 2018).

The ability of pupils completing VET programmes to enter higher education is further inhibited by national entrance examinations.

In Portugal, a centralised admissions process is used to manage the transition of pupils into tertiary education. However, this process relies on a national entrance examination that is based on the science-humanities curriculum delivered within general upper-secondary education (OECD, 2020d). While curriculum reforms have been introduced to try and reduce the disparity in content between general and vocational programmes (OECD, 2020d), this likely continues to prevent pupils who have completed VET programmes from accessing higher education.

Sweden

Sweden is a Type 2b education system (Green and Pensiero, 2016a; Pensiero and Green, 2018a; Green and Kaye, 2022). Skills outcomes at age 15/16 are mixed; average skills outcomes in maths and science are similar to the OECD average and higher than average in reading, but skills inequalities are well above average across these domains. Sweden has relatively few low achieving pupils in collaborative problem solving. Sweden was selected as a case study on the basis of its young adults' post-16 literacy and numeracy skill development and because skills inequalities also narrow post-16, as shown earlier in Table 4.

In Sweden, it is mandatory for all children from the age of 6 to attend pre-school education prior to compulsory schooling beginning for all children at age 7 and continuing until the age of 15/16 (OECD, 2017b; Cedefop, 2022b; OECD, 2023g). At age 16, pupils can enter general and vocational programmes that enable access to programmes at university and university colleges as well as higher vocational education (OECD, 2017b). The Ministry of Education and Research has overall responsibility for the education system through the National Agency for Education and National Agency for Higher Vocational Education (Cedefop, 2022b). This includes responsibility for upper secondary education, adult education and higher VET education (Cedefop, 2022b).

Key Success Factors

There is no tracking until pupils enter upper secondary education and there is a relatively high level of curriculum standardisation across all upper secondary education routes.

As pupils enter upper secondary education at age 16, they are able to choose from a range of general and vocational programmes. There are a total of 12 VET programmes covering a range of occupational fields and each programme can be pursued either through a school-based pathway or as an apprenticeship. School-based programmes require 15% of time in work-based learning whereas apprenticeships require 50% (OECD, 2017b, p. 201; Cedefop, 2022b). All programmes at the upper secondary level cover core foundation subjects, including Swedish, English and mathematics, as well as programme-specific subjects (Cedefop, 2022b). The modular-nature of these programmes allows pupils in upper secondary education to transfer between programmes if they wish to change their route of study, although country experts indicated that this is not common (Cedefop, 2022b). This means that there is a relatively high level of standardisation of the curriculum across all programmes available for upper secondary. Furthermore, graduates of VET programmes with sufficient passing grades in particular modules (such as Swedish, English and mathematics) can then access higher vocational education (Cedefop, 2022b). Around 31% of graduates from vocational upper secondary education programmes have direct access to tertiary education (OECD, 2022c). Country experts highlight the importance of maintaining this breadth in the curriculum across all routes at upper secondary level to give young people choice and ensure they have the pre-requisite skills for a range of potential future educational and/or labour market destinations. This likely contributes to the relatively high level of cognitive skill development and reduction in skills inequalities Sweden achieve between age 15/16 and age 20-24. This provides further evidence that a key opportunity for supporting improved skills development post-16 in England may be to ensure all pupils study maths and English until age 18 when they complete upper secondary education.

Pupils can access established bridging courses to help them achieve the requirements to gain entry to upper secondary academic and VET programmes.

Students who do not have the passing grades in Swedish, English, Maths and five additional compulsory subjects that are typically needed entry to all upper secondary education programmes can access one of four established bridging programmes to help them achieve these requirements (OECD, 2017b; Cedefop, 2022b). Depending on students' goals and performance, they usually last from 1 to 3 years. These programmes are often aimed young, mostly recently arrived immigrants, who are not eligible for admission to an upper secondary VET programme (Cedefop, 2022b). These programmes likely support social mobility by helping low-attaining and immigrant populations access upper secondary education, which is necessary for access to higher or further education and improved labour market outcomes.

Strong culture of accessing adult education/ lifelong learning (particularly among immigrant/ non-native population).

Sweden has well established pathways into adult education for those over 20 years of age, either through formal municipal programmes or through non-traditional liberal adult education providers (Cedefop, 2022b). Adults often access these modular programmes to gain qualifications in new fields or study courses required to access higher vocational or higher general education. A range of courses and programmes are available at various levels of education, financed through fees or by companies and organisations, with public grants also provided (Cedefop, 2022b). Municipal adult education courses at upper secondary level are free of charge for the learner, though learners must pay for their teaching materials themselves, which likely makes these course more accessible and improves participation rates. In 2019, participation in lifelong learning was above 34%, making it the highest in the European Union (Cedefop, 2022b). Country experts commented that adult education has a long tradition in Sweden and highlighted the value of these courses in supporting adults in Sweden to continue upskilling and to retrain if they wish, or need, to change careers.

Investment in education in Sweden is above the OECD average.

In 2020, public spending on primary and tertiary education represented around 5.7 per cent of Sweden's GDP (compared to an OECD average of 5.1 per cent) (OECD, 2023c). Across phases, this equates to about USD[14] 15,994 per pupil (compared to an OECD average of USD 12,647 per pupil) (OECD, 2023c). As discussed already, increased investment in education may contribute to reduced inequalities in skills development.

14 In equivalent USD converted using PPPs for GDP.

Key Compromises

Vocational upper secondary programmes are not held in equal regard to academic programmes.

While participation rates in upper secondary education in Sweden are only slightly below the OECD average (OECD, 2017b, 2023c), country experts highlight that there remains a stigma around participation in VET programmes that prevents pupils enrolling in these programmes. Despite vocational programmes typically providing pupils with the pre-requisite subject courses and credits needed to access higher education (Cedefop, 2022b), there remains a perception among parents and pupils that those who graduate from these programmes will not be able to access higher education. Similarly, there remains a perception that VET programmes are only for low-attaining pupils. Country experts highlighted this stigma as key factor that puts young people off studying VET programme at the upper secondary level and reducing the esteem in which VET programmes are held. As already discussed, this is a challenge also present within the English education system.

Case study evidence suggests Sweden achieves relatively high post-16 outcomes despite the perceptions of vocational education because of the high degree of curriculum standardisation across upper secondary education/training programmes, the accessibility of upper secondary education via bridging courses and a strong culture of adult education, as discussed above.

Local and regional variability in the availability of different education pathways for pupils.

Country experts highlighted that the programmes pupils are able to access, particularly at upper secondary level, vary notably depending on location in which they reside. For example, rural students are often not able to access all 18 upper secondary education programmes that are theoretically available to all students. Country experts reported that that this is largely driven by the significant teacher shortages Sweden is currently experiencing (Cedefop, 2022b), with teachers much more difficult to recruit outside of major cities. They also commented that specialist teachers, such as those needed to teach VET programmes, are the most difficult to recruit, meaning sometimes entire VET programmes are simply not delivered in a particular school or locality.

Switzerland

Switzerland is a Type 3 education system with tracked school-based general education and a dual apprenticeship system, and was identified as a high performing country because it had the highest average socio-emotional skill level of all countries amongst age 15/16 year-olds. Across reading, maths and science, Switzerland had relatively high skills levels and relatively high skill inequalities amongst 15/16 year olds, as shown in Table 4. Our analysis also suggests that young adults in Switzerland make relatively strong progress in their literacy and numeracy skills and skills inequalities also narrow post-16.

In Switzerland, education is decentralised across the 26 Cantons (states) that make up the country, though the Cantons share responsibility for post-compulsory education with the Federal Government (Eurydice, 2023c). Education is compulsory from age 4 to 15, with pupils attending kindergarten between ages 4 to 6, primary school between ages 6 to 12 and lower secondary education from age 12 to 15 (Eurydice, 2023c; Swiss Confederation, 2024). When pupils enter upper secondary education they can choose from a range of routes: baccalaureates, specialised academic upper secondary education, vocational baccalaureates, three or four year VET and two year VET (OECD, 2023g). These programmes then offer progression at age 19/20 to a range of tertiary and post-secondary education programmes at university (including universities of teacher education and universities of applied sciences), colleges of higher education and federal professional education (OECD, 2023h).

Key Success Factors

Swiss cantons often make the development of socio-emotional skills explicit within their curriculum frameworks throughout compulsory education.

As the education system in Switzerland is decentralised,the national curriculum for compulsory education varies for each language region, although each is based on the national educational goals of the Swiss Conference of Cantonal Ministers of Education (EDK). Socio-emotional skills are emphasised explicitly, under the broader category of 'transversal competencies' within the curriculum frameworks in each language region. For example, Curriculum 21 – which is a framework that has been implemented across the German-speaking cantons (which make up the majority of Swiss cantons) - explicitly outlines socio-emotional competencies that schools should seek to develop in pupils, such as persistence, emotion identification and regulation and self-reflection (Lehrplan21, 2016). While the framework recognises that the development of personal and social skills in pupils is largely the product of their family and their wider social environment, it outlines how these socioemotional skills should be developed and trained in schools (Lehrplan21, 2016).

Country experts highlighted that the success of schools developing socioemotional skills is in part underpinned by an awareness among families and wider society of the importance of socioemotional development. They also highlighted that teachers in Switzerland are increasingly being trained on how to facilitate the development of socioemotional skills in their teaching during their initial teacher training.

As already discussed, this case study evidence suggests that there may be an opportunity to facilitate improved socio-emotional skill development in England by ensuring that socio-emotional skill development is sufficiently explicit across the national curriculum and regulatory frameworks. It also suggests that it would be beneficial to accompany this with improved teacher training on how to support socio-emotional development in the classroom.

The teaching workforce is required to be highly qualified across pre-school, compulsory schooling and upper secondary education level.

Teachers in Switzerland are required to be comparatively high qualified. Teachers across pre-schools and primary schools must hold a Bachelor's degree, while all teachers across lower secondary and upper secondary baccalaureate schools are required to hold a Master's degree and complete an additional year of training (Eurydice, 2023d). In addition, teachers working in vocational schools are required to hold either a Bachelor's or Master's degree (Eurydice, 2023d). Individual cantons then set the requirements and entitlements for teachers working in pre-school, compulsory schools and upper secondary baccalaureate schools to complete CPD (Eurydice, 2023d). Similarly, CPD for teachers in vocational schools is compulsory and regulated by the Vocational and Professional Education and Training Ordinance (Eurydice, 2023d). Cumulatively, these requirements and entitlements help to generate a comparatively highly qualified and highly skilled workforce, which likely help underpin high average levels of skill development to age 15/16. This underlines the critical importance of a strong teaching workforce.

Participation rates in VET programmes at upper-secondary level are high, which likely reflects the high regard for vocational pathways.

At age 15, upon completion of their compulsory education, pupils are able to choose between a range of general/academic and vocational education pathways (OECD, 2023h). Across Switzerland as a whole, about two-thirds of pupils who progress to upper-secondary education opt for VET programmes, with the remainder pursuing general academic programmes (baccalaureate school or upper-secondary specialised school) (Swiss Confederation, 2021b, 2024). Around 27% of the 15–19-year-old age group are enrolled in general upper secondary education and 38% in vocational upper secondary education, with a further 16% are enrolled in lower secondary programmes and 4% in tertiary programmes (OECD, 2023h). This compares to an OECD average of 37% enrolled in general upper secondary programmes, 23% in vocational upper secondary programmes, 12% in lower secondary programmes and 12% in tertiary programmes (citation). Country experts highlighted that this high rate of participation is driven by the perceived prestige of completing VET programmes, particularly within the German-speaking cantons. The dual-system (where pupils on an apprenticeship spend three or four days working in industry and the remaining time attending vocational school) is the predominant form of VET at the upper secondary level (Swiss Confederation, 2021a). Country experts suggested that these programmes are well regarded, offer desirable educational and employment outcomes (Swiss Confederation, 2021a) and are a key driver behind Switzerland's low youth unemployment rates. In Switzerland, 4.1% of young adults with vocational upper secondary attainment are unemployed, compared to 5.5% of those with general upper secondary attainment (OECD, 2023h).

Key Compromises

The decentralised nature of the Swiss education system results in local and regional disparities in provision and outcomes.

Country experts also highlighted the disadvantages of having a decentralised education system across 26 Cantons. They suggested that, while VET pathways are highly regarded in German-speaking Cantons, this is not the case in French-speaking Cantons. Similarly, the lack of national curriculum means Cantons differ in their inclusion of socioemotional development within the curriculum and the extent to which this is an explicit expectation for schools. The Intercantonal Agreement on Harmonisation of Compulsory Education (Eurydice, 2023b) attempts to address this by driving greater curriculum standardisation, including outlining the basic competencies that should be regularly monitored (Eurydice, 2023b). This highlights the need to balance the benefits of greater skills devolution in England with the benefits of greater standardisation.

Drawing insights from these seven case study countries

While each of these case studies countries have vastly different education systems underpinned by different socio-cultural and economic contexts, two key commonalities emerge.

High performing countries have coherent education systems underpinned by an implicit vision and set of values for education, which are informed by the socio-cultural and economic context in which they operate.

Each case study country typically has a relatively coherent education system. The case study evidence suggests that the coherence of these systems is brought about by an implicit vision and set of values for education which are closely aligned with the socio-cultural and economic context in which the education system must operate. For example, Austria places vocational education at the heart of their vision for the education system, underpinned by a long-lasting strong social contract between employers and young people and high regard for vocational programmes and qualifications. Vocational education is designed to meet the needs of employers / labour market and employers receive participating pupils are their future workforce. Similarly, the Japanese education system reflects the wider socio-cultural expectations of equity and homogeneity within Japanese society and the premium placed on achieving a tertiary level education. This helps minimise fragmentation within the education system by providing a clear set of guiding principles and parameters the system must align with and within which the system must operate. This ensures it is responsive to the needs and expectations of society more widely. The relative coherence of these systems highlights the relative fragmentation of the tertiary education system in England and suggests that reducing this fragmentation may benefit pupil outcomes. This theme is elaborated upon in the Working Paper 7 Summary Report, which draws out the policy implications of the research findings presented in this paper.

High performing education systems demonstrate that success in some areas of skill development can necessitate compromises in other areas of development or involve other trade-offs.

None of the countries identified through our quantitative analysis as 'high performing' were high performing across all the outcomes measures we assessed, despite the fact all seven adopted most of the features identified in the wider literature as being associated with improved skills outcomes. The case study evidence highlights that education systems are composed of interrelated and interdependent features that evolve over time reflecting a wider socio-economic and cultural context. Efforts to make a change to one aspects of an education system must consider these relationships and contexts and will inevitably require trade-offs and compromises. Improved outcomes in some domains might involve reduced outcomes in other domains (for example, due to reduced teaching time) and/or necessitate other compromises, such as curriculum narrowing. For example, Japan performed highly across pre-16 and post-16 literacy and numeracy outcomes and this is likely a result of the emphasis placed on academic achievement in these domains. However, this has contributed to a comparatively narrow curriculum, with subjects like the arts and humanities less readily available to pupils. Similarly, the focus on cognitive and academic outcomes may also result in other areas of pupil development (such as socio-emotional development or mental health and wellbeing) being less well supported. This evidence highlights the importance of ensuring that the research findings discussed in this paper are translated into policy and practice changes that align with the vision, values and wider context of the UK education system, with careful consideration given to trade-offs and compromises.

Bibliography

Balladares, J. and Kankaraš, M. (2020) Attendance in early childhood education and care programmes and academic proficiencies at age 15. OECD Education Working Papers No 214. Available at: https://doi.org/10.1787/f16c7ae5-en.

Bocock, L., Del Pozo Segura, J.M. and Hillary, J. (2024a) Rethinking skills gaps and solutions. Working paper 4 of The Skills Imperative 2035: essential skills for tomorrow's workforce. Available at: https://www.nfer.ac.uk/publications/rethinking-skills-gaps-and-solutions/ (Accessed: 12 November 2024).

Bocock, L., Del Pozo Segura, J.M. and Hillary, J. (2024b) Rethinking skills gaps and solutions. Working Paper 4 of The Skills Imperative 2035: essential skills for tomorrow's workforce. Available at: https://www.nfer.ac.uk/media/mmpjeq3p/rethinking_skills_gaps_and_solutions_working_paper_4_of_the_skills_imperative_2035_essential_skills_for_tomorrows_workforce.pdf (Accessed: 28 February 2025).

Bocock, L., Del Pozo Segura, J.M. and Hillary, J. (2024c) Rethinking skills gaps and solutions. Working Paper 4 of The Skills Imperative 2035: Essential skills for tomorrow's workforce. Available at: https://www.nfer.ac.uk/media/mmpjeq3p/rethinking_skills_gaps_and_solutions_working_paper_4_of_the_skills_imperative_2035_essential_skills_for_tomorrows_workforce.pdf (Accessed: 21 March 2025).

Bocock, L., Del Pozo Segura, J.M. and Hillary, J. (2025) Building Foundations: the implications of research on childhood skill development for addressing future skills needs in England. Working Paper 6 from The Skills Imperative 2035: Essential skills for tomorrow's workforce. Available at: https://www.nfer.ac.uk/media/powfukkx/building_foundations_the_implications_of_research_on_childhood_skills_development_for_addressing_future_needs_in_england.pdf (Accessed: 19 March 2025).

Bodovski, K., Byun, S., Chykina, V. and Chung, H.J. (2017) 'Searching for the golden model of education: cross-national analysis of math achievement', Compare: A Journal of Comparative and International Education, 47(5), pp. 722–741. Available at: https://doi.org/10.1080/03057925.2016.1274881.

Bodovski, K., Munoz, I., Byun, S. and Chykina, V. (2024) 'Do education system characteristics moderate the socioeconomic, gender and immigrant gaps in math and science achievement?', International Journal of Sociology of Education, 9(2), pp. 122–154. Available at: https://doi.org/10.17583/rise.2020.4807.

Bol, T., Witschge, J., Van de Werfhorst, H.G. and Dronkers, J. (2014) 'Curricular tracking and central examinations: counterbalancing the impact of social background on student achievement in 36 countries', Social Forces, 92(4), pp. 1545–1572. Available at: https://doi.org/10.1093/sf/sou003.

Brown, E.R., Groom, M., Zhang, K. and Angell, S. (2023) World class: what England can learn from global experience to make early years policy work for disadvantaged children. Available at: https://www.suttontrust.com/wp-content/uploads/2023/07/A-Fair-Start-%E2%80%93-World-Class-Global-Learnings-For-England-On-Early-Years-Policy.pdf (Accessed: 5 November 2024).

Carney, M. (2018) The future of work. Available at: https://www.bankofengland.co.uk/speech/2018/mark-carney-whitaker-lecture (Accessed: 24 July 2024).

Cedefop (2021) Vocational education and training in Portugal: short description. Available at: https://www.cedefop.europa.eu/files/4191_en.pdf (Accessed: 23 January 2025).

Cedefop (2022a) Vocational education and training in Europe - Austria: system description. Available at: https://www.cedefop.europa.eu/en/print/pdf/node/144692 (Accessed: 23 January 2025).

Cedefop (2022b) Vocational education and training in Europe - Sweden: system description. Available at: https://www.cedefop.europa.eu/en/print/pdf/node/145997 (Accessed: 23 January 2025).

Cefai, C., Bartolo, P.A., Cavioni, V. and Downes, P. (2018) Strengthening Social and Emotional education as a core curricular area across the EU: a review of the international evidence. Available at: https://boa.unimib.it/retrieve/handle/10281/188490/268947/Strengthening-Social-and-Emotional-Education.pdf (Accessed: 12 November 2024).

Centre for Psychological Research and Social Intervention (2023) 'Assessing social and emotional skills of children and youth in Portuguese is now easier', CIS-iscte, 29 November. Available at: https://www.cis.iscte-iul.pt/post/assessing-social-and-emotional-skills-of-children-and-youth-in-portuguese-is-now-easier (Accessed: 6 January 2025).

Chiu, M.M. (2015) 'Family inequality, school inequalities, and mathematics achievement in 65 countries: microeconomic mechanisms of rent seeking and diminishing marginal returns', Teachers College Record, 117(1), pp. 1–32. Available at: https://doi.org/10.1177/016146811511700105.

Chiu, M.M. and McBride-Chang, C. (2010a) 'Family and reading in 41 countries: differences across cultures and students', Scientific Studies of Reading, 14(6), pp. 514–543. Available at: https://doi.org/10.1080/10888431003623520.

Chiu, M.M. and McBride-Chang, C. (2010b) 'Family and reading in 41 countries: differences across cultures and students', Scientific Studies of Reading, 14(6), pp. 514–543. Available at: https://doi.org/10.1080/10888431003623520.

Costa, R., Liu, Z., Pissarides, C. and Rohenkohl, B. (2024) Old skills, new skills: what is changing in the UK labour market? Available at: https://www.ifow.org/publications/old-skills-new-skills---what-is-changing-in-the-uk-labour-market (Accessed: 21 August 2024).

Creese, B., Gonzalez, A. and Isaacs, T. (2016) 'Comparing international curriculum systems: the international instructional systems study', The Curriculum Journal, 27(1), pp. 5–23. Available at: https://doi.org/10.1080/09585176.2015.1128346.

David Robinson and Gerard Dominguez-Reig (2020) An international comparison of technical education funding systems: what can England learn from successful countries? Available at: https://epi.org.uk/wp-content/uploads/2020/03/EPI-Tech_ed_funding_2020.pdf.

DfE (2024) Early years qualification requirements and standards. Available at: https://assets.publishing.service.gov.uk/media/65844707ed3c34000d3bfd40/Early_years_qualification_requirements_and_standards_-_Jan_24.pdf (Accessed: 6 January 2025).

Dickerson, A., Rossi, G., Bocock, L., Hillary, J. and Simcock, D. (2023) An analysis of the demand for skills in the labour market in 2 035. Working paper 3. Available at: https://www.nfer.ac.uk/publications/the-skills-imperative-2035-an-analysis-of-the-demand-for-skills-in-the-labour-market-in-2035/ (Accessed: 24 July 2024).

Dolton, P. and Marcenaro-Gutierrez, O.D. (2011) 'If you pay peanuts do you get monkeys? A cross-country analysis of teacher pay and pupil performance', Economic Policy, 26(65), pp. 5–55. Available at: https://doi.org/10.1111/j.1468-0327.2010.00257.x.

Dräger, J., Washbrook, E., Schneider, T., Akabayashi, H., Keizer, R., Solaz, A., Waldfogel, J., Rie, S. de la, Kameyama, Y., Kwon, S., Nozaki, K., Casoni, V.P., Sano, S., Sheridan, A. and Shikishima, C. (2023) Cross-national differences in socioeconomic achievement inequality in early primary school: the role of parental education and income in six countries. Available at: https://strathprints.strath.ac.uk/84244/1/Drager_etal_SocArXiv_2023_Cross_national_differences_in_socioeconomic_achievement_inequality.pdf (Accessed: 6 January 2025).

Duckworth, A.L., Taxer, J.L., Eskreis-Winkler, L., Galla, B.M. and Gross, J.J. (2019) 'Self-control and academic achievement', Annual Review of Psychology, 70, pp. 373–399. Available at: https://doi.org/10.1146/annurev-psych-010418-103230.

Educacao Para A Cidadania (2017) Students' profile by the end of compulsory schooling. Available at: https://cidadania.dge.mec.pt/sites/default/files/pdfs/students-profile.pdf (Accessed: 6 January 2025).

EduCanada (2024) Elementary school in Canada. Available at: https://www.educanada.ca/study-plan-etudes/elementary-primaire.aspx?lang=eng (Accessed: 6 January 2025).

Educational Testing Service (2024) PIAAC Cycle 2 released cognitive items. Available at: https://www.oecd.org/content/dam/oecd/en/about/programmes/edu/piaac/released-items/cycle-2/PIAAC_CY2_Released_Cognitive_Items_EN.pdf (Accessed: 19 March 2025).

Employment and Social Development Canada (2021) Canada country background report – quality in early childhood education and care. Available at: https://www.canada.ca/content/dam/esdc-edsc/documents/programs/early-learning-child-care/reports/2021-canada-country-background-quality/Canada%20Country%20Background%20Report%20-%20Quality%20in%20Early%20Childhood%20Education%20and%20Care.pdf (Accessed: 6 January 2025).

Eurydice (2023a) Austria: traineeships and apprenticeships. Available at: https://national-policies.eacea.ec.europa.eu/youthwiki/chapters/austria/35-traineeships-and-apprenticeships (Accessed: 6 January 2025).

Eurydice (2023b) Switzerland: teaching and learning in primary education, European Commission. Available at: https://eurydice.eacea.ec.europa.eu/national-education-systems/switzerland/teaching-and-learning-primary-education (Accessed: 23 January 2025).

Eurydice (2023c) Switzerland: overview. Available at: https://eurydice.eacea.ec.europa.eu/national-education-systems/switzerland/overview (Accessed: 6 January 2025).

Eurydice (2023d) Switzerland: teachers and education staff. Available at: https://eurydice.eacea.ec.europa.eu/national-education-systems/switzerland/teachers-and-education-staff (Accessed: 6 January 2025).

Eurydice (2024) Portugal: overview. Available at: https://eurydice.eacea.ec.europa.eu/national-education-systems/portugal/overview (Accessed: 6 January 2025).

Figueira, A.I., Rosa, A.P., Policarpo, D., Figueiredo, I.L., Salguiero, L., Pereira, M., Salgueiro, M.N., Soutenho, O., Meireles, P. and Tomas, S. (2021) Education guidelines for the world of work. Available at: https://cidadania.dge.mec.pt/sites/default/files/pdfs/refmundo-trabalho-en.pdf (Accessed: 6 January 2025).

Gal, I. and Tout, D. (2014) Comparison of PIAAC and PISA frameworks for numeracy and mathematical literacy. 102. Available at: https://doi.org/10.1787/5jz3wl63cs6f-en.

Government of British Columbia (2023) Graduation requirements. Available at: https://www2.gov.bc.ca/gov/content/education-training/k-12/administration/legislation-policy/public-schools/graduation-requirements (Accessed: 6 January 2025).

Government of Manitoba (no date) 'Graduation requirements for the English program'. Available at: https://www.edu.gov.mb.ca/k12/policy/gradreq/docs/grad_req_en.pdf (Accessed: 6 January 2025).

GOV.UK (2024a) 16 to 19 Funding: maths and English condition of funding, GOV.UK. Available at: https://www.gov.uk/government/publications/16-to-19-funding-maths-and-english-condition-of-funding (Accessed: 28 February 2025).

GOV.UK (2024b) The National Curriculum. Key Stage 3 and 4, GOV.UK. Available at: https://www.gov.uk/national-curriculum/key-stage-3-and-4 (Accessed: 6 January 2025).

Greatbatch, D. and Tate, S. (2019) School improvement systems in high performing countries. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/905496/School_improvement_systems_in_high_performing_countries.pdf (Accessed: 6 January 2025).

Green, A. and Kaye, N. (2022) 'The effects of system type and characteristics on skills inequalities during upper secondary education: a quasi-cohort analysis of OECD data', Research Papers in Education, 39(3), pp. 466–491. Available at: https://doi.org/10.1080/02671522.2022.2150884.

Green, A. and Pensiero, N. (2016a) 'The Effects of Upper-Secondary Education and Training Systems on Skills Inequality. A Quasi-Cohort Analysis Using PISA 2000 and the OECD Survey of Adult Skills', British Educational Research Journal, 42(5), pp. 756–779. Available at: https://doi.org/10.1002/berj.3236.

Green, A. and Pensiero, N. (2016b) 'The effects of upper-secondary education and training systems on skills inequality. A quasi-cohort analysis using PISA 2000 and the OECD survey of adult skills', British Educational Research Journal, 42(5), pp. 756–779. Available at: https://doi.org/10.1002/berj.3236.

Gutman, L.M. and Schoon, I. (2013) The impact of non-cognitive skills on outcomes for young people. A literature review, Education Endowment Foundation: London, UK. Report. Available at: https://educationendowmentfoundation.org.uk/evidence-summaries/evidence-reviews/essential-life-skills/ (Accessed: 31 January 2025).

Hanushek, E.A. and Woessmann, L. (2006) 'Does educational tracking affect performance and inequality? Differences-in-differences evidence across countries', The Economic Journal, 116(510), pp. C63–C76. Available at: https://doi.org/10.1111/j.1468-0297.2006.01076.x.

Hanushek, E.A. and Woessmann, L. (2010) The economics of international differences in educational achievement. Working Paper 15949. Available at: https://doi.org/10.3386/w15949.

Hanushek, E.A. and Woessmann, L. (2012) 'Do better schools lead to more growth? Cognitive skills, economic outcomes, and causation', Journal of Economic Growth, 17(4), pp. 267–321. Available at: https://doi.org/10.1007/s10887-012-9081-x.

Heckman, J.J. and Kautz, T. (2012) 'Hard evidence on soft skills', Labour Economics, 19(4), pp. 451–464. Available at: https://doi.org/10.1016/j.labeco.2012.05.014.

Heisig, J.P. and Solga, H. (2015) 'Secondary education systems and the general skills of less- and intermediate-educated adults: a comparison of 18 countries', Sociology of Education, 88(3), pp. 202–225. Available at: https://doi.org/10.1177/0038040715588603.

Kashefpakdel, E. and Ravenscroft, T. (2021) Essential skills and their impact on education outcomes. Available at: https://www.skillsbuilder.org/file/essential-skills-and-their-impact-on-education-outcomes (Accessed: 23 January 2025).

Kuczera, M., Field, S. and Windisch, H.C. (2016) Building skills for all: a review of England. Available at: https://epale.ec.europa.eu/sites/default/files/building-skills-for-all-review-of-england.pdf (Accessed: 23 January 2025).

Lee, S.S. (2018) 'The Gini coefficient's magic does not work on standardized test scores', in. The Annual Conference of the American Educational Research Association (AERA), New York, NY. Available at: https://repository.upenn.edu/server/api/core/bitstreams/f4a554ef-092c-418d-ad3e-80380d7866af/content (Accessed: 28 February 2025).

Lehrplan21 (2016) Interdisciplinary skills. Available at: https://v-ef.lehrplan.ch/index.php?code=e|200|3 (Accessed: 23 January 2025).

Liebowitz, D., González, P., Hooge, E. and Lima, G. (2018) OECD Reviews of School resources: Portugal 2018. Available at: https://www.oecd.org/en/publications/oecd-reviews-of-school-resources-portugal-2018_9789264308411-en.html (Accessed: 24 January 2025).

Major, L.E., Eyles, A., Lillywhite, E. and Machin, S. (2024) A generation at risk. Rebalancing education in the post-pandemic era. Available at: https://news.exeter.ac.uk/wp-content/uploads/2024/04/Nuffield-Report-April-2024.pdf (Accessed: 24 January 2025).

Mammadov, S. (2022) 'Big Five personality traits and academic performance: a meta-analysis', Journal of Personality, 90(2), pp. 222–255. Available at: https://doi.org/10.1111/jopy.12663.

Ministry of Education and Research, Estonia (2022) Background report for OECD on vocational education and training (VET) in Estonia. Available at: https://www.hm.ee/sites/default/files/documents/2022-10/oecd_vet_background.pdf (Accessed: 24 January 2025).

Ministry of Education and Research, Estonia (no date) General education in Estonia. Available at: https://www.hm.ee/en/education-research-and-youth-affairs/general-education/general-education-estonia (Accessed: 24 January 2025).

Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan (2015) 'Improving the quality and ability of teachers'. Available at: https://www.mext.go.jp/en/policy/education/elsec/title02/detail02/__icsFiles/afieldfile/2015/08/11/1303528_01_1.pdf (Accessed: 24 January 2025).

Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan (no date) Principles guide Japan's educational system. Available at: https://www.mext.go.jp/en/policy/education/overview/index.htm (Accessed: 24 January 2025).

Montouri, A. (2011) 'Systems Approach', in R. Mark and S. Pritzker (eds) Encyclopedia of Creativity. Second. San Diego: Academic Press, pp. 414–421. Available at: https://www.sciencedirect.com/science/article/abs/pii/B9780123750389002120 (Accessed: 24 January 2025).

Münch, R. and Wieczorek, O. (2023) 'Improving schooling through effective governance? The United States, Canada, South Korea, and Singapore in the struggle for PISA scores', Comparative Education, 59(1), pp. 59–76. Available at: https://doi.org/10.1080/03050068.2022.2138176.

Murasovl, M. (2018) Cedefop opinion survey on vocational education and training in Europe: Estonia. Cedefop ReferNet thematic perspectives series. Available at: https://cumulus.cedefop.europa.eu/files/vetelib/2018/opinion_survey_VET_Estonia_Cedefop_ReferNet.pdf (Accessed: 24 January 2025).

Musset, P., Field, S., Mann, A. and Bergseng, B. (2019) Vocational education and training in Estonia. Available at: https://www.oecd-ilibrary.org/docserver/g2g9fac9-en.pdf (Accessed: 24 January 2025).

National Center for University Entrance Examinations, Tokyo (2024) Overview of the Common Test for university admissions. Available at: https://www.dnc.ac.jp/kyotsu/shiken_gaiyou/ (Accessed: 24 January 2025).

NCEE (2024) Top-performing countries: Japan. Available at: https://ncee.org/country/japan/ (Accessed: 24 January 2025).

O'Connell, M. and Marks, G.N. (2022) 'Cognitive ability and conscientiousness are more important than SES for education analysis of the UK Millennium Cohort Study', Personality and Individual Differences, 188, p. 111471. Available at: https://doi.org/10.1016/j.paid.2021.111471.

OECD (2012) Literacy, numeracy and problem solving in technology-rich environments: framework for the OECD survey of adult skills. Available at: https://doi.org/10.1787/9789264128859-en. (Accessed: 24 January 2025).

OECD (2015a) 'Canada', in Education Policy Outlook 2015: making reforms happen. Paris: OECD Publishing. Available at: https://www.oecd-ilibrary.org/education/education-policy-outlook-2015/canada_9789264225442-18-en (Accessed: 24 January 2025).

OECD (2015b) Education policy outlook: Japan. Available at: https://web-archive.oecd.org/2021-01-22/379200-japan-country-profile.pdf (Accessed: 24 January 2025).

OECD (2015c) 'Policies, practices and assessments that enhance Social and Emotional skills', in Skills for social progress: the power of social and emotional skills. Paris: OECD Publishing.

OECD (2017a) Education policy outlook: Austria. Available at: https://web-archive.oecd.org/2021-01-22/450269-education-policy-outlook-country-profile-austria.pdf (Accessed: 5 November 2024).

OECD (2017b) Education policy outlook: Sweden. Available at: https://web-archive.oecd.org/2021-01-22/442599-education-policy-outlook-country-profile-sweden.pdf (Accessed: 24 January 2025).

OECD (2017c) PISA 2015 assessment and analytical framework: science, reading, mathematic, financial literacy and collaborative problem solving. Available at: https://www.oecd-ilibrary.org/docserver/9789264281820-en.pdf (Accessed: 24 January 2025)

OECD (2017d) What do we know about teachers' selection and professional development in high-performing countries? Available at: https://doi.org/10.1787/87acdc87-en.

OECD (2020a) Early learning and child well-being in England. Available at: https://www.oecd-ilibrary.org/docserver/c235abf9-en.pdf (Accessed: 23 January 2025)

OECD (2020b) Early learning and child well-being in Estonia. OECD. Available at: https://doi.org/10.1787/15009dbe-en.

OECD (2020c) Education policy outlook in Estonia. OECD Education Policy Perspectives, No. 13. Available at: https://www.oecd.org/en/publications/education-policy-outlook-in-estonia_9d472195-en.html (Accessed: 23 January 2025).

OECD (2020d) Education policy outlook in Portugal. OECD Education Policy Perspectives, No. 21. Available at: https://doi.org/10.1787/0e254ee5-en. (Accessed: 23 January 2025).

OECD (2022a) 'Austria', in education at a glance 2022: OECD indicators. Available at: https://doi.org/10.1787/1e0a77e5-en (Accessed: 23 January 2025).

OECD (2022b) 'Japan', in Education at a glance 2022: OECD indicators. Paris: OECD Publishing. Available at: https://doi.org/10.1787/1e0a77e5-en (Accessed: 23 January 2025).

OECD (2022c) 'Sweden', in education at a glance 2022: OECD indicators. Available at: https://doi.org/10.1787/dc0f9e92-en (Accessed: 30 August 2023).

OECD (2023a) 'Canada', in Education at a glance 2023: OECD Indicators. Paris: OECD Publishing. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/09/education-at-a-glance-2023_581c9602/e13bef63-en.pdf (Accessed: 23 January 2025).

OECD (2023b) Education at a Glance 2023: Country note - Austria. Available at: https://www.oecd-ilibrary.org/docserver/b2bac0e0-en.pdf

OECD (2023c) Education at a Glance 2023: Country note - Sweden. Available at: https://www.oecd-ilibrary.org/docserver/533a44bc-en.pdf

OECD (2023d) 'Estonia', in Education at a glance 2023: OECD Indicators. Paris: OECD Publishing. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/09/education-at-a-glance-2023_581c9602/e13bef63-en.pdf (Accessed: 23 January 2025).

OECD (2023e) 'Japan', in Education at a glance 2023: OECD Indicators. Paris: OECD Publishing. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/09/education-at-a-glance-2023_581c9602/e13bef63-en.pdf (Accessed: 23 January 2025).

OECD (2023f) 'Portugal', in Education at a glance 2023: OECD Indicators. Paris: OECD Publishing. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/09/education-at-a-glance-2023_581c9602/e13bef63-en.pdf (Accessed: 23 January 2025).

OECD (2023g) 'Sweden', in Education at a glance 2023: OECD Indicators. Paris: OECD Publishing. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/09/education-at-a-glance-2023_581c9602/e13bef63-en.pdf (Accessed: 23 January 2025).

OECD (2023h) 'Switzerland', in Education at a glance 2023: OECD Indicators. Paris: OECD Publishing. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/09/education-at-a-glance-2023_581c9602/e13bef63-en.pdf (Accessed: 21 March 2025).

OECD (2023i) 'United Kingdom', in Education at a glance 2023: OECD Indicators. Paris: OECD Publishing. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/09/education-at-a-glance-2023_581c9602/e13bef63-en.pdf (Accessed: 23 January 2025).

OECD (2024a) Education at a Glance 2024 - Country notes: United Kingdom. Available at: https://www.oecd.org/en/publications/education-at-a-glance-2024-country-notes_fab77ef0-en/united-kingdom_c3bad31e-en.html.

OECD (2024b) Mathematics for life and work: a comparative perspective on mathematics to inform upper secondary reform in England. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/11/mathematics-for-life-and-work_a951fc0a/26f18d39-en.pdf (Accessed: 27 February 2025).

OECD (2024c) Social and emotional skills, OECD. Available at: https://www.oecd.org/en/topics/social-and-emotional-skills.html (Accessed: 19 March 2025).

OECD (2024d) Social and Emotional Skills for better lives. Findings from the OECD Survey on Social and Emotional Skills 2023. Available at: https://www.oecd.org/en/publications/social-and-emotional-skills-for-better-lives_35ca7b7c-en/full-report.html (Accessed: 23 January 2025).

OECD (2025) PISA data and methodology. Available at: https://www.oecd.org/en/about/programmes/pisa/pisa-data.html (Accessed: 28 February 2025).

Ontario Ministry of Education (2024) Earning your high school diploma. Available at: https://www.ontario.ca/page/high-school-graduation-requirements (Accessed: 23 January 2025).

Payton, J., Weissberg, R., Durlak, J., Dymnicki, A., Taylor, R., Schellinger, K. and Pachan, M. (2008) The positive impact of social and emotional learning for kindergarten to eigth-grade students: findings from three scientific reviews. Available at: https://files.eric.ed.gov/fulltext/ED505370.pdf (Accessed: 31 January 2025).

Pensiero, N. and Green, A. (2018a) 'The Effects of Post-Compulsory Education and Training Systems on Literacy and Numeracy Skills: A Comparative Analysis Using PISA 2000 and the 2011 Survey of Adult Skills', European Journal of Education, 53(2), pp. 238–253. Available at: https://doi.org/10.1111/ejed.12268.

Public Accounts Committee (2024) '40,000 extra staff and 84,500 more places needed by 2025 to meet childcare entitlements in England, PAC warns', UK Parliament, 28 May. Available at: https://committees.parliament.uk/committee/127/public-accounts-committee/news/201762/40000-extra-staff-and-84500-more-places-needed-by-2025-to-meet-childcare-entitlements-in-england-pac-warns/#:~:text=The%20DfE%20estimates%20that%20the,15%2C500%20more%20new%20places%20nationally (Accessed: 23 January 2025).

Rindermann, H. (2007) 'The g-factor of international cognitive ability comparisons: the homogeneity of results in PISA, TIMSS, PIRLS and IQ-tests across nations', European Journal of Personality, 21(5), pp. 667–706. Available at: https://doi.org/10.1002/per.634.

Sánchez-Álvarez, N., Berrios Martos, M.P. and Extremera, N. (2020) 'A meta-analysis of the relationship between emotional intelligence and academic performance in secondary education: a multi-stream comparison', Frontiers in Psychology, 11. Available at: https://doi.org/10.3389/fpsyg.2020.01517.

Scott, M., Bocock, L., Del Pozo Segura, J.M. and Hillary, J. (2024) Shifting sands: anticipating changes in the future labour market and supporting the workers at greatest risk. Available at: https://www.nfer.ac.uk/publications/the-skills-imperative-2035-shifting-sands-anticipating-changes-in-the-future-labour-market-and-supporting-the-workers-at-greatest-risk/ (Accessed: 12 November 2024).

Steponavičius, M., Gress-Wright, C. and Linzarini, A. (2023) Social and Emotional Skills (SES): latest evidence on teachability and impact on life outcomes. 304. Available at: https://doi.org/10.1787/ba34f086-en.

Strello, A., Strietholt, R., Steinmann, I. and Siepmann, C. (2021) 'Early tracking and different types of inequalities in achievement: difference-in-differences evidence from 20 years of large-scale assessments', Educational Assessment, Evaluation and Accountability, 33(1), pp. 139–167. Available at: https://doi.org/10.1007/s11092-020-09346-4.

Suto, I. and Oates, T. (2021) High-stakes testing after basic secondary education: how and why is it done in high-performing education systems? Available at: https://www.cambridgeassessment.org.uk/Images/610965-high-stakes-testing-after-basic-secondary-education-how-and-why-is-it-done-in-high-performing-education-systems-.pdf (Accessed: 7 January 2025).

Swiss Confederation (2021a) Basic vocational education and training. Available at: https://www.eda.admin.ch/aboutswitzerland/en/home/bildung-wissenschaft/bildung/berufsbildung-lehre.html (Accessed: 7 January 2025).

Swiss Confederation (2021b) Education – facts and figures. Available at: https://www.eda.admin.ch/aboutswitzerland/en/home/bildung-wissenschaft/bildung/bildung---fakten-und-zahlen.html (Accessed: 7 January 2025).

Swiss Confederation (2024) Education. Available at: https://www.eda.admin.ch/aboutswitzerland/en/home/bildung-wissenschaft/bildung.html (Accessed: 7 January 2025).

Taylor, A., Nelson, J., O'Donnell, S., Davies, E. and Hillary, J. (2022) The Skills Imperative 2035: what does the literature tell us about essential skills most needed for work? Working paper 1. Available at: https://www.nfer.ac.uk/media/hgwls32i/the_skills_imperative_2035_working_paper_1_essential_skills_literature_review.pdf (Accessed: 24 July 2024).

The Council of Ministers of Education, Canada (no date) Education in Canada: an Overview. Available at: https://www.cmec.ca/299/Education-in-Canada-An-Overview/index.html (Accessed: 7 January 2025).

Tonga, F.E., Eryiğit, S., Yalçın, F.A. and Erden, F.T. (2022) 'Professional development of teachers in PISA achiever countries: Finland, Estonia, Japan, Singapore and China', Professional Development in Education, 48(1), pp. 88–104. Available at: https://doi.org/10.1080/19415257.2019.1689521.

UK NARIC (2017) Cedefop European public opinion survey on vocational education and training, country overview: United Kingdom. Available at: https://cumulus.cedefop.europa.eu/files/vetelib/2018/opinion_survey_VET_United_Kingdom_Cedefop_ReferNet.pdf (Accessed: 7 January 2025).

Welsh, M., Parke, R.D., Widaman, K. and O'Neil, R. (2001) 'Linkages between children's social and academic competence: a longitudinal analysis', Journal of School Psychology, 39(6), pp. 463–482. Available at: https://doi.org/10.1016/S0022-4405(01)00084-X.

Wheater, R., Kuhn, L., Classick, R., Del Pozo Segura, J.M., Harland, J., Liht, J. and Lopes, G.H. (2024) Survey of Adult Skills 2023 (PIAAC): national report for England. Available at: https://assets.publishing.service.gov.uk/media/675330e020bcf083762a6d48/Survey_of_Adult_Skills_2023__PIAAC__National_Report_for_England.pdf (Accessed: 27 February 2025).

Wilson, R., Bosworth, D., Bosworth, L., Cardenas-Rubio, J., Day, R., Patel, S., Bui, H., Lin, X., Seymour, D., Thoung, C. and Hillary, J. (2022) The Skills Imperative 2035: occupational outlook – long-run employment prospects for the UK. Working paper 2: headline report. Available at: https://www.nfer.ac.uk/media/ybkcqvuz/the_skills_imperative_2035_working_paper_2_headline_report.pdf (Accessed: 24 July 2024).

YouGov (2023) Perceptions of Vocational and Technical Qualifications - wave 6. Available at: https://www.gov.uk/government/statistics/perceptions-of-vocational-and-technical-qualifications-wave-6 (Accessed: 16 July 2024)

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