Benchmarking the Performance of China's Education System

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Preface

Policy makers, researchers, school leaders and educators around the world work to unlock the key to high-performing education systems. An excellent education system not only meets the demands of parents, learners and employers but also secures the future economic development, prosperity and well-being of a country and the world. There is no better way for a country's leadership to build the future, in fact, than to invest in the quality of education and the competencies of its people.

There are no easy answers, however, nor a single key, or even a finite definition of a high-performing education system. At the same time, countries want to ensure that their education systems are well prepared and preparing for the future. An uncertain future, however, makes building capacity for future-readiness a nearly impossible challenge. What contributes to a high-quality education system today may not be what is needed – or sustainable – for tomorrow. In a rapidly changing society, how can education systems prepare students to thrive in the future and actively build that future?

To start answering these questions, it is important to identify the dimensions of an education system that are measurable in a comparative way. By collecting available comparative evidence, the performance of an education system can be benchmarked against other high-performing systems. That is what this report attempts to do for the education system in the People's Republic of China (hereafter "China").

China has the most extensive education system in the world, with 270 million students and 16 million full-time teachers in over 500 000 schools across the country. China's education system is also one of the world's fastest-changing education systems in recent decades. Great efforts have been made to achieve universal access to education and enhance the quality of schooling. These efforts have improved the outcomes of the education system, yielding social and economic returns for the country. Meanwhile, like many other education systems in the world, China faces a series of challenges, such as urban-rural inequality, student segregation, and assessment reform.

The OECD has measured China's education performance for more than a decade. China's Shanghai has participated in the OECD Programme for International Student Assessment (PISA) since 2009. Its students were the top performers in reading, mathematics and science in 2009 and 2012. In 2015, three more Chinese municipalities joined Shanghai in PISA: Beijing, Jiangsu and Guangdong. In 2018, Zhejiang, another eastern province, also participated. In all four cycles of PISA, Chinese students from these jurisdictions have outperformed the majority of students from other education systems. Even though the participating Chinese jurisdictions do not represent China as a whole, they are still considerably larger than many OECD countries: Beijing, Shanghai, Jiangsu and Zhejiang together are home to over 183 million people, which is more than the combined population of France and Germany.

Knowledge of China's extensive and dynamic education system is still limited, however. What is it about its education system that makes China such a high performer? Above and beyond its students' cognitive performance in PISA, what is the quality of China's learning environment like? What teaching and learning practices are being used, and to what effect? How is the education system in China held accountable to students, parents and other stakeholders?

This report aims to address these questions and more. It brings forth evidence at both international and national levels and examines China's education system from multiple dimensions, aligned to the inputs and outputs of its education. Together, this presents a fuller picture of China's education system and how it compares to other high-performing education systems.

This report can help two important audiences. First, China can explore the performance of its education system in comparison with other education systems that performed well in PISA, which has the potential to inform policy making for the future of education in China. Second, this report can help the international

education community develop a greater understanding of China's education system, which could help fuel global reflection on building and maintaining high-performing education systems.

Whether the strengths of today's education system will be sufficient to make it ready for the future remains open for debate. High performance can easily lead to conservatism, risk aversion and complacency. This benchmarking exercise should be completed and possibly updated by a follow-up study on the future readiness of the Chinese education system. Such a study should identify the indicators of today's high performance that are sustainable in the long run, and complement them with the indicators that indicate the system's openness to change and innovation.

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The development of this report was steered by the Education Future Readiness Index team in the Directorate for Education and Skills at the OECD. Dirk Van Damme led the project and authored Chapter 1. Ziyin Xiong drafted Chapters 2, 3, 4 and 6. Tijana Prokic-Breuer drafted Chapter 5 and Stan Vermeulen provided statistical support. The report was edited by Julie Harris and was prepared for publication by Henri Pearson. Matthew Gill and Leonora Lynch-Stein provided administrative support during the publication process.

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Executive Summary

This report provides an assessment of both the strengths and potential areas for improvement in the education system of the People's Republic of China (hereafter "China"). China's education system is benchmarked against other high-performing education systems based on available comparative evidence mainly collected through OECD education surveys. To broaden the scope of the evidence, this report has also brought in up-to-date policies and practices implemented in China, to examine the contextual environment and mechanisms underpinning its education system.

The report looks at China's education system from four key dimensions: learning environment; curriculum and pedagogy; student outcomes; and education governance. These four dimensions articulate the inputs and outputs of China's education system, presenting a comprehensive picture of the quality of China's education system. Meanwhile, comparisons with other high-performing systems are conducted, revealing the patterns that are common or different between China's education system and other high-performing systems. Some key findings from this assessment include the following.

» Access to education has improved dramatically in China, but work remains to be done at some education levels

Access to education at all levels has expanded remarkably in China over recent decades. Nearly the entire country has achieved universal access to primary education and lower secondary education. However, education levels such as early childhood education and care (ECEC) and upper secondary vocational education are still to be fully developed.

Chinese families require more early childhood education and care, particularly for children under three. The ECEC enrolment rate for children under three is estimated at less than 10%, compared to 33% among OECD countries, on average. Ensuring that children have access to ECEC can contribute to their future educational and socio-economic outcomes. It also has the potential to increase parent participation in the labour market.

Vocational programmes at the upper secondary level tend to be less valued compared to general academic programmes, by both Chinese parents and society in general. Research shows that career guidance is an effective way to support students in identifying their career aspirations and making responsible choices regarding their educational pathways. However, in Shanghai, career guidance is still largely inaccessible to students, according to the Programme for International Student Assessment (PISA) 2012.

Further, China has four different types of vocational schools that provide diverse learning opportunities, but the governance, management, qualification frameworks of different vocational schools are often separate, raising co-ordination difficulties.

» High-quality instruction is a solid pillar supporting education system in Shanghai

The quality of Shanghai teachers is one of the strongest factors explaining the excellence of Shanghai education system. Excellent teachers are also commonly found in many other high-performing education systems.

Investing in teachers is one of the paths to quality instruction and learning. Teachers in Shanghai tend to receive more mentoring and induction opportunities than teachers in the majority of OECD countries. Participation in induction activities has been shown to influence Shanghai teachers' self-efficacy during their first posts. Similarly, teacher participation in continuous professional development (CPD) is higher in Shanghai than any other high-performing education system, even though Shanghai teachers tend to receive less support to participate in CPD than their peers in high-performing countries.

Clarity of instruction, which requires teachers to explain a subject to students to help them better understand it, is more frequently used by Shanghai teachers compared to teachers from other high-performing education systems. The use of clarity of instruction tends to be associated with better student outcomes in science, for example.

Meanwhile, cognitive activation methods, which prove to be positively associated with mathematics scores in PISA, are also frequently used by Shanghai teachers, compared to many other high performing education systems.

» China's high-quality learning environment leads to excellent learning outcomes

Students in Beijing, Shanghai, Jiangsu and Zhejiang (B-S-J-Z) outperformed their peers in other high-performing countries in all three PISA domains (mathematics, science and reading) by a large margin. In addition, the education systems in B-S-J-Z (China) have a lower share of low-performing students and a higher share of high-performing students when compared to other high-performing education systems.

The excellence of student cognitive outcomes in B-S-J-Z (China) can be attributed to teacher and school characteristics to a large degree. The disciplinary climate, teacher professional development and teacher enthusiasm have stronger positive influence on the education systems in B-S-J-Z (China) than in other high-performing countries. Student time spent studying is also positively associated with student performance in B-S-J-Z (China), but only up to a certain point.

Differences in student performance between urban and rural areas are large in B-S-J-Z (China), in particular in reading and science. The urban-rural performance gap is larger in B-S-J-Z (China) compared to the average level of other high-performing countries. Differences in individual, peer, and school characteristics between urban and rural schools explain most of such performance gaps.

Student life satisfaction in B-S-J-Z (China) is lower than in other high-performing countries. 15-year-olds in B-S-J-Z (China) frequently experience negative feelings, whereas this proportion is lower in many high-performing education systems. Students in B-S-J-Z (China) have very strong motivation and high self-efficacy, while their work-related anxiety is rather moderate compared to their peers in other high-performing countries.

» The classroom environment is positive and conducive to learning in Chinese education systems

Shanghai students participate more often in creating a pleasant learning atmosphere in classrooms, compared to students from other high-performing education systems. The high level of positive classroom discipline thus helps Shanghai teachers spend less time on classroom management and more on teaching. This helps explain why Shanghai teachers' use of practices related to school management is one of the lowest, while time spent on teaching is one of the highest, compared to other high-performing countries.

Student exposure to bullying is relatively rare in B-S-J-Z (China) compared to other high-performing education systems. Students and teachers also often maintain positive relationships in B-S-J-Z (China) schools. Teachers' support of students is of high quality in B-S-J-Z (China), which tends to be a common trait shared by many high-performing education systems.

» A strong accountability culture is observed at classroom, school and system levels in China

Nearly all teachers are formally appraised in Shanghai schools. The resources and methods used for conducting teacher appraisal are more diverse in Shanghai schools than in other high-performing education systems. Schools in Shanghai have built a sophisticated teacher appraisal system coupled with a well-constructed professional ladder, which works well for both evaluating teachers' quality and at the same time motivating teachers' professional growth.

Compared to other high-performing education systems, the use of performance data for accountability purposes is relatively less prevalent in Beijing, Shanghai, Jiangsu and Guangdong. In China, regulatory and performance-based approaches can be observed in ensuring school accountability. In the case of Shanghai, a wide range of professional collaboration activities provide a mechanism that motivates teachers to hold themselves accountable to their peers and the public, which has also contributed to the strength of school accountability in Shanghai.

In response to the education emergency caused by the global pandemic COVID-19, China as one of the "early responders" quickly mobilised resources to enhance the capacity of its education governance. The ten-year development plan for ICT in education, issued by the Ministry of Education in 2011, has laid a foundation for the provision of online learning platforms during the pandemic. The long-time partnership between the education sector and ICT service providers helped facilitate the technology sector providing education services during the COVID-19 crisis.

Chapter 1

Key Findings

This chapter summarizes the key findings of the report and integrates them in a coherent assessment of the education system in China. It also includes some recommendations for further improvement of the system. Finally, it opens up the question on how to move from excellent performance to future readiness.

In just a few decades, the People's Republic of China (hereafter "China") has built a world-class primary and secondary education system, in line with its remarkable economic and social development. This achievement is unique in recent global educational history.

This report provides an assessment of the strengths of China's education system, benchmarking it against other high-performing education systems around the globe. It is based on the available comparative evidence, mainly collected through OECD education surveys. The data coverage is mostly limited to one or several municipalities that have participated in these surveys. Thus, the picture provided in this report might represent the educational reality in some of the more advanced municipalities, while realities differ in other parts of this vast country.

This assessment also signals some areas for further improvement. China is very committed to continuing to perfect its educational system to reinforce its future economic and social development toward an inclusive knowledge society and to improve its citizens' quality of life. One of the strengths of the Chinese system is its inclination to learn and improve continuously. Even more so than in the past, high-quality education will be key to the objectives and ambitions of the country in the near future. This requires doubling the efforts to maintain the strengths in a changing environment while managing the change processes for further improvement.

At the same time, education must prepare for the longer-term future. High quality today is not automatically a guarantee for high performance tomorrow or the day after tomorrow. This report provides some input for further work and reflection on the long-term sustainability and future-readiness of the Chinese education system.

Strengths

Any foreigner visiting a Chinese school, especially when coming from Europe or North America, immediately experiences the main strengths of the education system in China: a considerable social commitment to education and learning, a high level of aspiration and motivation among students, the professional quality of the teachers and their collaborative culture, orderly classrooms focused on learning, high-quality instruction and excellent learning outcomes. However, most foreign visitors will probably travel to one of the more developed municipalities, so the view of visitors and observers probably is biased. Realities in other parts of the country will probably be different. Still, many of the strengths of the Chinese education system are systemic and fundamental to its approach to educational development and, hence, will probably also be at work in other parts of the country.

» A highly supportive social ecosystem

An excellent education system can only thrive in an environment where all stakeholders and partners are highly committed to education as an engine of social improvement. Of course, policies implemented by governments matter, but they need to be supported by families who engage in the education of their children, by students who believe that they can secure their future through education and by teachers and school leaders who are competent and trusted to deliver the desired outcomes. This ecosystem of social support and trust is probably one of the main foundations for the excellence of education in China. It is not unique – other emerging economies also demonstrate a high social commitment to education as the engine of social progress, particularly in Asia – but this foundation is remarkably strong in China. The high social value put into education creates an environment where all stakeholders share the aspiration to excel, an environment in which ambitious policies can succeed.

Yet, the supportive social environment is not guaranteed. The strong value system underpinning support for education among students, families and local communities is at risk of erosion by the same forces that are threatening education in many other countries. Increased material prosperity, technological progress and the consumer culture with its readily available gratification might undermine the willingness to sacrifice the present in order to invest in the future. Chinese policy makers are very concerned that levels of motivation and aspiration among young students might drop. Educational ambition might also be affected by disruptive societal changes, such as increased inequality, limits to social mobility and migration.

» A high-quality teaching profession

Within the education system, teacher quality is likely the strongest factor explaining the excellence of the Chinese education system. Most of the factors that the OECD has identified as contributing to an excellent teaching workforce are well in place in China. Competitive and selective mechanisms are in place to select highly motivated and high-achieving students into the profession and the pre-service training. A four-year teaching training with mandatory teaching practicum in the field ensures proper professional pre-service training. When licensed to become a teacher and upon entry into schools, teachers receive appropriate induction and mentoring support. Moreover, throughout their careers, teachers have access to regular and relevant professional development that helps them develop the skills needed to overcome new challenges.

Teachers receive regular evaluation and appraisal, feedback mechanisms that allow them to improve their teaching. In short, teachers are seen and treated as professional knowledge workers, dedicated to the learning and well-being of their students, and continuously learning to improve. Working conditions in large classes are sometimes challenging and salaries are not at the top level, yet professionalism and commitment are high.

Particularly important is the culture of collaborative professionalism among teachers. Teachers collaborate for strengthening pedagogical practice, providing feedback, engaging in action research and experimentation. There are few countries that can match the collaborative professional culture among teachers.

» A positive school climate

Another factor explaining the excellence of the Chinese education system is a positive school climate. Classrooms are orderly and teachers report very few incidents or disruption. Thus, teachers' instruction time can be spent on teaching and learning activities, whereas in many other countries, including high-performing ones, a disproportionate amount of time goes to classroom management. A relative low teaching load allows teachesr to devote due attention to other social needs of students and teacher-student relations are very positive. Students' exposure to bullying is comparatively low, although there are differences between schools in the frequency of bullying, and cyberbullying, in particular, might be an issue to watch carefully. The classroom disciplinary climate is relatively high and teachers report that students contribute to creating a pleasant learning atmosphere in class. Students exhibit a relatively high level of self-efficacy and the level of their "fear of failure" is closer to that of some European countries than to other East Asian countries. Students are also very ambitious and motivated to succeed. In contrast to widely shared views, Chinese students have only moderate levels of schoolwork-related anxiety and fear of tests.

» A relevant curriculum

One of the main strengths of the education system in China is a well-balanced curriculum. Few countries in the world have spent an equivalent amount of political energy, time and expertise in the development and regular update of their curriculum frameworks for schools. The approach to curriculum development is highly centralised, with only recently some tendencies for regional and school-level flexibility. However, teachers have and use many opportunities to contribute to the development of the central curriculum, through professional groups and research centres. This approach results in transparency and uniformity of action. Recent reforms

have moved the curriculum towards a competency-based approach, but without the fashionable exaggerations one can find in some countries. The cognitive foundation and the role of knowledge in the curriculum are still solid, which is also visible in the Programme for International Student Assessment (PISA) results. Social and emotional skills, character development and ethical values are also important ingredients of the curriculum. Physical and mental health, as well as students' well-being, are also integrated, although there are some notable gaps, for example, with regard to sexuality education.

» High-quality instruction and pedagogy

Data from the OECD Teaching and Learning International Survey (TALIS) implemented in Shanghai provide a glance at what happens within classrooms. The relatively high amount of time devoted to teaching and learning, because not much time is lost to classroom management, has already been noted. Instructional quality and teacher-directed instruction seem to be very important in Shanghai's classrooms. These teaching practices and pedagogies are associated with high cognitive learning outcomes in math and science. Shanghai teachers use cognitive activation strategies more frequently than teachers do in other high-performing systems, which is also associated with high learning outcomes.

The quality of classroom instruction and pedagogy is also related to the strong orientation towards evidence-based and research-driven design of teaching and learning environments. The research intensity of the education system in China is high, supported by a strong system ranging from academic research in universities, over applied research in teacher training to action research by teachers in schools. Pedagogy is driven by scientifically supported learning design principles.

» Excellent cognitive and non-cognitive learning outcomes

All this together creates a potent mix of ingredients for a rich teaching and learning environment where students can thrive and achieve high learning outcomes. The available assessments of students' learning outcomes confirm that this is indeed the case. Students in Chinese municipalities that participated in the PISA assessments demonstrate extremely high performance in mathematics, science and (somewhat lower) reading. The Chinese PISA results show very high shares of high performers and very low shares of low performers, even compared with other high-performing nations. In the more innovative and less knowledge-oriented domain of collaborative problem solving, assessed in PISA 2015, the results are less impressive in the three metrics of average performance, the share of high achievers and the share of low achievers. When comparing the subscales for science, it is also striking that Chinese students do exceptionally well with regard to content knowledge and explaining phenomena scientifically, but are slightly less proficient when it comes to interpreting data and evidence scientifically. Measured by the cognitive learning outcomes achieved by its students, the Chinese education system is genuinely a world-class system.

Although PISA does not assess students' social and emotional skills, it includes a range of self-assessment measures related to life satisfaction and well-being. Feeling good with life is something found in most high-performing systems, suggesting that the quality of education received is associated with life satisfaction. Chinese students are not an exception. They report relatively – also compared to other high-performing countries – high levels of positive feelings such as happiness and joy. On the other hand, the percentage of students expressing negative emotions such as sadness, anger or despair, is also relatively high. The moderate level of schoolwork-related anxiety seems to indicate that these negative feelings do not necessarily find their origin in school but in the more general context of growing up in a rapidly changing and demanding society.

Well-being and social and emotional skills are important by themselves, but they are also positively related to cognitive learning outcomes. The motivation to learn, the willingness to achieve, the ability to set learning goals and a positive attitude toward school all relate positively to higher learning outcomes in mathematics, science and reading. The relationship is particularly strong for students from disadvantaged backgrounds, who seem to be determined and motivated to improve their lives through educational success. This relationship is not unique for China and is visible in other high-performing systems. Nevertheless, it is an ingredient for excellence in education. On the other hand, test anxiety negatively associates with cognitive learning outcomes, and in China, test anxiety is somehow more prevalent than in other systems. Striking a balance between motivation, ambition and competitiveness on the one hand, and excessive levels of test anxiety on the other seems to be an important challenge.

Challenges and areas for improvement

Even the best education systems have challenges, areas where performance is waning, and areas where "good" performance can be raised to "excellent". This benchmarking report has identified several of these areas for improvement in China's education system.

» Data

Before entering into the discussion of these areas for improvement, it must be acknowledged that, as has been experienced repeatedly during the preparation of this report, the data infrastructure in China's education system is very difficult to access. There are many indications that education policies are data-driven and evidence-informed. China is also very ambitious in developing a sophisticated student-tracking system, which will follow up on every student's educational progress. The data intensity of the system is probably high, and the ambitions are impressive, but very little of the data infrastructure is accessible. The data delivered to international organisations (e.g. the United Nations Educational, Scientific and Cultural Organization [UNESCO], the World Bank and the OECD) are rather basic. Very gradually, some municipalities are joining international data collections implemented by the OECD, but as frequently noted throughout this report, these provide only a partial picture of the country. This makes international benchmarking very difficult. It is strongly recommended that China: 1) include making data publicly and internationally accessible in its ambitious data and evidence strategy in education; and 2) develop a strategy for comprehensive participation in international data collections.

» Architecture and learning pathways

Focusing first on the overall architecture of the Chinese education system, the general design of the system is very much in line with general international practice. It is also transparent and very readable, without unnecessary complexities. It remains comprehensive until the end of lower secondary (ISCED 2) and then distinguishes between a general, more academically oriented track, and a vocational track in upper secondary (ISCED 3). However, this review indicates that there are two storeys of the educational building that fall short in resources and policy attention. These are early childhood education on the one hand and upper secondary vocational education on the other. To improve the architecture of the system and guarantee a sustainable educational building, these two storeys need improvement.

Early childhood education, especially pre-primary education serving children under three, is an under-developed part of China's overall education system. The gross enrolment ratio is much lower than in other high-performing systems. Provision is not sufficient to cover demand, and supply of services is happening through a mixture of public and private actors. Private provision is also prevalent in many other countries, but it is of critical importance that there are sufficient regulation and oversight to guarantee quality of services, qualifications of staff and adequate learning opportunities. Many high-performing education systems have come to acknowledge the critical importance of this first level of education and are developing appropriate policies to strengthen the sector. There is room for improvement in this area in China as well.

Upper secondary vocational education is also a struggling sector in many countries. Often perceived by parents, society and policy makers as inferior to the general, academic track preparing for university, it receives less policy priority, and participation suffers from a negative selection. Although this report has not been designed to include an in-depth evaluation of the vocational education sector in China, there are many indications that the sector suffers from similar problems found in many countries. There is a high fragmentation of specialised provision, without common quality standards. In order to develop a well-balanced qualifications ladder and a skills profile that suits China's economic and social development, a high-quality vocational education sector is essential. A knowledge economy cannot be built on academic qualifications only, but needs a well-developed middle tier in the skills distribution, preparing for a wide variety of essential technical and professional occupations. A well-developed vocational sector at upper secondary level could also alleviate the tremendous demand for tertiary education and the risk of academic drift. In many high-performing education systems, it has been shown that a well-trained person leaving the vocational track has a

much higher employability rate than a graduate from the general track who fails to enter tertiary education.

Recently, the country's political leadership has acknowledged the need to strengthen the vocational education sector. In 2019, the State Council and the Ministry of Education started to implement a plan for vocational education, aiming to alleviate poverty and to strengthen economic development. Over time, the implementation of the plan should be able to reinforce the country's vocational education system.

Essential to a well-functioning education system is that students are able to make smart choices about their educational trajectories. To that end, many high-performing systems have developed career coaching and guidance services that help students identify their career aspirations and define the best possible options to develop their potential. PISA 2012 data for Shanghai suggesting that these career-counselling services are not yet available to students, might now be outdated as measures are being taken to make these services readily accessible.

» Participation and graduation

China has been successful in implementing compulsory education and in getting children into schools. The net enrolment rate for primary education is now close to 100%. However, there are still some parts of the country, notably in western provinces and rural areas and among disadvantaged groups such as migrants, where universal participation is not yet the case. Enrolment in lower secondary education is also gradually increasing toward universal participation. The progress in lower secondary participation in the last two decades is quite remarkable, but closing the final gap to universal participation might remain a challenge.

Opening up access to lower secondary education seems to have temporarily decelerated progress in completion rates. The gross graduation rate has decreased, probably because the coverage of eligible students has been enlarged. The gross graduation rate has stabilised in recent years, but monitoring the evolution of graduation and completion is now important. It remains an important policy objective to ensure that every student entering the system also has a fair chance of graduating with a meaningful qualification.

Also, attention should be given to the decreasing enrolment and completion rates in upper secondary education. Given the high demand for education in the population, it is difficult to understand why upper secondary participation is decreasing. It is unclear whether the upper secondary school entrance examination (Zhongkao) is responsible for limiting entry into these schools. The expansion of upper secondary education should be an important goal for China, in order to build a balanced skills profile. To accomplish it, however, it is not only important to get students into upper secondary schools, but also to improve their efficiency so that young people complete their secondary education with a relevant qualification.

Although falling outside the scope of this report, it is evident that students' learning trajectories through the education system are very much determined by the highly selective national university entrance examination (Gaokao) for which aspiring students prepare. Demand for university education is rapidly growing among the Chinese middle class and, while China is expanding its tertiary education sector at a rate incomparable to what historically has happened in many other countries, demand still largely exceeds supply. Thus, selection is necessary. Still, it is clear that the importance of this transition point in the overall educational architecture is far too high and that it has an enormous impact on students, the relevance of their skills as well as their well-being. Improving the quality and accessibility of upper secondary education, and more specifically, its vocational sector, would probably offer valuable alternatives to university study. Doing so would therefore help to alleviate the pressure on the university entrance exam.

» Equity and diversity

Many education systems around the globe, including several high-performing systems, struggle to be as excellent in equity as they are in quality and efficiency. In its historical development in education, China has succeeded in building a world-class system by containing the risk that educational excellence would only be available to the privileged and advantaged parts of the population. This is a remarkable achievement. Still, the Chinese education system remains confronted with some equity challenges, which deserve attention.

A first challenge concerns gender. It was not possible to do an in-depth study of gender inequalities in the Chinese education system for this report, but some observations call for more research. The gender gap in the PISA results for reading, math and science for the Chinese municipalities have a different pattern than is observed in other high-performing systems. For all three domains (reading, mathematics and science), the gender balance is much more even than observed in almost all high-performing systems. In itself, this is a good thing as it suggests that the gender balance in learning opportunities and outcomes is less unequal in China than it is in other countries. Recent policies to improve reading motivation and skills among boys seem to have resulted in a more equitable distribution. The different gender profile in learning outcomes between China

and other high-performing countries requires more analysis.

With regard to socio-economic and cultural inequalities, PISA 2018 results for the participating Chinese municipalities suggest a comparably mild impact of family background on educational achievement. Both the slope and the strength of the relationship between mean performance and socio-economic status are around the average of other high-performing systems. This means that, as in most other high-performing systems, the chances to achieve good learning outcomes are relatively low for disadvantaged students compared to their more advantaged peers. However, having said that, the achievement level of disadvantaged students is very high in China compared to the high-performing countries used as a benchmark for this report. Disadvantaged students in China achieve educational outcomes that can only be achieved by advantaged students in other countries.

Another important equity dimension in the Chinese education system is the gap in opportunities and performance between urban and rural areas. The data analysed in this report do not cover the more remote and less developed provinces in western China. However, even within the more developed provinces for which data are available, the gap between urban and rural areas is significant. The gaps in performance in PISA 2018 are much larger than in the high-performing benchmark countries, even after controlling for students' socio-economic background. This suggests a rather significant disparity between students in urban and rural areas.

It is interesting to note that the performance gap between advantaged and disadvantaged students and the urban-rural gap to a significant degree can be attributed to teacher and school characteristics. This suggests that better and more enthusiastic teachers in schools with a more competitive, and more disciplinary, environment teach students from advantaged backgrounds living in urban areas. This is all the more important since these factors have a strong impact on performance, even more so than in other high-performing education systems. Ensuring a more equitable distribution of high-quality teachers over disadvantaged schools in rural environments and encouraging a stimulating school environment in those schools will be key to closing the performance gaps in Chinese education.

As in many other countries, the Chinese education system is also confronted with the challenge of coping with increased diversity in classrooms. This report did not have the opportunity to study the impact of migration on education, but – although migration in China follows patterns that are different from those in other countries, notably because it is more internal migration than immigration from abroad – it is very likely that the relevance of migration and diversity for what is happening in Chinese classrooms are increasing. The data suggest that many teachers are not yet well prepared to cope with increased diversity in classrooms. Teachers in Shanghai report that in the well-organised system of professional development there is not much on offer to help them become more proficient in handling multicultural classrooms. At the same time, school leaders report that they have difficulties finding teachers who are capable of working with such classrooms.

» Segregation

To some extent, equity gaps in education are related to the amount of school- and programme-level segregation in a system. Segregation means that students are separated into more or less homogeneous groups. In highly segregated school systems, disadvantaged students are less likely to encounter advantaged, high-performing peers, potentially exacerbating the performance gap along socio-economic background lines. The word 'segregation', used here in the same way as it has been used in PISA reports, does not suggest a deliberate strategy to install a kind of 'apartheid'. It describes a degree of systemic separation between groups as a result of system characteristics and choices made by schools, families and other stakeholders.

The Chinese education system is characterised by a rather high degree of competition, first among students, but also between schools. This is not necessarily a problematic issue, since competition to a large degree also drives performance. However, when leading to a large degree of segregation, inequity might take prevalence over excellence. The degree of between-school variance in China's PISA results is high and higher than on average in other high-performing systems. This leads to remarkably high levels of segregation and isolation of categories of students. Disadvantaged students are segregated from advantaged students, and low-performing students are to be found in different schools than high-performing ones.

It falls beyond the scope of this report to answer the question whether, in a system based on the principle of "the nearby enrolment", spatial and residential segregation is responsible for relatively high degrees of between-school segregation. This calls for more investigation.

Yet, the relatively high degree of segregation is a significant policy challenge. PISA 2018 data suggest that in schools with higher shares of disadvantaged students, school principals more frequently report that there are issues with the physical infrastructure hindering high-quality teaching and learning. In addition, student-teacher ratios are higher in schools

with more disadvantaged students. In the allocation of teachers and other resources, it should be a priority that struggling schools, with relatively more disadvantaged and more low-performing students, receive the resources and support they need to improve learning outcomes.

At the same time, it can be expected that middle-class parents will increase pressure to open up the principle of "the nearby enrolment" in favour of some degree of school choice. Pressures to attend better-performing schools further away are already visible. These demands are understandable, but policies are needed to ensure that more flexibility in school choice does not come with even greater segregation.

Another variant of segregation is to be found in tracking mechanisms in the transition to upper secondary education, and especially the bifurcation in general and vocational programmes. In this report, it was not possible to gather the necessary data to analyse the impact of social background on the results of the upper secondary school entrance examination (Zhongkao), on the tracking mechanisms between general and vocational programmes and on school choice. However, analysis of PISA 2018 data shows that there is a moderate performance gap between students of general and vocational tracks, smaller than in some other high-performing systems, but larger than in, for example, Japan. Yet, the performance gap does not decrease much when students' socio-economic background is controlled for, which suggests that the gap is not strongly related to background characteristics.

» Pedagogical innovation

Instructional clarity, cognitive activation and teacher-directed instruction are clear strengths of the Chinese pedagogical approach to teaching. They are most likely important ingredients in the educational configuration responsible for students excelling in cognitive learning outcomes. However, this approach to pedagogy entails the risk of being one-sided. Shanghai teachers have shown in the TALIS survey to be less inclined to use task-based learning and project-based learning, which require a less teacher-driven approach and are better suited to fostering student agency and developing critical thinking. Collaborative problem solving through task- and project-based learning activities is becoming essential in the 21st-century economy and society. Innovation in science, research and technology require well-developed critical-thinking skills. China's rather mediocre results for the collaborative problem-solving assessment in PISA 2015 and the low prevalence of these teaching practices in the TALIS survey suggest that this is an important area of pedagogical innovation and improvement for China.

The dominant pedagogical orientation in China's schools is related to the prevalence of the exam-oriented culture. High-stakes summative assessments are an important part of the educational experience, in addition to the selective national examinations. Despite attempts to gradually move to a culture of formative assessment, the exam culture is very difficult to change. In Shanghai, teachers assessed by TALIS reported increased usage of formative assessments. Moderating the impact of summative assessments, diversifying the assessment repertoire and developing assessments that are oriented to critical-thinking proficiency are important areas where pedagogical innovation and teachers' professional development should be stimulated.

Generally speaking, China's TALIS results are rather promising with regard to innovation in the classroom. Shanghai teachers indicate being very open to pedagogical innovation and developing new approaches to teaching and learning. The high degree of professionalism among teachers and their excellent pre-service training and in-service professional development seem to stimulate the demand for pedagogical innovation.

Given the omnipresence of digital technologies in daily life in China, it is quite surprising that educational technologies have not yet really become mainstream in Chinese classrooms. In a range of indicators related to digital technologies in school, China lags other high-performing countries. Analysis of PISA and TALIS data suggests that this is not affecting negatively on the quality of learning opportunities and outcomes. Shanghai teachers demonstrate a slow increase in using digital technologies in their teaching. Yet, a more systematic strategy of pedagogical innovation, integrating the usage of digital technologies, seems to be the way forward.

» Governance and complexity

The Chinese education system is not only the largest in the world, it is also characterised by a very high degree of complexity. Many observers of the Chinese education system seem to think of it as a completely top-down driven system, whereby the lower levels of local government and schools just implement what the higher levels have decided. This is not accurate. As in many other systems in the world, the way the governance of the Chinese education system works is characterised by a lot of complexity.

The central level of decision-making is important, as it sets out the strategic directions of reform. A lot of the qualities of the system are the result of careful and evidence-based decision-making at the centre of the system. The strong strategic role of the centre produces overall coherence and cohesion in the system. However, the implementation at the local level is mediated by complex decision-making

at provincial and local levels, taking into account specific needs and interests of regional and local stakeholders. The Chinese system also allows for school leaders to exert a great deal of autonomous decisions and for teachers to take on their professional responsibilities. The tendency to decentralise reform implementation has been strengthened over the past decades. A strong system of accountability manages to keep fragmentation and competition, possible adverse effects of decentralisation and school autonomy, under control, while the positive impact of competition on excellence is acknowledged.

The positive role of the Chinese approach to educational governance could further be strengthened by continuing to develop school leaders' managerial skills. At the same time, the school system could allow giving a stronger voice to students and parents in the local decision-making processes and stimulating external partners such as employers, cultural stakeholders and representatives of the local community to be actively involved with schools.

Looking forward: Sustainability and future-readiness

China's education system's many strengths provide a powerful basis for further development and improvement. As this report has highlighted, challenges in the system mean there are several opportunities for improvement. China's considerable ambitions in economic and social development require an education system that continues to improve and innovate, to the same extent as in the recent past.

However, what is excellent today, might not be appropriate tomorrow. Whether there are any limits to the sustainability of China's educational model and whether its long-term future-readiness can be assured are valid questions. These questions entail many other interesting and challenging questions. Is the high social commitment and trust in education going to last once material living conditions have reached a certain level and social mobility becomes less of a priority for parents and students? Will digital technologies and artificial intelligence fundamentally alter the role of education in equipping students with relevant skills and in preparing them for jobs? Will consumer culture and digital devices fundamentally transform the lives of youngsters and lead to a radical shift in their value system? These and many more questions need to be asked when reflecting on the longer-term sustainability of education in China.

For an education system to be future-ready – meaning capable of confronting future challenges but also preparing students to building the future – it must be open to change and innovation. A future-ready system not only welcomes change, but actively seeks to innovate in order to prepare students for the future and to enable them to construct that future.

China's education system definitely has some strengths that build confidence that it is capable of doing so. A culture of excellence, strong leadership, a well-entrenched culture of collaborative professionalism, action research and reflective practice, a shared responsibility for excellence between schools and the community, all probably contribute to fulfilling the conditions for future-readiness. However, the question is whether these strengths are sufficient. And could these strengths also become the enemy of innovation and change? There are historical examples of high-performing education systems, such as the United States in the first half of the 20th century, that did not prepare well for the future shocks and proved to be too complacent to adapt to rapid changes in the environment. In the case of the United States, the result was that it lost it competitive edge in the second half of the century and was passed by rapidly improving and much more innovative systems. Strengths can easily turn into complacency and conservatism.

Assessing the future-readiness of the Chinese education system is a difficult exercise, and falls beyond the scope of this book. Yet, some questions can already be put on the table for further analysis

and research. In line with China's overall social and economic development in the past decades, the education system is designed for gradual change, without too much disruption. Radical reforms and innovations have been and are taking place, but in a carefully designed and monitored system of implementation. The question is whether this approach to innovation and change is preparing the system well for future shocks. The way Chinese schools have addressed the disruption caused by the COVID19 pandemic stems hopeful, but this was largely the outcome of local autonomy and there are also more worrisome signals of conservatism and risk avoidance at higher levels in the education governance system.

More generally, risk-taking can be seen as a necessary ingredient of future-readiness. At present, school leaders and teachers demonstrate a very high degree of professional autonomy. This includes the capacity to learn collectively and to develop a learning culture at the frontline level of the educational system. To increase the future-readiness of the system, the learning culture could be further developed into an entrepreneurial culture of risk-taking and innovation. At the same time, the middle layers of the system at municipal and provincial level should be incentivised to develop a more innovative approach, including a readiness to allow school leaders and teachers to be innovative.

This report provides a thorough assessment and benchmarking of the education system in the PRC. The overall picture it produces is very positive, while at the same time there are several areas where further improvement is needed. At the same time, it invites China to reflect not only about its current strengths and weaknesses, but also to start asking questions about the future-readiness of the system.

Chapter 2

Methodology

This chapter introduces the context of this report and describes the methodology used to develop the benchmarking exercise. This chapter discusses the process of gathering evidence, selecting and developing indicators, collecting qualitative information, and defining a comparison group of high-performing countries.

Based on the most recently available evidence and data, this report presents a systematic review of the performance of the education system in the People's Republic of China (hereafter "China"). It compares China's education system with other education systems that performed well in the Programme for International Student Assessment (PISA) 2018. The purpose of this benchmarking exercise is to assist China in gaining a comparative understanding of where it stands in relation to OECD countries, in particular in relation to other high-performing education systems in each dimension of education. Thus, attention is placed on the indicators and comparative data where Chinese jurisdictions have participated at the international level. This report adopts mixed methods, combining both quantitative and qualitative approaches with the aim of presenting both comparable information and in-depth contextual evidence. The qualitative approaches serve as important tools to complement the quantitative analysis in each dimension outlined in this report.

Context

The scope of the education system covered in this report is ISCED 0 to ISCED 3.[1] Given the availability of the data on China's education system, the primary focus of the benchmarking exercise is given to its basic education, which corresponds to ISCED 1 and ISCED 2. Due to the multi-dimensional nature of the education system, this report categorises the performance of education systems into four broad dimensions: the learning environment; curriculum and pedagogy; outcomes; and governance. In each dimension, the key components that determine the quality of this dimension are identified. In total, this exercise covers 14 fundamental sub-dimensions from the four broad dimensions that together constitute an effective education system (see Table 2.1).

Table 2.1. Benchmarking the performance of education systems: A framework

Learning environment	**Learning pathway and tracks** Has well-designed pathways and tracks (e.g. general and vocational), which combine integration and diversification, enable flexible pathways while avoiding socially determined segregation, with adequate student guidance provisions.
	Human resources Supplies well-prepared and highly qualified professional teachers to educational institutions (schools), with adequate compensation and career development incentives, working conditions, opportunities for professional collaboration, and induction, mentoring and professional development arrangements.
	Financial resources Provides threshold levels of financial investment in education to promote the quality and equality of educational opportunity to every student.
	School climate Ensures that schools offer a positive school climate that fosters learning and students' well-being, with low levels of bullying, truancy and misbehaviour.
Curriculum and pedagogy	**Teaching and learning practices** Promotes teaching and learning practices that are evidence-informed and have demonstrated a positive impact on the quality of learning and the resulting learning outcomes.
	Curriculum framework Develops and implements curriculum frameworks for schools that foster the development of a wider and a future-oriented range of competencies, including social and emotional skills, digital skills, physical and mental health and well-being, financial literacy and ethics.
	Transformative competencies Has the necessary curricular provisions in place to encourage schools and decision makers to develop student agency and the transformative competencies needed for education to remain relevant in the future.
Outcome	**Education attainment** Achieves upper-secondary educational attainment levels within the top 10% of countries with available data, with relatively narrow gaps related to gender, migration status and social background.
	Cognitive learning outcomes Succeeds in achieving and maintaining high levels of cognitive learning outcomes (proficiency in reading, mathematics and science) equitably and fairly.
	Social and emotional well-being Produces high levels of social and emotional well-being, including a strong sense of belonging and high life satisfaction.
	Education aspirations Encourages students to develop ambitious educational aspirations which tap their full potential, and supports them in overcoming constraints and barriers.
	External outcomes Leads to significant external economic, social and cultural outcomes that are relevant for both the individual and the wider community and society, including health, employability and interpersonal trust.
Governance	**Accountability** Supports a data-driven and robust evaluation and accountability culture, with adequate assessment practices at the classroom level, collaborative evaluation practices at the school level, adequate inspection and school feedback systems, and system-level monitoring infrastructure.
	Governance Has an effective governance and policy infrastructure, characterised by a well-designed distribution of responsibilities, clear policy objectives, adequate implementation strategies and efficient monitoring mechanisms.

Understanding the factors that can contribute to "good" quality in some dimensions can be less straightforward than for other dimensions. For example, in the school climate dimension, there is consensus that school bullying does not contribute to good quality education. Thus, the school bullying indicator can be interpreted directly as part of the "good" or "bad" quality of the learning environment. However, many dimensions are more dynamic and complex in nature and cannot easily be captured directly by any indicators that determine if they are of "good" or "bad" quality.

Therefore, the purpose of this benchmarking exercise is not to conclude that China's education system is better or worse than others; this cannot be determined and contributes little to the global knowledge of diverse education practices. Instead, this benchmarking exercise is organised to present how China's education system is different from or similar to other education systems around the world regarding particular dimensions. It digs deep into the practices and policies that underline the performance of each dimension in China's wide educational context, and by so doing provides a comprehensive understanding of the interrelation between indicator values, policies and practices.

Process

» Gathering existing evidence

This benchmarking exercise primarily targets existing evidence at the international level, and mainly includes two strands of evidence. The first strand is administrative data collected by international institutional sources, which include databases from major international organisations. In this case, the first strand comes from international projects or surveys where Chinese jurisdictions have participated, and data are publicly available. The scope of Chinese jurisdictions included in this study is limited to regions in mainland China.

Publicly available domestic data, the second strand of evidence, as reported by Chinese authorities, are also included in this benchmarking exercise. The primary domestic data sources are the statistical yearbooks published by the Ministry of Education in China. If the relevant data for China are missing at the international level, data from domestic sources are referred to and converted using international calculation methods (see Table 2.2).[2]

Table 2.2. Evidence and sources used for this report

Type of evidence	Source
Administrative data from international sources	UNESCO – Institute for Statistic (UIS) Database OECD Indicators of Education Systems (INES)
International surveys and projects	OECD Programme for International Student Assessment (PISA) OECD Teaching and Learning International Survey (TALIS) Education at a Glance reports Education Indicators in Focus (EDIF)
Administrative data from domestic sources	Statistic yearbooks Educational statistic yearbooks

There is no specific time span for including or excluding existing evidence. Where applicable, the most recent data are used.

As Chinese jurisdictions participating in international projects and surveys vary, this report subscribes to the original ways the data of the Chinese jurisdictions were represented in the source reports or surveys. This means that the specific Chinese jurisdictions are represented together by the initial capital letter of the participating regions' names as displayed in the original sources (see Table 2.3). Due to the partial participation of China in these projects and surveys, the interpretation of the benchmarking results does not necessarily represent the overall performance of China's education system as a whole.

Table 2.3. Chinese jurisdictions in OECD studies

Projects and surveys in which Chinese jurisdictions participated	Participating regions	Acronym used in this report
PISA 2018	Beijing-Shanghai-Jiangsu-Zhejiang	B-S-J-Z (China)
PISA 2015	Beijing-Shanghai-Jiangsu-Guangdong	B-S-J-G (China)
PISA 2012	Shanghai	-
PISA 2009	Shanghai	-
PISA 2006	Shanghai	-
TALIS 2018	Shanghai	-
TALIS 2013	Shanghai	-

» Selecting and developing indicators

Based on the conceptual framework underpinning this benchmarking exercise, the existing indicators from the above-listed sources (Table 2.2) are first mapped onto the four major dimensions: learning environment, curriculum and pedagogy, student outcomes, and governance. Then, following a more specific review of the indicators in each dimension, indicators are further categorised into the corresponding sub-dimensions. For instance, indicators related to resources are classified into financial resources and human resources in the learning environment dimensions.

The criteria used for selecting the indicators for this benchmarking exercise are based on:

- **Relevance and comprehensiveness:**

  Indicators must be relevant to the themes of the 14 sub-dimensions outlined in the framework; they are chosen to cover each dimension from comprehensive perspectives.

- **Comparability:**

  Indicators must have comparable data across education systems, collected through a valid and transparent methodology.

- **Coverage on China:**

  Indicators must have data on China's (or its subnational regions') education systems. If there are equivalent data from domestic data sources, the indicator is included.

For indicators where there is no immediate available data on China in the original international sources, further attempts have been conducted to determine the final inclusion of those indicators in the benchmarking exercise. First, a search of the corresponding data provided by domestic sources is conducted. If the data are available at the domestic level and are consistent with the international calculation, then they are used for benchmarking the indicator. If the domestic data use different units for calculation than the international calculation, efforts are made to convert domestic data with the methods that have been used in calculating this indicator. For instance, data on China's national investment per student at lower education levels are first originally retrieved from China's Ministry of Education and then calculated following the same methods used in Education at a Glance (converting Chinese currency "Yuan" (CNY) into equivalent USD by using PPP index). If the domestic data are calculated differently than the methods used for the indicators from international sources, and it is not possible to convert them to comply with the selected indicator, then the indicator is dropped.

» Collecting qualitative information

Qualitative data provide in-depth information on policies and practices adopted in China's education system, which is a fundamental resource used to complement the quantitative information in this benchmarking exercise. In particular, qualitative research is conducted in some dimensions that are hard to be quantified by their nature and no indicators have been developed under international efforts. For instance, governance is dynamic and deeply rooted in context, which is hard to evaluate through quantitative methodologies. Therefore, in the Governance chapter, attention is given to the qualitative information on policies and practices that reveal how China governs its education systems differently from others.

Qualitative data on policy and practice information are mainly collected through desk-based research and interviews with experts.

» Desk-based research

Two types of desk-based research were involved depending on the needs of this benchmarking exercise: 1) primary research: conducting a review of policies and other official documents issued by Chinese authorities; 2) secondary research: reviewing published research and other secondary information issued by trustworthy sources (e.g. institutional publications, peer-reviewed journals, etc.).

» Interviews with experts

Interviews with experts were conducted in order to gain more insight into the policy and practices information that is hard to collect through desk-based research. The experts included researchers, professors and key decision makers who have been researching and working on relevant education topics in China's context.

The qualitative information gathered through the above research activities are either presented in the text or separately in tables, diagrams or boxes, providing comparative analysis and examples of specific policies and practices.

» Defining a comparison group of high-performing countries

The indicators used for this benchmarking exercise compare China's value on each indicator within the distribution of a selection of high-performing countries. The selection of high-performing education systems is based on student performance in all subjects in the PISA 2018 results. The countries whose performance in reading, mathematics and science are statistically significantly above the OECD average are the high-performing education systems used in this report (Table 2.4). China's economies outside of mainland China are not included.

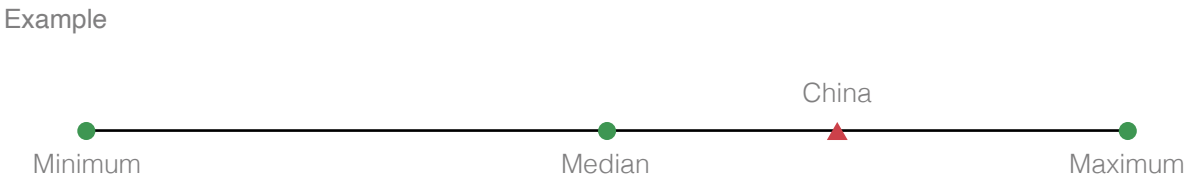
Table 2.4. High-performing countries used in this report

High-performing countries in PISA 2018 used in this report	Belgium Canada Denmark Estonia Finland France Germany Ireland Japan Korea New Zealand Poland Singapore Slovenia Sweden United Kingdom

When there is only sub-regional data instead of national data available, the sub-regional data are used for this benchmarking exercise. The name of the region is indicated with its country name in parentheses; for example, the Flemish community (Belgium). If there is no national or regional data for a selected country on certain indicators, then this report does not include the country in calculating the respective indicators.

The distribution of the high-performing countries mainly highlights three fundamental values: the minimum value, the median value and the maximum value of the selected high-performing countries (excluding China). The median value of the high-performing education systems is calculated as the value in the centre of the distribution of all listed high-performing countries for which data are available. A distribution chart that summarises the key indicators with available data is presented in each dimension. This chart highlights China's relative position within the distribution of the high-performing countries on the given indicators (see Figure 2.1 for an example).

Figure 2.1. Example: China's position within the distribution of high-performing countries on Indicator X



Positioning China's performance in the distribution of the PISA 2018 high-performing countries shows where China's jurisdictions stand in relation to the tendency of all other high-performing countries. However, a higher value does not necessarily mean that one must outperform the other, as some indicators themselves do not directly represent the performance. For instance, the indicator of national expenditure per student does not mean higher investment leads to a better education system. Instead, it needs to be considered together with student outcomes and other factors.

This report aims to highlight the different or similar features that China's education systems have in relation to other high-performing systems, which leaves room for interpreting the results and generating meaningful discussions on the dynamic interplay of each dimension in relation to the construction of high-performing education systems.

NOTES:

1. ISCED is an abbreviation for International Standard Classification of Education.
2. Whenever domestic data is used for benchmarking with international sources, the calculation methods are explained in a note.

Chapter 3

Learning Environment

This chapter presents a review of the quality of the learning environment in Chinese education systems in comparison with other high-performing education systems in the Programme for International Student Assessment (PISA) 2018. This analysis of the learning environment focuses on: 1) educational pathways; 2) financial resources; 3) human resources; 4) infrastructure and facilities; and 5) school climate.

Overview

The learning environment is a prominent dimension of an education system; it serves as an overarching umbrella for the conditions under which teaching and learning can take place. It is a complex concept that involves the interplay of multi-level dynamics (at the classroom level, school level, system level, etc.) and concerns not only teachers and students but also a wide number of actors and contextual factors that continually shape teaching and learning processes and outcomes.

The scope of the learning environment in education is comprehensive both in its breadth and depth. Horizontally, it encompasses learning resources from multiple strands (e.g. financial, human, infrastructures, and facilities). Vertically, the structure of the learning environment, such as how resources are co-ordinated and distributed, and how learning and teaching are organised, are all of importance in shaping the learning experiences and outcomes of students.

In light of the Sustainable Development Goal 4 ("ensure inclusive and equitable quality education and promote lifelong learning opportunities to all"), this chapter suggests that the learning environment needs to achieve an equitable and efficient allocation of both financial and human resources for all students. Equally important, the learning pathways through which learners are mobilised in an education system should be flexible and diverse enough to allow students to make unfettered decisions about their learning and future professions. Finally, at the basis of a learning environment, ensuring a healthy school climate where students feel safe and supported is the cornerstone for constructing a high-quality education system.

This chapter begins with a snapshot of the education system in the People's Republic of China (hereafter "China") from early childhood education (ISCED 0) to upper secondary education (ISCED 3). It summarises the characteristics of China's education structure and highlights recent trends in China's education system at each level. The chapter then examines China's performance along the five key dimensions of the learning environment: 1) educational pathways; 2) financial resources; 3) human resources; 4) infrastructure and ICT-resources; and 5) school climate.

» A snapshot of the Chinese education system

The international community has developed a widely used instrument for assembling and presenting data from different education systems in a comparable and uniform way, which is known as the International Standard Classification of Education (ISCED). The ISCED provides a statistical framework classifying the type and levels of education and qualifications alongside education programmes. Despite the various and separate education programmes offered in individual countries, ISCED presents a common framework that enables international benchmarking of education systems' performance. This report adopts the ISCED 2011 classification to present the levels and types of education offered in China's education system. Equally, ISCED is also applied to other education systems selected for benchmarking purposes for this report. The scope of this report is from ISCED 0 to ISCED 3 (see Table 3.1 for the definition of levels ISCED 0 to ISCED 4).

Table 3.1. International Standard Classification of Education

ISCED-Programmes (ISCED-P)	0	Early childhood education
	1	Primary education
	2	Lower secondary education
	3	Upper secondary education

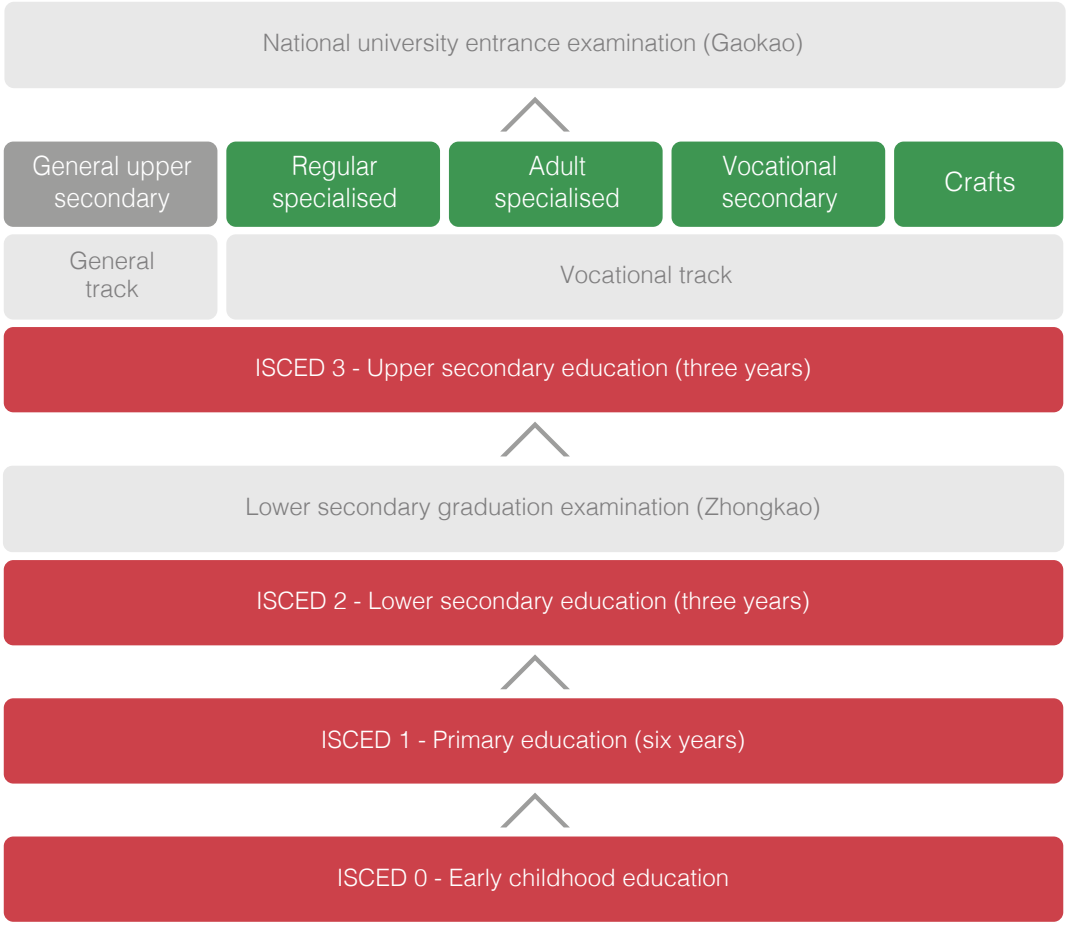
Source:
UNESCO (2011[1]), International Standard Classification of Education (ISCED) 2011, http://www.uis.unesco.org.

China has the world's largest population of school-aged children. Its education system provides education services to over 270 million students, with more than 16 million full-time equivalent teachers' participation in 500 000 schools (Ministry of Education, 2017[2]). The number of students enrolled in education at each level is increasing every year, which correspondingly expands the scale of China's education system. With an increasingly large education system, the central government is continuously shifting the responsibility of education provision towards lower-level governments. In most regions, county-level authorities are in charge of education governance and delivery.

The Chinese education system has implemented nine years of compulsory education for all school-age children since 2006. Nine years of compulsory education consists of six years of primary education (ISCED 1) and three years of lower secondary education (ISCED 2). Recently, some developed regions in China are promoting twelve years of compulsory education, which includes three years of upper secondary education. However, it has not been scaled to the national level. The statutory age for children to begin receiving an education is six years old. Before the age of six, parents can enrol their children in formal early childhood education, which is not included as part of compulsory education.

After completing lower secondary education, students are required to take an upper secondary education entrance exam (Zhongkao) in order to participate in upper secondary education. There are two major learning tracks in upper secondary education programmes: general education programmes and vocational education programmes. Under the framework of vocational programmes, four main types of schools are provided for different learners and training purposes: 1) regular specialised schools; 2) adult specialised schools; 3) vocational secondary schools; and 4) crafts schools (see Figure 3.1).

Figure 3.1. The structure of China's education system from ISCED 0 to ISCED 3



Sources: Authors' own work, based on OECD (2019[3]), «*China: Overview of the education system*», https://gpseducation.oecd.org/; National Center on Education and the Economy (2020[4]), «*Shanghai-China: Learning Systems*», https://ncee.org/.

Box 3.1. Definitions of key terms used in this report

Net enrolment ratio: Total number of students in the theoretical age group for a given level of education enrolled in that level, expressed as a percentage of the total population in that age group. This report uses net enrolment ratio to present student participation in China's education system when the data of net enrolment ratio is publicly available.

Gross enrolment ratio: Number of students enrolled in a given level of education, regardless of age, expressed as a percentage of the official school-age population corresponding to the same level of education. For the tertiary level, the population used is the five-year age group starting from the official secondary school graduation age. If the data of net enrolment ratio is not identified, this report presents the gross enrolment ratio to examine student participation in China.

Gross graduation ratio: Number of graduates regardless of age in a given level or programme, expressed as a percentage of the population at the theoretical graduation age for that level or programme. This report mainly looks at the gross graduation ratio to present student completion of education in China.

Gender parity: Reaching gender parity in education implies that the same proportion of boys and girls - relative to their respective age groups - would enter the education system and participate in its different cycles.

Gender parity index (GPI): Ratio of female to male values of a given indicator.

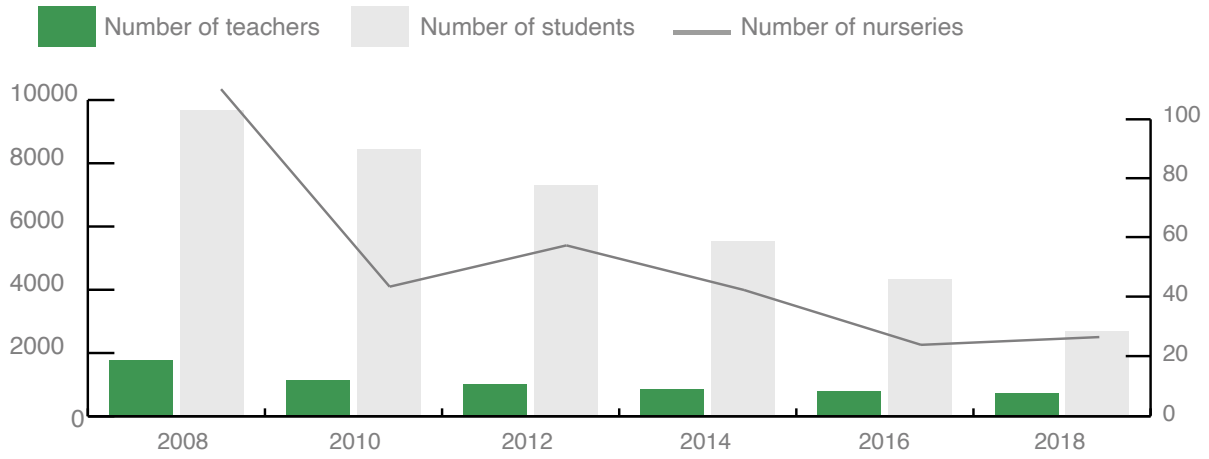
Source: UNESCO Institute for Statistics (2020[5]), «Methodology: Glossary», http://uis.unesco.org/en/glossary.

» More early childhood education services for under-threes is needed

There are three types of early childhood education and care (ECEC) provided to children under the age of six in China: nurseries (0-3 years old); kindergartens (3-6 years old); and pre-school classes (5-6 years old).

The number of state or collectively owned nurseries has decreased over the past 30 years, partially due to the development of marketisation in the Chinese education system as well as decreasing birth rates since the 1970s (see Figure 3.2 for an example from Shanghai).

Figure 3.2. Change in the number of nurseries in Shanghai, 2008-18



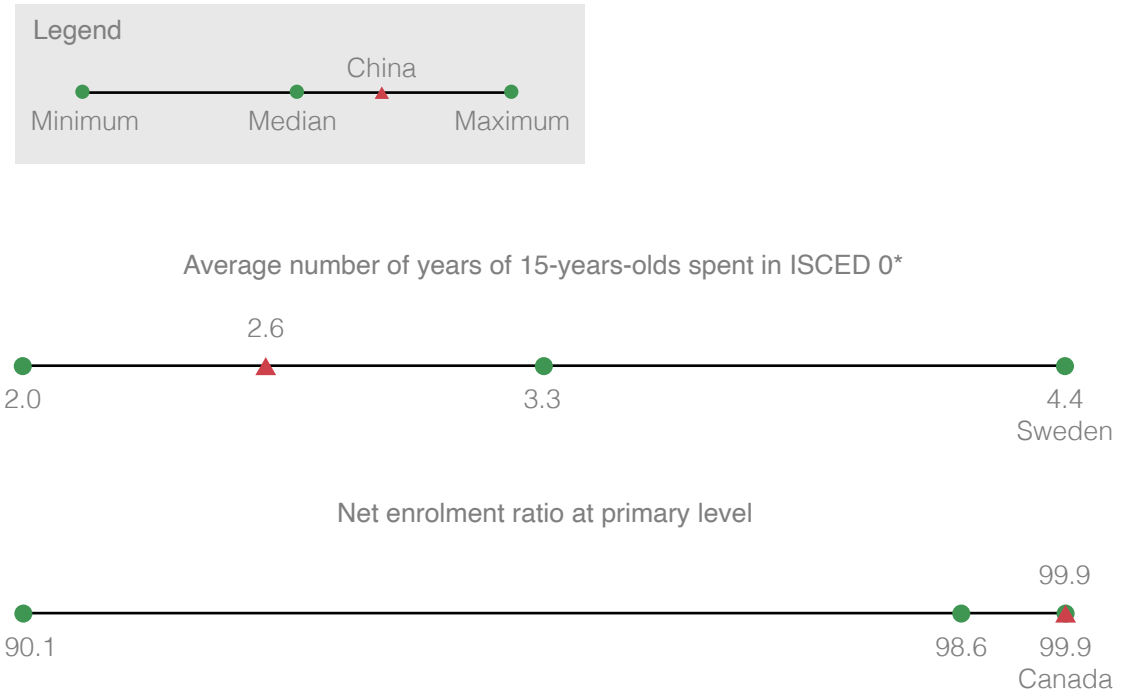
Source: Authors' own work, based on Shanghai Municipal Education Commission (2009-2019[6]), *上海教育年鉴 2009-2019 [Shanghai Educational Yearbook]*.

Enrolment in kindergarten is increasing every year, with the number of kindergartens having doubled over the past ten years (Ministry of Education of China, 2020[7]). Kindergarten plays the dominant role of providing early childhood education services in China. However, as kindergartens mainly receive children above three years old, there is still a significant need for early childhood education and services for children under three among today's Chinese families; a recent report shows that more than one-third of Chinese families reported such a need (National Working Committee on Children and Women, 2017[8]). The average number of years students in B-S-J-G (China) received ISCED 0 is considerably lower compared to many high-performing countries (see Figure 3.3).

Across OECD countries, the enrolment rate in ECEC among children 0-2 years old is 33.2% on average. In China, this rate is estimated at less than 10% (National Working Committee on Children and Women, 2019[9]). Inadequate supply of ECEC for children under three could increase the likelihood of mothers forgoing their jobs due to childcare reasons (OECD, 2017[10]). Despite the promotion of the two-child policy published in 2006 in China, a recent Chinese study reveals that the primary factor constraining Chinese parents' decisions to have a second child is concern about inadequate childcare (Hong, 2020[11]).

Early childhood education is not included as compulsory education in China. The state encourages both public and private actors from different sectors to provide these services. The number of non-government-run kindergartens has increased rapidly over the past 30 years in China, providing services to around half of the children in ISCED 0. This is consistent with the majority of OECD countries, where 58% of children enrolled in ECEC attend private institutions. The rise of privately operated ECEC providers may broaden children's access to education and provide parents more diverse options, on the condition that the government employs effective measures to ensure quality provided by private actors (OECD, 2017[10]).

Figure 3.3. Participation in education in China, compared with participation in selected high-performing education systems



Source: *Data are limited to four Chinese regions: Beijing, Shanghai, Jiangsu and Guangzhou.
ISCED 0 is early childhood educational development and pre-primary education.
Source: Authors' own work, based on OECD (2016[12]), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264267510-en; UNESCO Institute for Statistics (2020[13]), *Education (database)* http://data.uis.unesco.org/.

» Participation in primary education is high

Primary school education is compulsory and lasts six years. The typical age to start primary education is six years old. With the introduction of the Compulsory Education Law of the PRC and China's commitment to the "education for all" movement led by the United Nations Educational, Scientific and Cultural Organization (UNESCO), primary school education has seen great progress in achieving universal access for school-aged children. Over the past 20 years, the net enrolment rate of school-aged children in primary education rose from 97.8% in 1999 to 99.9% in 2018 (Ministry of Education of China, 2019[14]). Balance is achieved between female and male participation in primary education with the gender parity index (GPI) maintained at 1 from 2013 to 2018 (UNESCO Institute for Statistics, 2020[15]).

To access primary education for their children, parents need to adhere to the principle of "nearby enrolment", meaning children cannot move to schools outside their "hu kou" (the household registration system in China). Despite the improvement of universal access in primary education, education inequality remains between economically developed and under-developed regions. For instance, in 2017, while the national net enrolment rate reached 99.9%, differences can be observed between the eastern, developed provinces and western, less-developed provinces. Enrolment rates in provinces such as Beijing, Shanghai, Jiangsu, and Zhejiang are above 99.9%, whereas this rate is generally lower than 99.9% in western, inland provinces like Gansu, Qinghai, Sichuan and Tibet (Ministry of Education, 2017[2]).

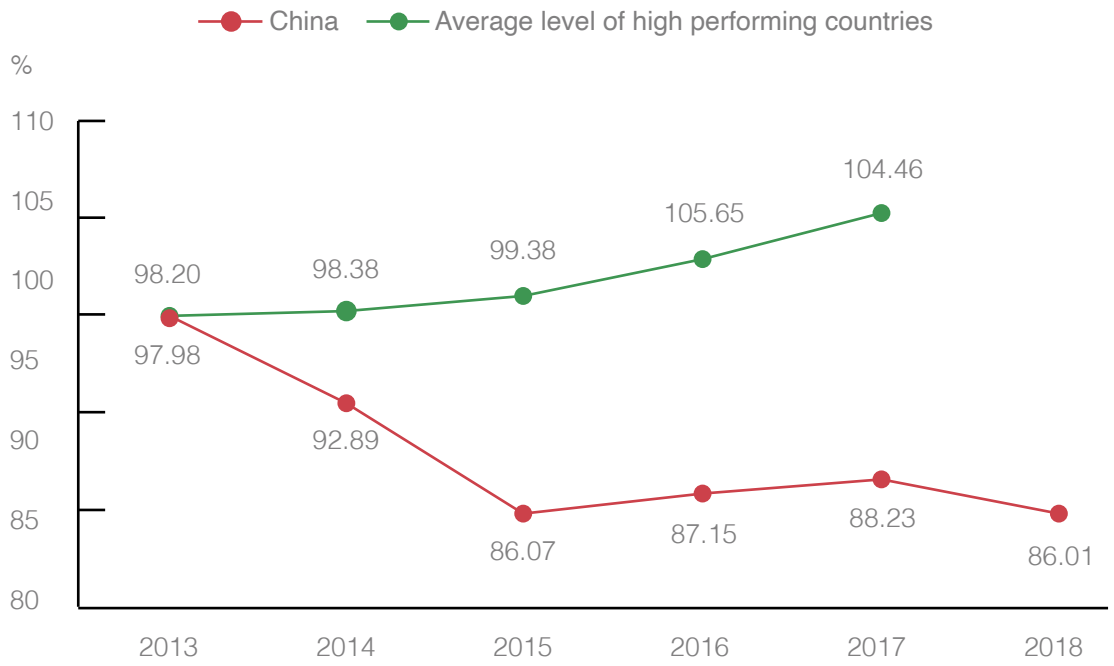
» Completion of lower secondary education is decelerating

As in many OECD countries, lower secondary education lasts three years, which is the last stage of compulsory education in China. The average age of children participating in secondary education is 12 to 15 years old. Lower secondary school, in general, is non-selective and free; students can enrol in lower secondary education based on the "nearby enrolment" approach. This approach groups students from the same neighbourhood

together, which, to some extent, promotes equal learning opportunities for every student regardless of different student characteristics. Nevertheless, as education quality differs largely by region, a growing number of parents choose to invest in school-district houses (xue qu fang) where there are better educational resources.

Since 1990, as access to lower secondary education has expanded significantly, the gross enrolment rate of lower secondary education has increased from 66.7% in 1999 to 100.9% in 2018 (Ministry of Education of China, 2020[7]). However, the gross graduation ratio from lower secondary education declined from 2013 to 2018 (UNESCO Institute for Statistics, 2020[13]) (see Figure 3.4).

Figure 3.4. Gross graduation ratio from lower secondary education in China and selected high-performing countries, 2013-18



Source: Authors' own work, based on UNESCO Institute for Statistics (2020[13]), *Education database*, http://data.uis.unesco.org/ and sources listed in Chapter 1 (Methodology).

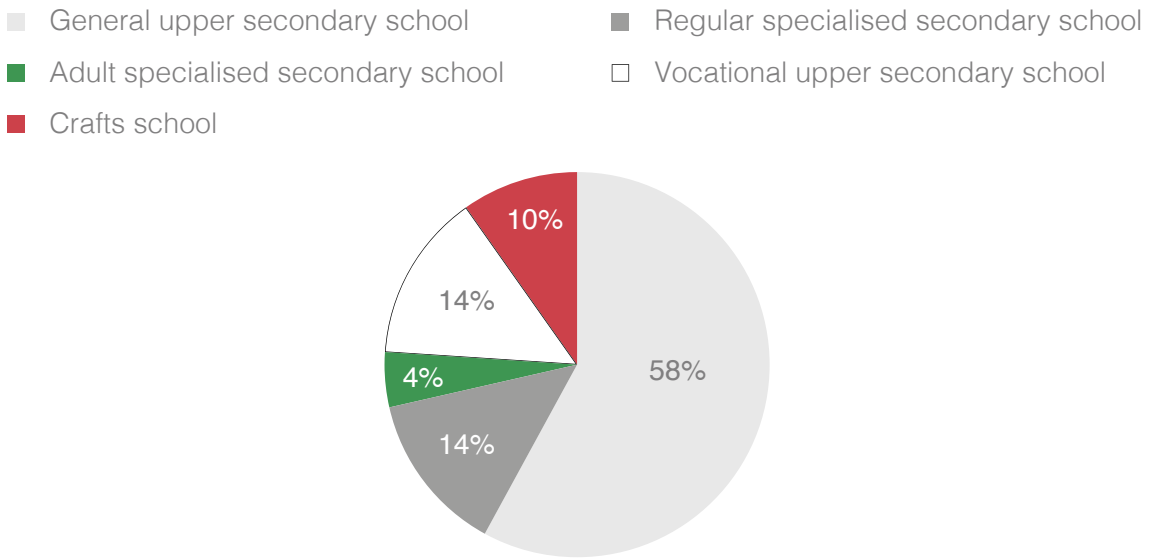
Graduation ratio is a key proxy measure of the quality of the output of an education system. A decrease of the gradation ratio can be associated with many contextual factors related to socio-economic profile, gender and geographical gaps and so on, which requires more in-depth analysis to examine the causal reasons.

» Participation and completion rates in upper secondary education are declining

Upper secondary education is not compulsory in China. The age range for children to participate in upper secondary education is from 15 to 18 years old (three years). Like in many countries, there are two major pathways to upper secondary education provided to students. One is a general education programme where students learn general knowledge, skills and competencies; the other is a vocational educational programme that prepares students for direct employment in a particular occupation. Chinese school systems adopt a differentiated approach to sort students into different educational pathways.

As mentioned above, vocational education is provided by four types of vocational schools designed for different learners and learning purposes: 1) regular specialised schools; 2) adult specialised schools; 3) vocational secondary schools; and 4) crafts schools. Regular specialised schools tend to be the most popular option for vocational education (see Figure 3.5).

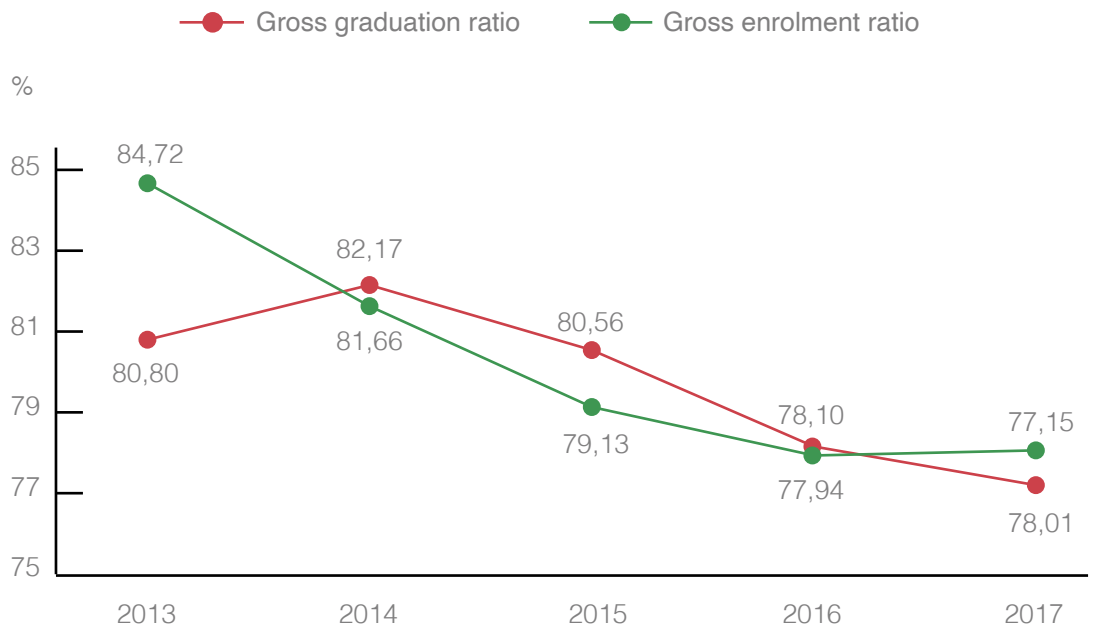
Figure 3.5. Student enrolment in different types of schools in upper secondary education in China



Source: Authors' own work, based on Ministry of Education of China (2020[7]), *2019 全国教育事业发展公报 [Bulletin of the development of the national education]*.

To move into upper secondary education, students need to first graduate from lower secondary education and then take the upper secondary school entrance examination (Zhongkao), which is a national exam that determines students' qualification of entry. Student participation rates in the general education track are generally higher than in the vocational education track. In 2018, 60% of upper secondary education students participated in general education programmes, and 40% did so in vocational education programmes. This being said, during the past few years, both the participation and completion rates in upper secondary education have been declining (see Figure 3.6).

Figure 3.6. Participation and completion rates in upper secondary education in China, 2013-17



Source: Authors' own work, based on UNESCO Institute for Statistics (2020[13]), *Education (database)* http://data.uis.unesco.org/

Educational pathways

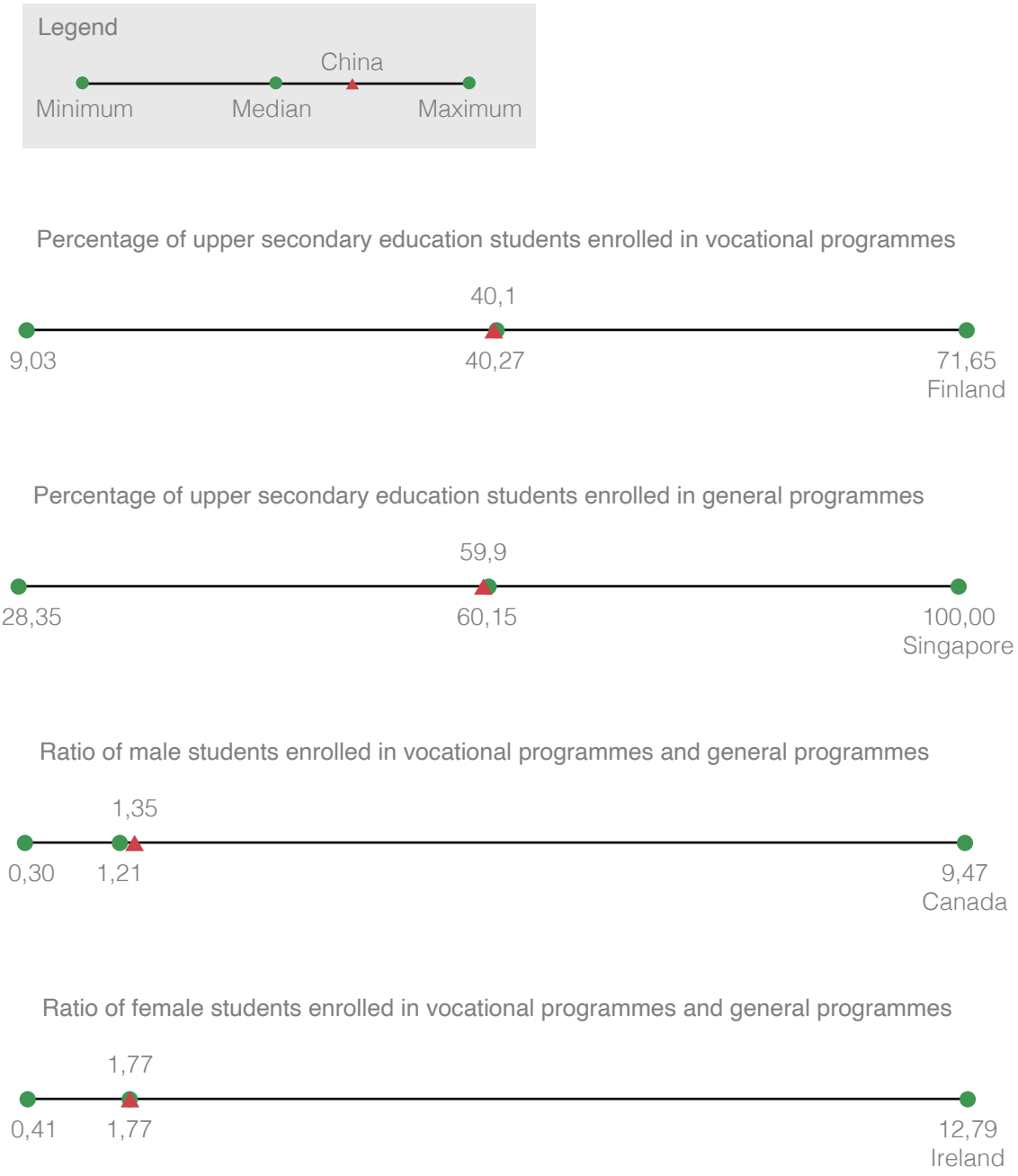
Ensuring that every student has equal access to quality education is a fundamental goal of today's education system. To meet the growing diverse needs for student learning, education systems need to enable flexible pathways for students to easily access and act within the education system. Meanwhile, it is also crucial to avoid socially determined segregation, possibly perpetuated by ill-designed learning tracks.

A strong education system ought to provide diverse learning pathways that meet the different learning needs of its students. Diversification in education programmes is increasingly important in today's world due to an increasingly diverse student composition in upper secondary education and the growing diverse needs of the labour market. In particular, with a world facing evolving changes and uncertainties, diversification of learning pathways is a key strategy to provide quality education opportunities for all citizens keen to develop knowledge and skills for their lifelong development. Lessons can be learned, for example, from the 2007-08 financial crisis, where youth in Austria, Germany and Switzerland, countries that implement "dual" vocational education systems, were more able to maintain their jobs in the struggling global labour market (OECD, 2018[16]).

Flexibility of learning pathways is another prominent feature that defines a strong education system. A flexible learning pathway that reduces the costs and barriers constraining learners from pursuing their learning goals has profound positive impacts on nurturing their lifelong learning. Building flexible pathways is necessary to adapt and modulate learning, given the rapid transformation of work and lifestyles in today's world. For instance, a growing number of adult learners require learning systems flexible enough to allow them to access, participate in and complete without overwhelming conflict with their work and life activities. Meanwhile, providing flexible learning pathways is key to reducing socially determined aggregation, allowing students to have adequate opportunities to move across and through different learning tracks (e.g. general/vocational) regardless of their socially determined backgrounds.

Figure 3.7 presents China's participation in vocational programmes and general programmes, in comparison with other high-performing education systems.

Figure 3.7. Participation in vocational programmes and general programmes in China, compared with participation in selected high-performing education systems



Note: "Ratio of male (female) students enrolled in vocation programmes and general programmes" is calculated by dividing the share of male (female) students in vocational programmes by the share of male (female) students in general programmes. Values less than 1 means a larger share of male (female) students go to general programmes; values higher than 1 mean a larger share of male (female) students go to vocational programmes.
Source: Authors' own work, based on UNESCO Institute for Statistics (2020[13]), *Education database*, http://data.uis.unesco.org/

» Diversification of educational pathways

There are two, identical learning tracks (general and vocational) for students who have completed their compulsory education. The general learning track is academically oriented and prepares students to move toward the next level of post-secondary or tertiary education. Within the general educational track, there are two distinguishable learning pathways comprised of different subject areas. One is a humanities-oriented learning pathway, where students study history, political science and geography. The other is a science-oriented learning pathway, which involves physics, chemistry and biology. For students driven to study art or sports, they can choose either the humanities or science tracks and study art or sports-specific content on the side.

Enrolment in vocational education is commonly lower than in general education in China. In many OECD countries, vocational education is used as an effective strategy to prepare a highly-skilled workforce for the needs of social and economic development. In China, vocational education programmes have been broken down into four separate types of schools: 1) regular specialised secondary schools; 2) adult specialised secondary schools; 3) vocational upper secondary schools; and 4) crafts schools. Except for the adult specialised secondary school, which is devoted to adult students, the other types of vocational schools are all accessible to the school-aged population. The most significant distinction between these schools is the difference in the governance bodies and institutes issuing the certificates.

The four types of vocational schools cover various areas for vocational learning. In general, there are 270 vocational specialities provided to students, which can be roughly categorised into the following domains (Kuczera and Field, 2010[17]):

- **agriculture and forestation**
- **resource and environment**
- **energy**
- **civil works and hydraulic engineering**
- **manufacturing**
- **transportation**
- **information technology**
- **medicine and health**
- **business, trade and tourism**
- **finance and economics**
- **culture, arts and sports**
- **social and public affairs**
- **other.**

Although the government encourages combined school and work vocational programmes at the policy level, there is not enough guidance, to set out what and how vocational schools should do in this regard at the ground level. In fact, there seem to be few quality standards and guidance at the national level on the regulation of combined school-work vocational programmes. As some school-work integrated vocational programmes rely primarily on negotiations between schools and local employers (Kuczera and Field, 2010[17]), the implementation of this kind of programme may lack proper planning and scientific structure, which may limit students' learning experiences.

» Flexibility of educational pathways

With regard to general education, students can choose between either the humanities or science tracks, leading up to a corresponding selective examination to tertiary education. During the three years of education at this level, students can switch between humanities and science if they find their first choice is not suitable. However, once students follow a specific route, they must take the corresponding higher education entrance examination that allows them to enrol in a specific field. Some fields are only open to students who have followed the science-oriented learning track, such as physics, chemistry and astronomy. Likewise, some fields, such as literature and history, offer most of their places to students from the humanities-oriented learning track.

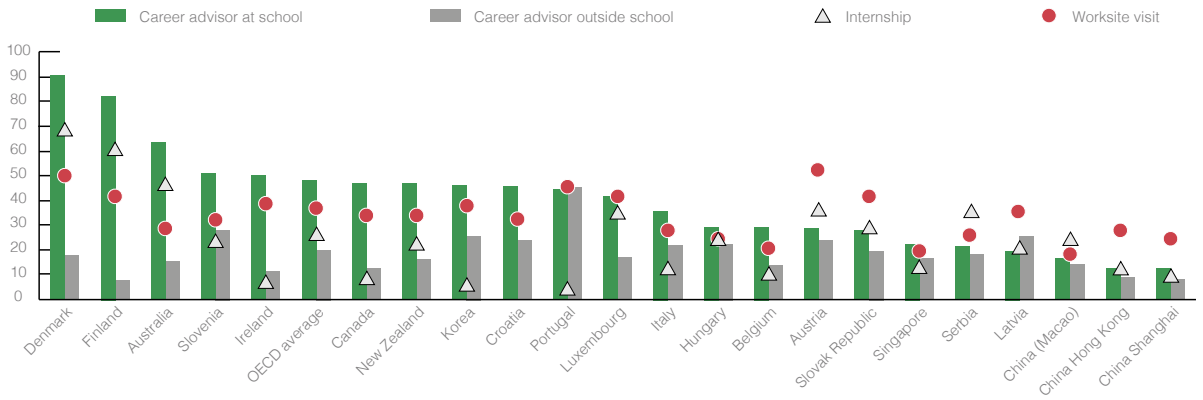
Moving from the general educational pathway to the vocational pathway is more frequent than the other way around. Whereas the former requires students with better academic results in the upper secondary education entrance exam, the vocational pathway serves as an effective educational option for students with relatively lower academic performance, or even dropout students. For students registered in vocational education, mobility to general education is restricted by their academic performance. There seems to be no direct transferable learning pathway that allows students to move between the vocational and general tracks.

Some vocational schools are authorised to issue specific professional certificates to students who complete their studies, allowing them to work in specific occupations. However, instead of entering the labour market immediately, many students who complete vocational education choose to continue to tertiary education. There is an open pathway for students in the vocational track to access higher education, but only those students who attend certain types of vocational schools (e.g. vocational secondary school).

Research shows that individualised career coaching and guidance contribute significantly to the effective transition of upper secondary education graduates to post-secondary education and labour markets. Career guidance is crucial for helping students identify their career aspirations and potential, thus informing their decision making on their next life steps. Career counselling can be provided via multiple sources, including schools and teachers, parents and peers, and third-party advisors. Different types of sources on career guidance can complement each other and enhance the overall availability of career guidance for students.

In Shanghai, the overall availability of career counselling for 15-year-old students is relatively low, compared to many high-performing countries. This may limit students' career opportunities and hinder their successful progression (Figure 3.8).

Figure 3.8. Percentage of 15-year-old students with access to career guidance, by type, 2012



Source: OECD (2014[18]), PISA 2012 *Results: What Students Know and Can Do (Volume I, Revised edition, February 2014): Student Performance in Mathematics, Reading and Science,* PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264208780-en.

Financial resources

Financial resources are one of the cardinal enablers of quality learning environments. The extent to which a country invests in education directly impacts not only its citizens – affecting student enrolment, student school life and teachers' working conditions – but it can also profoundly enhance the productivity of a society, leading to long-term economic and social benefits. This being said, investment in education does not necessarily mean "more is better"; countries need to balance the demands of education and other public services; as well as different educational priorities, e.g. enhancing education quality and expanding access to education. What matters more to the quality of education is how a country allocates and organises, and thus optimises the value of, its investments in education.

This section focuses on the financial resources that China has devoted to its education system. Based on the availability of data, this section looks at two prominent indicators that reflect, to some extent, its financial resources in education: 1) national expenditure on educational institutions; and 2) expenditure per student.

» National expenditure on educational institutions

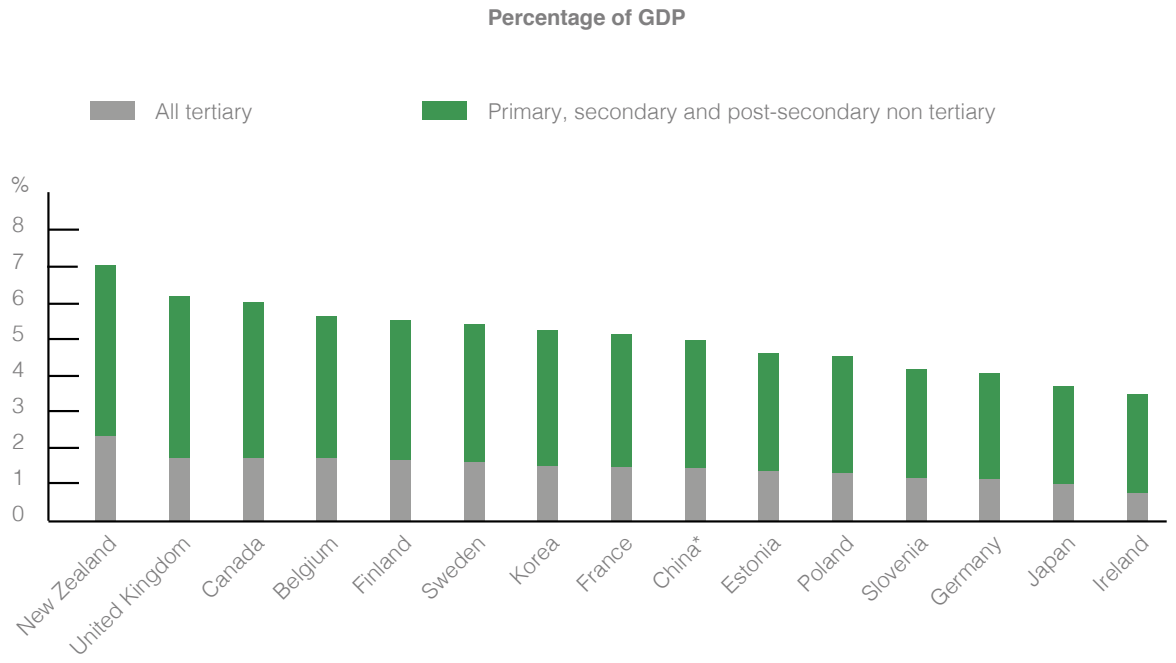
National expenditure on education reflects the extent to which a government prioritises its education as a function of the country's overall resources. With the global move to foster a knowledge-driven economy, countries' expenditure on education provides a measurement of its social investment in knowledge and skills. China has committed to building a strong state for scientific and technological innovation by 2050 (China's State Council, 2016[19]). National expenditure on education is thus important, as it reflects China's investment in education to prepare its labour force for an innovation-oriented society.

A common way to gain a measurable understanding of the financial resources devoted to education in a nation is through data on the total expenditure on educational institutions as a percentage of gross domestic product (GDP). There are many factors, however, that can affect the level of expenditure on educational institutions. For instance, a larger school-aged population may increase the level of educational expenditure, whereas relatively lower salary standards for teachers may lead to relatively lower expenditure on education.

In 2016, China devoted CNY 3 888 billion in total to its educational institutions at all levels (including tertiary education) (Ministry of Education, 2017[20]), which accounts for approximately 5.2% of its GDP. The total amount of investment in education has risen consistently over the past seven years in China.

OECD countries invested around 5% of its GDP in education, on average, across all levels in 2016. Among the high-performing education systems in PISA 2018, the majority devoted more than 5% of GDP to education (Figure 3.9).

Figure 3.9. National expenditure on educational institutions in selected high-performing countries, 2016



Note: The year of reference is 2016.
Source: OECD (2019[21]), Education at a Glance 2019: OECD Indicators, OECD Publishing, Paris, https://dx.doi.org/10.1787/f8d7880d-en; data for China are from National Bureau of Statistics (2017[22]), 2017 *中国教育经费支出年鉴 (2017 Statistics Yearbook of Educational Funds)*.

More than two-thirds of total expenditure on educational institutions go into primary, secondary and post-secondary non-tertiary education in China, which is not surprising given the high student enrolment rate at non-tertiary levels of education. Total expenditure on educational institutions at the compulsory education level (including primary and lower secondary levels) makes up around 2% of China's GDP (Ministry of Education, 2017[20]). Across OECD countries, national expenditure on the primary and lower secondary level is 2.5% of GDP, on average. For upper secondary education institutions, China devoted around 0.8% of its GDP, which is 0.3 percentage points lower than the average level found in OECD countries (1.1%); this may be partly due to the higher participation rate in upper secondary education in OECD countries. Vocational programmes in upper secondary education received around 0.24% of GDP in China, whereas this figure is much higher at the average OECD level (0.6%). Across OECD countries, general programmes tend to receive more investment than vocational programmes (OECD, 2019[21]). This also holds true in China.

» Expenditure per student

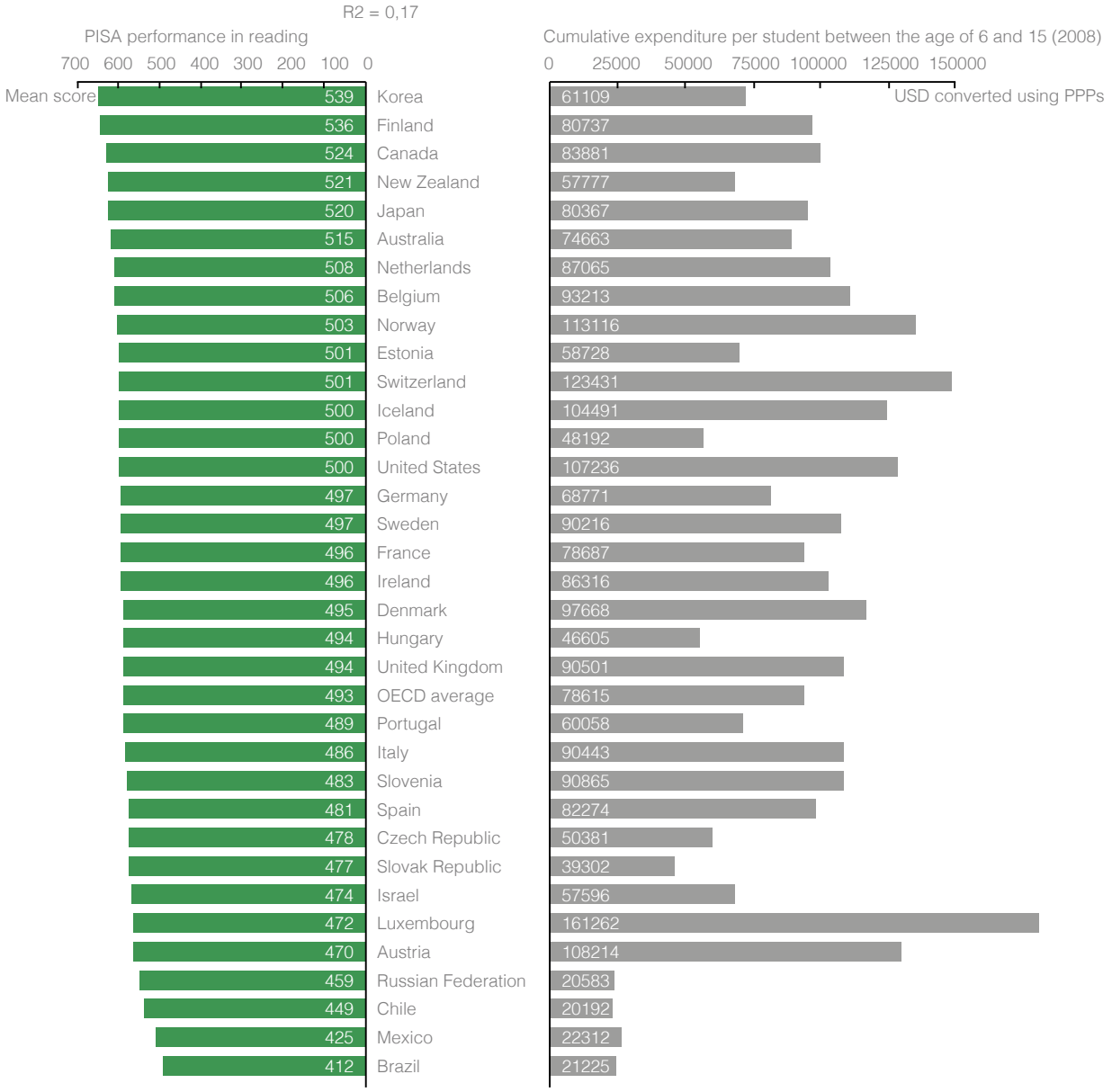
Dividing total expenditure by the number of students enrolled in educational institutions can reveal the extent of investment to which countries commit for each student. This figure can be further analysed by the level of education to indicate the variation of the investment that students receive at different education levels. Although the relationship between the amounts of investment that a country devotes to its students and student outcomes is not direct, data on the expenditure per student can be an effective indicator to reflect the quality of financial support provided to students in learning environments. Total expenditure per student also allows for a comparable international analysis of how countries allocate financial resources and provide various levels of investment to students in their education systems, which can fuel global reflection on how to optimise financial resources for better returns on investment in education.

Based on data available from China's Ministry of Education (2016[23]), China's investment per student at primary, secondary and post-secondary non-tertiary levels is estimated at approximately USD 3 500 in 2016. OECD countries spend, on average, around USD 9 400 at the corresponding levels of education. Similar to most OECD countries, when the level of education is higher, the expenditure per student increases. In China, upper secondary school students tend to see more per student expenditure (around USD 4 200) than their counterparts at primary and lower secondary education. Expenditure per primary student is around USD 2 860 and around USD 4 000 per lower secondary student in China. This figure is significantly lower than the average level

found in OECD countries (USD 8 470 at primary level and USD 9 884 at the lower secondary level).

The amount of expenditure per student is affected by many factors, such as the number of teachers and school staff, teachers' salaries, the number of enrolled students, etc. These factors also reflect a country's strategy regarding its financial resource allocation for education. There is no clear answer, however, on how much investment is needed to achieve the most effective returns in an education system. Evidence has shown that higher expenditure per student does not automatically lead to better student outcomes (Figure 3.10). China's example, with regard to its financial investment in education and its students' high academic performance in PISA, can serve as a compelling case for analysing the complex relationship between expenditure and the return on investment in education. Further data and in-depth research are needed, however, to examine the educational policies, resource allocation, teaching and learning practices to better understand China's financial investment in its education system.

Figure 3.10 "More does not necessarily lead to better": PISA performance in reading, 2009 and student expenditure, 2008



Source: OECD (OECD, 2011[24]), «Which factors influence the level of expenditure?», in *Education at a Glance 2011: OECD Indicators, OECD Publishing*, Paris, https://doi.org/10.1787/eag-2011-22-en.

Human resources

The quality of an education system relies largely on the quality of its teachers. Adequate supply and retention of highly qualified professional teachers are the prerequisites to sustain quality learning opportunities through which students can receive trustworthy supports. Research shows that most education systems that perform well in PISA tend to commit to developing a strong teaching profession (Darling-Hammond, Hyler and Gardner, 2017[25]).

This section begins with a description of teacher education programmes implemented in China at the national level, compared with other high-performing education systems, so as to discuss how teachers are selected and prepared for the teaching profession. The section then looks at the supports that Shanghai education system provide to its novice teachers as well as experienced teachers, including induction, mentoring and continuous professional development activities. It also examines the quality of working conditions in which teachers conduct their daily teaching practices.

» How teacher candidates are selected and trained in China

Countries tend to use different strategies to recruit and train their teachers, in accordance with the characteristics and needs of their education systems (OECD, 2018[26]). However, an earlier analysis of the high-performing education systems in PISA indicates that despite the various instruments countries adopt, all high-performing education systems place great value on selecting the right candidates for the teaching profession and developing them into effective instructors (McKinsey & Company, 2007[27]).

China, as one of the high-performing education systems in PISA, has prioritised the development of a strong teaching force in its policy agenda (State of Council of China, 2019[28]). To attract highly motivated students to the teaching profession, China implemented the "public education for normal university students" (公费师范生教育) policy at the national level. This national policy aims to "develop a group of excellent teachers, promote the social atmosphere where teachers are respected and valued, and encourage more young people to devote themselves to the teaching profession" (Ministry of Education of China, 2012[29]). Under this policy framework, teacher candidates who have passed the national higher education entrance exam benefit from free tuition fees and subsidies for four years, guaranteed job allocation when they graduate and opportunities for in-service master's level studies. In return, teacher candidates must commit to teaching for at least six years.

China's requirements for entry into the teaching profession are similar to those found in other high-performing education systems in PISA. They include competitive examinations to enter pre-service teacher training as well as the teaching profession, mandatory teaching practicum, and a license required for teaching (see Table 3.2).

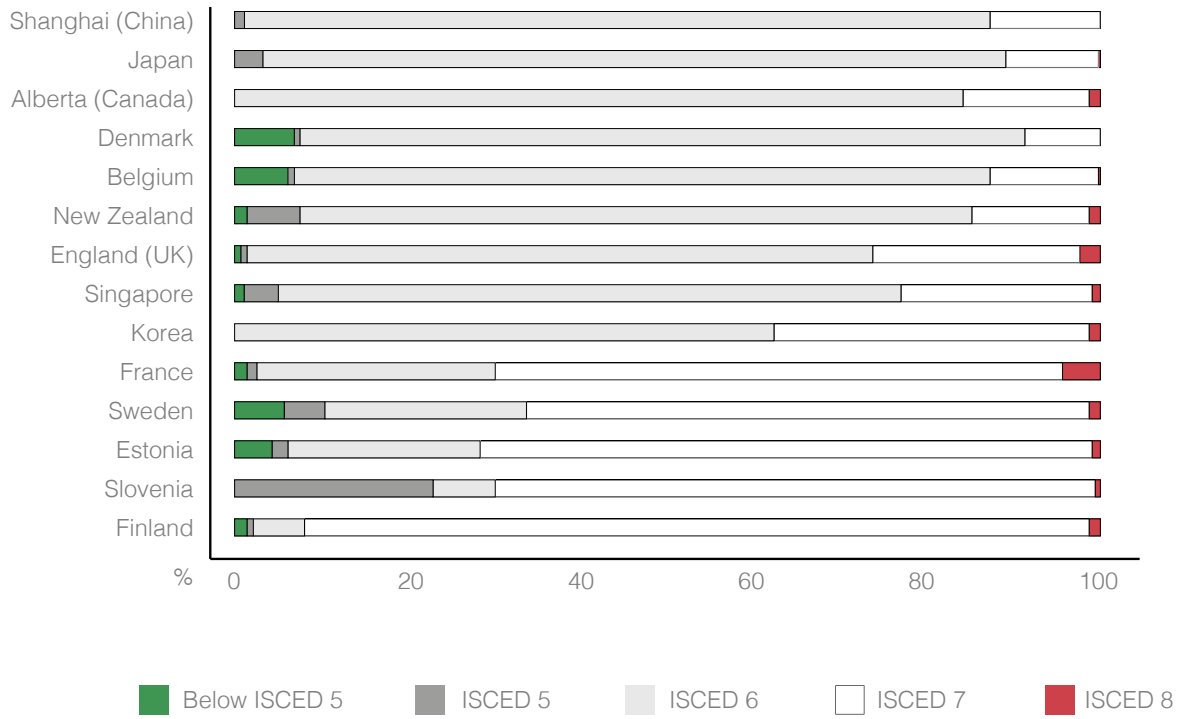
Table 3.2. Requirements for entry into the teaching profession in China and selected high-performing education systems, 2018

	Competitive examination required to enter pre-service teacher training	Mandatory teaching practicum	Competitive examination to enter the teaching profession	Duration of pre-service teacher training programme (in years)	Attainment level at the end of the teacher training programme (ISCED 2011)	Credential or license required to start teaching	Credential or license required to become a fully qualified teacher
B-J-S-G (China)	Yes	Yes	Yes	4	ISCED 6	Yes	Yes
England (United Kingdom)	No	Yes	x	4	ISCED 7	x	Yes
Estonia	No	Yes	x	5	ISCED 7	x	x
Finland	Yes	Yes	x	5	ISCED 7	x	x
Flemish Community Belgium	x	Yes	x	3	ISCED 6	x	x
Germany	..	Yes	x	6.5	ISCED 7	x	x
Japan	x	Yes	Yes	4	ISCED 6	Yes	x
Korea	Yes	Yes	Yes	4	ISCED 6	No	x
New Zealand	..	Yes	..	..	..	..	..
Singapore	No	Yes	No	1	ISCED 6	No	No
Slovenia	No	Yes	x	5	ISCED 7	x	Yes

Note: B-J-S-G = Beijing, Jiangsu, Shanghai and Guangzhou
x = Not applicable
.. = Not available
Source: OECD (2018[26]), *Effective Teacher Policies: Insights from PISA*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264301603-en.

In China, most teacher education programmes offer a four-year programme leading to a bachelor's degree. Further pursuit of a master's degree is not obligatory but is encouraged at the policy level. In the case of Shanghai, Most teachers hold a bachelor's degree, which is the case in many high-performing education systems. In countries like Finland, France and Korea, the majority of teachers completed a master's degree, which corresponds to a longer teacher-training track (five years) than found in other countries (Figure 3.11).

Figure 3.11. Teachers' highest education attainment in selected high-performing education systems, 2019



Note: Countries and economies are ranked in descending order of the percentage of lower secondary teachers whose highest level of formal education is ISCED 6.
Education categories are based on the International Standard Classification of Education (ISCED-2011).
ISCED 5 is a short-cycle tertiary education that may include a bachelor's degree in some countries.
ISCED 6 is a bachelor's or equivalent level.
ISCED 7 is a master's or equivalent level.
ISCED 8 is a doctoral or equivalent level.
Source: OECD (2019[30]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

» The extent to which teachers receive support in schools

Research has indicated that novice teachers in their first three years are more likely to leave the teaching profession, as they often encounter challenges in the classroom and have limited professional experience to address those challenges (Fantilli and McDougall, 2009[31]). Therefore, induction and mentoring opportunities are essential strategies for supporting new teachers to help them overcome difficulties in the transition period and preventing early dropouts from the teaching force.

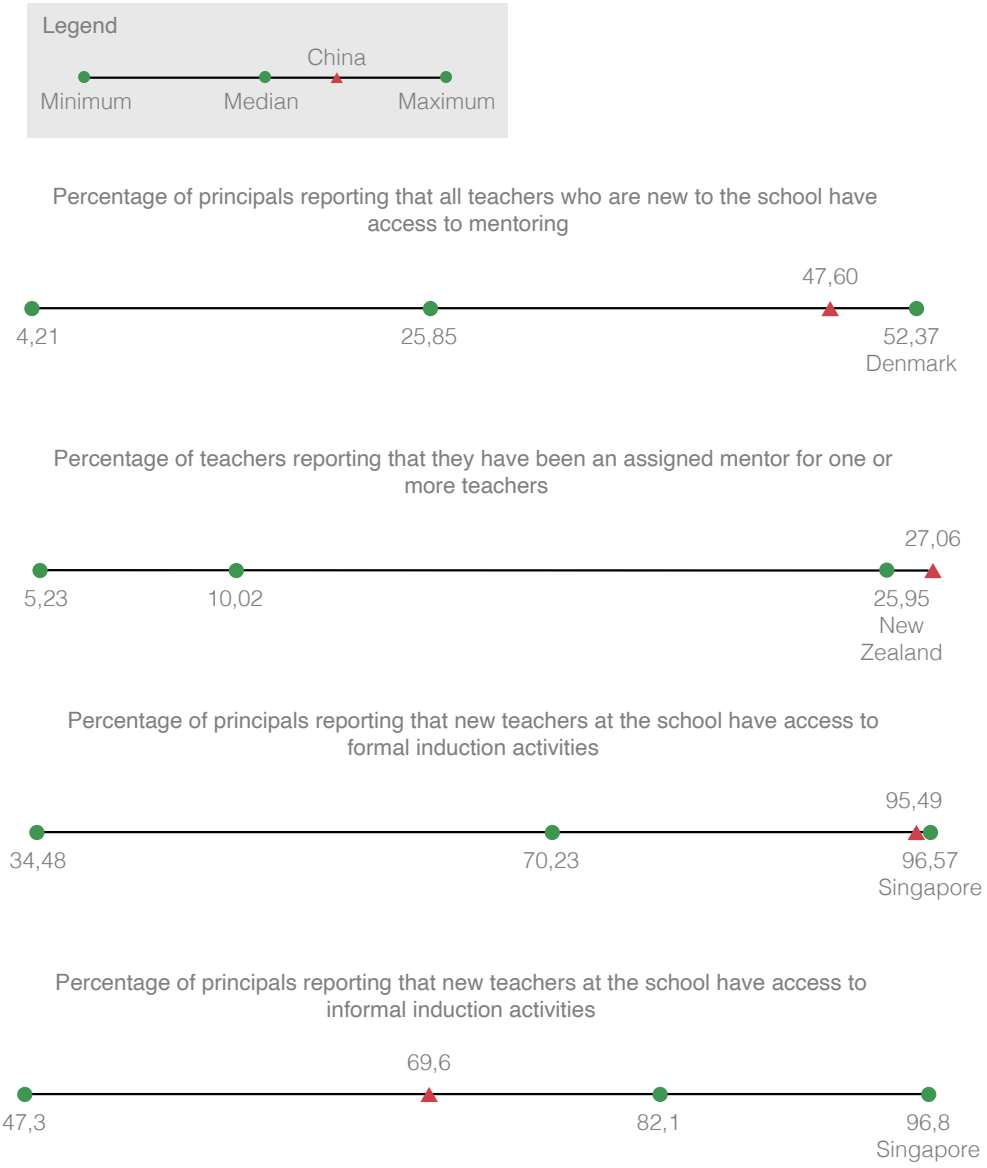
Shanghai schools provide strong support for their novice teachers. Nearly half of school leaders in Shanghai report that all new teachers have access to mentoring, which ranks high among other high-performing education systems (see Figure 3.12). Participating in mentoring activities is also positively related to teachers acting as a mentor for other peers (OECD, 2014[32]). A larger share of teachers has had experiences with being a mentor in Shanghai than in other high-performing education systems. Indeed, peer mentoring is a mentoring approach that is more widespread in Shanghai schools. Such a linkage between acting as a mentee and a mentor helps to create a reciprocal learning atmosphere among novice teachers and experienced teachers. This type of atmosphere is fundamental not only for novice teachers' success (Schmidt, 2008[33]) but also for the quality of the professional environment (Patrick et al., 2010[34]).

Formal induction programmes are also widely implemented in schools in Shanghai. Nearly all

schools offer formal induction programmes to their new teachers. However, informal induction activities are less prevalent. In many high-performing countries, the opposite case is true: informal induction activities are more common than formal induction activities. Singapore is the only high-performing country where schools tend to offer induction activities mixing both formal and informal components. Both formal and informal induction activities have advantages for supporting entrant teachers' development. In teachers' learning processes, formal learning and informal learning are found to complement each other, rather than be mutually exclusive (Richter et al., 2011[35]). Striking a balance between the two has the potential to deepen teachers' learning experiences and foster teachers' life-long learning.

Teachers who participate in induction activities tend to report higher self-efficacy and job satisfaction (OECD, 2019[30]), which are two important factors that matter to the quality of teaching practices. In the case of Shanghai, the induction activities provided to teachers in their first employment demonstrate a clear contribution to Shanghai teachers' self-efficacy and job satisfaction. The positive relationship between teachers' self-efficacy and teachers' participation in induction activities during their first employment in Shanghai is even stronger than the average level found among OECD countries.

Figure 3.12. Teacher participation in mentoring and induction in Shanghai, compared with participation in selected high-performing education systems

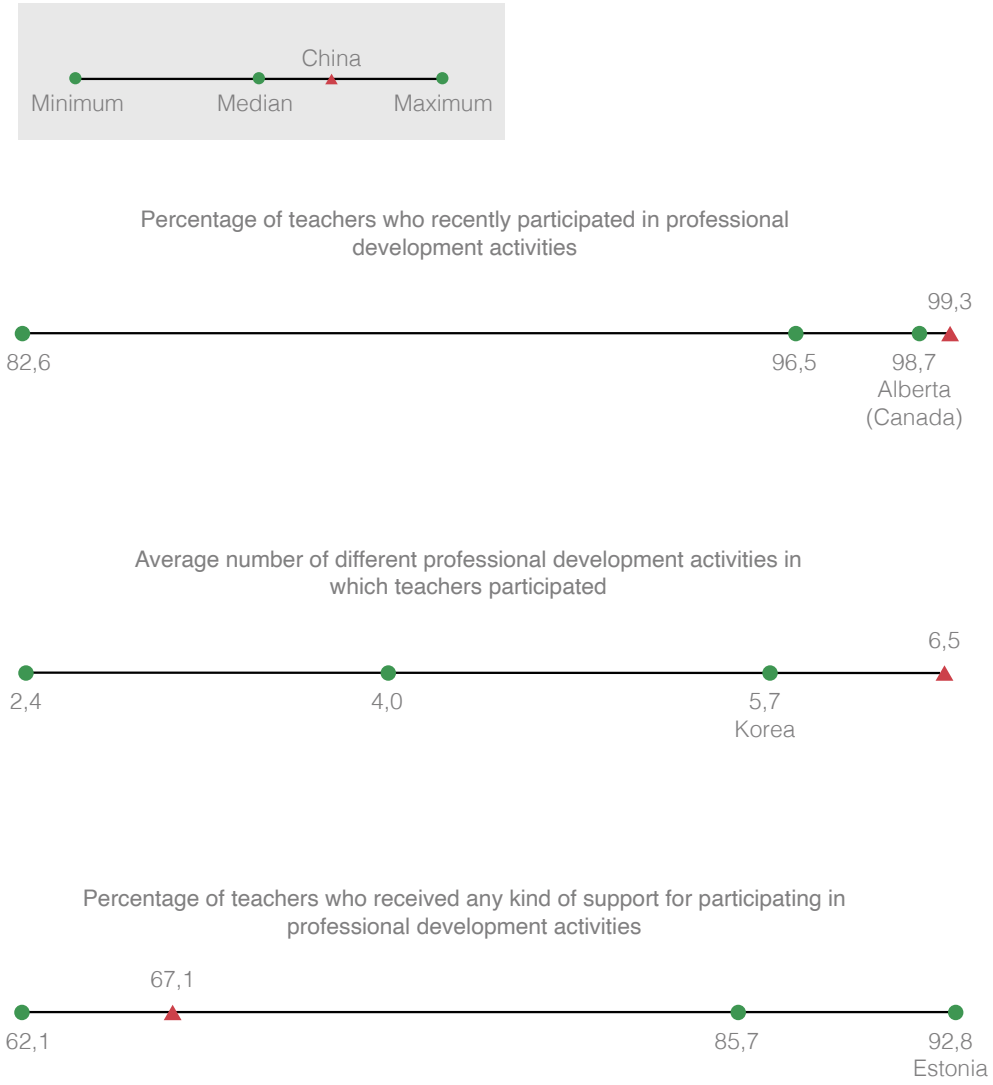


Note: China's data for this figure is limited to Shanghai only.
Source: Authors' own work, OECD (2019[30]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

» Participation in CPD is high, despite a comparatively low level of support received by teachers in Shanghai

As the knowledge and skills demanded by today's society is continually evolving, teachers need to update their professional competencies so they can fulfil the needs of today's students. Providing teachers with opportunities to participate in continuous professional development (CPD) can not only foster their lifelong learning but also improve their professional competency, leading to enhanced career development. The quality of a teaching force is directly related to the quality of available CPD opportunities. The TALIS survey shows that teachers, in general, value CPD opportunities, and those who have benefited from CPD have reported positive impacts on their teaching practices (OECD, 2019[30]).

Figure 3.13. Teacher participation in continuous professional development in Shanghai, compared with participation in selected high-performing education systems



Note: China's data for this figure is limited to Shanghai only.
Source: authors' own work, based on OECD (2019[30]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

In the case of Shanghai, nearly all teachers had recently participated in professional development (see Figure 3.13), making it one of the highest-ranking education systems in the TALIS survey. Across high-performing countries in PISA, it is common for teachers to participate in CPD, most of these countries are above the OECD average. Shanghai exceeds the OECD average by a large margin. Teachers in Shanghai have access to more diverse CPD opportunities than in any other

high-performing country. Averagely, teachers participate in at least six different professional development activities during a year (see Figure 3.13).

The training content of professional development activities shows the types of knowledge and skills teachers receive through these activities, which reflect the types of teaching competencies that teachers have developed or are yet to develop through CPD. Content-driven training is identified by teachers as an essential feature that contributes to an effective professional development activity (OECD, 2019[30]). In Shanghai, content-focused training is the CPD activity that attracts the most teacher participation. Content-focused training often focuses on improving teachers' content-related knowledge, such as understanding of a subject, subject-oriented pedagogical competence or curriculum knowledge. Content knowledge is a fundamental aspect of teachers' professionalism.

TALIS study shows that there is a positive correlation between teachers' participation in CPD and the support received by teachers for participation. However, this correlation is rather weak in the case of Shanghai. As shown in Figure 3.13, among the high-performing countries, the level of support that teachers receive is comparatively low. On the other hand, teachers' participation in CPD, and the average number of CPD types teachers received are the highest in Shanghai.

Shanghai teachers' participation in CPD tends to have a stronger association with job satisfaction than with the level of external support. Similarly, social utility motivations held by teachers also demonstrate a positive correlation with the number of CPD types in which teachers participate. Teachers who view teaching as a profession that allows them to contribute to social equity and society at large tend to participate in more CPD activities. This is a universal pattern shared by many OECD countries, including high-performing ones (OECD, 2019[30]).

» Teacher working conditions

Teacher working conditions can serve as an enabling or constraining factor that shapes not only the quality of teachers' teaching practices but also the quality of teachers' well-being. A policy review has suggested that improving working conditions tends to increase the attractiveness of the teaching profession (OECD, 2005[36]). In many high-performing countries in PISA, there is a higher percentage of teachers who regard working conditions as one of the important criteria when choosing the teaching profession. This is also linked to the higher social value placed on being a teacher in those countries.

» Class sizes are weakly associated with the quality of working conditions in Shanghai

The size of classes is associated with many factors that matter to the quality of teachers' working conditions. For instance, bigger classes can require teachers to give more attention and time to classroom management, student evaluation or providing individualised feedback to students. The PISA 2015 study found that teachers in smaller classes more commonly adapt their teaching to meet the needs of students (OECD, 2016[37]).

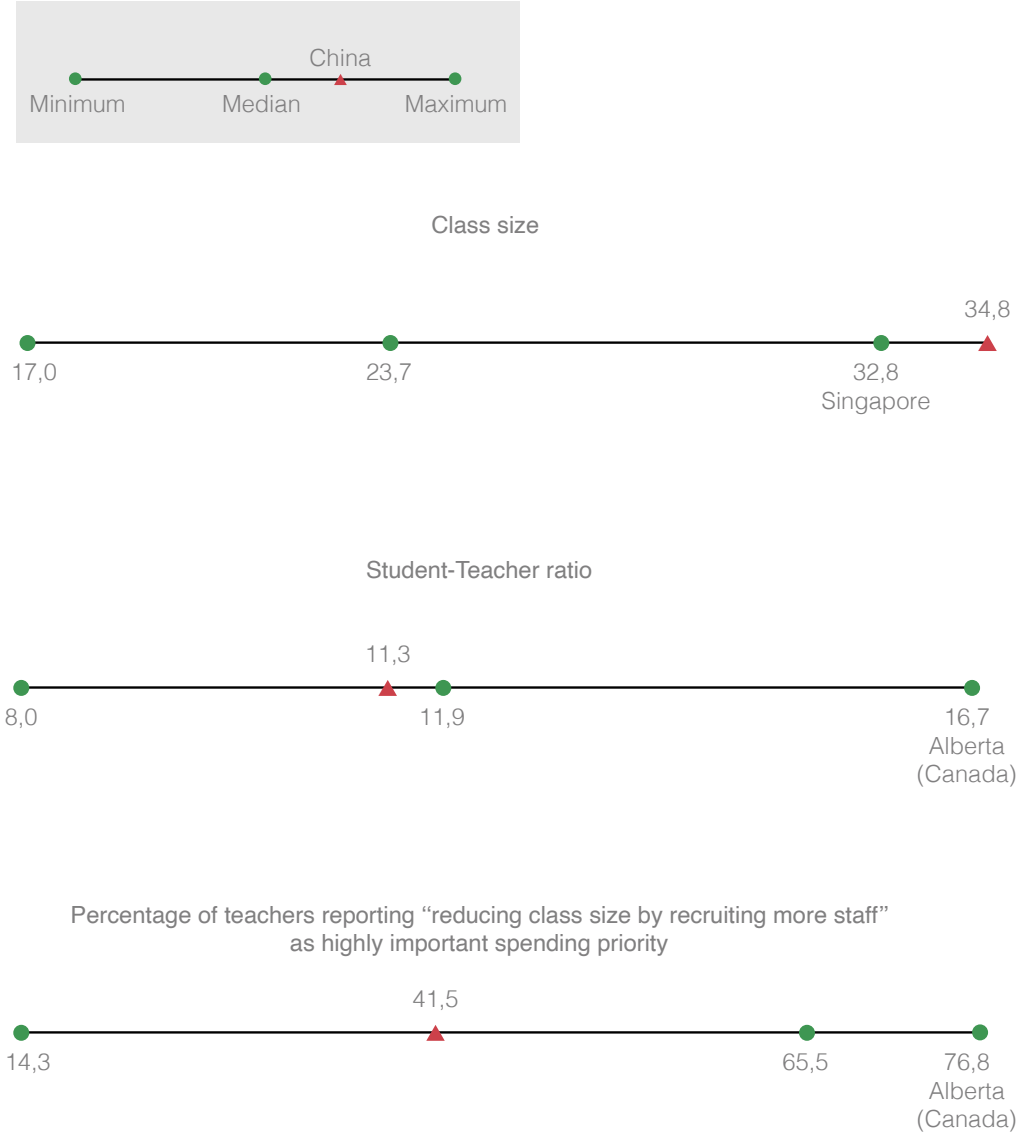
The number of students per class in Shanghai is significantly higher than the majority of the high-performing countries (Figure 3.14). PISA 2018 surveyed Beijing, Shanghai, Jiangsu and Zhejiang together, which found that the average class size of language instruction classes is 42 students, which is also significantly higher than the average level found in OECD countries (26 students) (OECD, 2019[38]).

TALIS reveals that teachers who teach in larger classes tend to devote less classroom time to actual teaching and learning (OECD, 2019[30]). However, this pattern is not evident in the case of Shanghai, where class sizes are relatively large, but teachers spend a high amount of time on teaching and learning. This suggests that large class size is not necessarily a barrier to quality teaching.

Teachers in Shanghai also do not view "reducing class sizes by hiring more staff" as a highly important spending priority for further intervention (see Figure 3.14). This suggests that Shanghai teachers themselves do not consider class sizes as a factor that constrains their daily work. The relatively lower student-teacher ratios in Shanghai may partially explain this phenomenon. Teachers may cope with larger class sizes in Shanghai, but the lower student-teacher ratio also suggests that more teachers can work together to distribute the teaching responsibilities in schools in Shanghai than in many other high-performing education systems.

The way teachers teach in a large class also matters to the quality of teaching and learning. Pedagogic practices such as dividing students into small groups or having multiple tutors in class can be effective ways to mitigate the negative effects of large class size on the quality of teaching and learning. In addition, teachers' professional and personal beliefs, motivations and attitude can also influence their perception of the quality of the working conditions. This topic requires more nuanced research in the future to fully understand.

Figure 3.14. Class size and student-teacher ratio in Shanghai, compared with class size and student-teacher ratio in selected high-performing education systems



Note: China's data for this figure is limited to Shanghai only.
Source: authors' own work, based on OECD (2019[30]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

» Teachers' working hours and satisfaction with salaries

Workload can reflect the quality of teachers' working lives. Heavy workloads can hinder teachers' choices to pursue other meaningful teaching-related activities, such as participating in professional development. For instance, around half of teachers across OECD countries report that schedule conflicts prevent them from participating in professional development (OECD, 2019[30]). More importantly, too much work can limit teachers' work-life balance, which may result in mental illness (Van Droogenbroeck, Spruyt and Vanroelen, 2014[39]).

Teachers in Shanghai work 45.3 hours a week on average (see Figure 3.15), higher than the average level of OECD countries. Teachers in many high-performing countries also work more than the OECD average (38.8 hours) (OECD, 2020[40]).

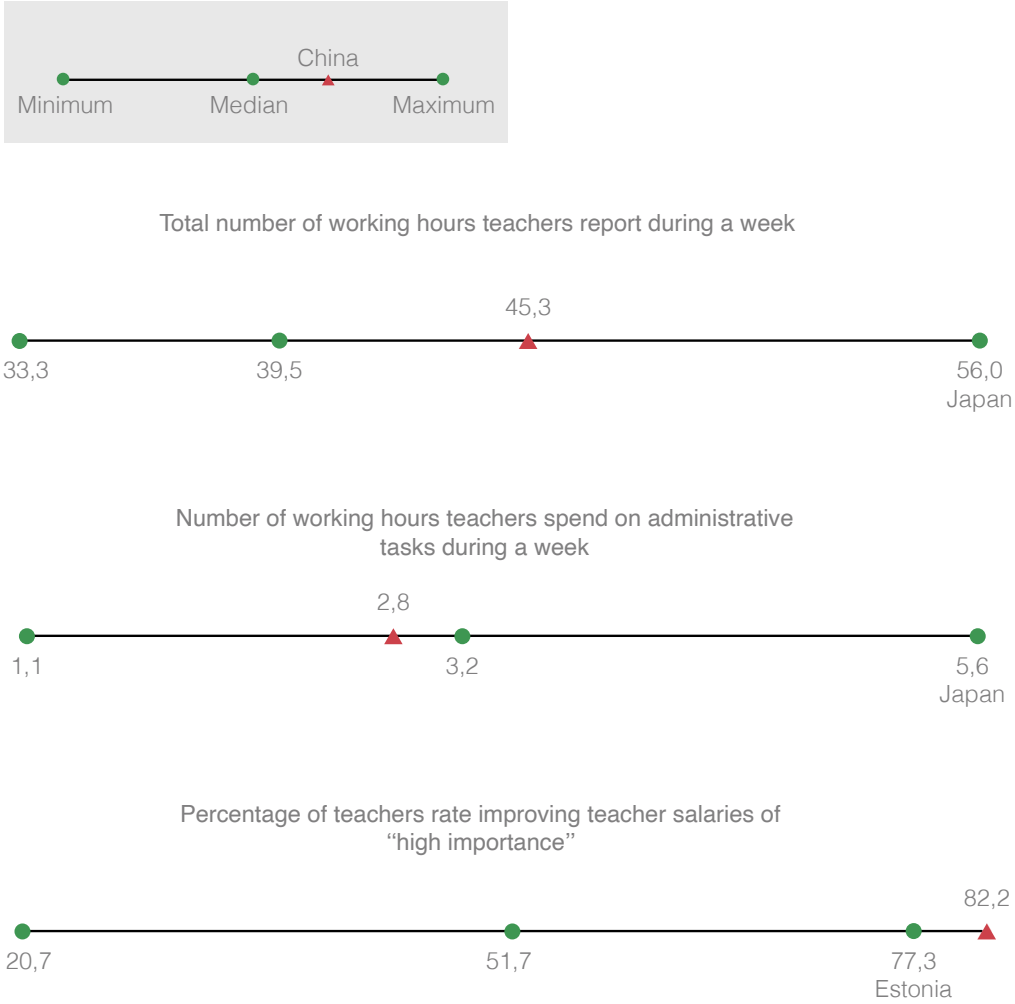
How teachers spend their working hours is also somewhat similar among the high-performing countries. Teachers from these countries tend to spend more time on teaching-related tasks, such as "teaching", "preparing/planning lessons" and "marking/correcting student work", and spend less time on administrative work. TALIS shows that teachers who spend many hours on administrative work are more likely to experience higher levels of stress than their peers who spend more time on teaching (OECD, 2020[40]). Compared to many high-performing countries, teachers in Shanghai spend relatively less time performing administrative tasks (see Figure 3.15).

Although Shanghai teachers' working hours are relatively high compared to other TALIS participants, Shanghai teachers did not consider "reducing administrative workload by hiring more support staff" a priority for intervention. In contrast, they tend to be more concerned about salary improvement than teachers in other OECD countries (see Figure 3.15). Compared to other high-performing education systems, there is a larger gap between teachers' working hours and their satisfaction with their current salaries.

Compensation is one of the key factors that attract and retain a highly qualified teaching force. Results from PISA 2012 showed that countries that tend to provide higher teacher salaries relative to their national income per capita perform slightly better in mathematics (OECD, 2013[41]). Globally, teachers' salaries have increased over the past few years. However, in many countries, teachers still earn less compared to other tertiary-educated workers and other similar educational workers (OECD, 2014[42]).

Regarding priorities for future education investment, teachers in Shanghai rated "improving teachers' salaries" of high importance in terms of devoting more educational investment. When comparing teachers by different types of institutions, public school teachers in Shanghai are more likely to report the need to improve teachers' salaries than their counterparts in private schools. In addition, teachers from schools with higher concentrations of students from disadvantaged backgrounds are more likely to report the need for salary improvement than schools with lower concentrations of disadvantaged students.

Figure 3.15. Teachers' working hours and satisfaction with their salaries in Shanghai, compared with those in selected high-performing education systems



Note: China's data for this figure is limited to Shanghai only.
Source: Adapted from OECD (2019[30]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

Infrastructure and ICT resources

School resources, including infrastructure, facilities, educational materials and technological equipment, are considered another important resource dimension that complements financial and human resources in supporting the functioning of an education system. The quality of these school resources influence not only student academic outcomes but also student and teacher personal development and well-being.

This section examines the material conditions in place in China's education system, mainly its school infrastructure, instructional materials, and information and communication technology (ICT) equipment. There is no universally recognised standard on the volume of resources that should be devoted to a school. However, practitioners' opinions on whether school resources facilitate or hinder teaching, learning or student overall development, can provide insights into the adequacy and quality of school resources in an education system.

» Socio-economic gaps exist in terms of physical infrastructure in schools

Physical infrastructure is one of a school's fundamental resources in that it provides teachers and students with the necessary shelter for teaching and learning to take place. The scope of physical infrastructures encompasses the physical buildings (at the very least) as well as other services essential for the functioning of the buildings, such as heating, cooling and lighting.

The TALIS 2018 survey asked school principals if a shortage of physical infrastructure hindered their school's capacity. Fewer school principals (17.6%) in Shanghai considered their schools' capacity hindered, compared with principals in OECD countries (25.5%) on average. PISA 2015 asked a similar question of principals in the four regions of Beijing, Shanghai, Jiangsu and Zhejiang (B-S-J-Z): around 12.9% reported that lack of physical infrastructure had hindered the delivery of instruction to a large degree.

Although schools disturbed by a shortage of physical infrastructure may account for a relatively low percentage, a noticeable gap remains between schools with advantaged economic conditions and schools without. Using school socio-economic profiles in PISA reveals that there are significant disparities between advantaged and disadvantaged schools in terms of principals' views on lack of physical infrastructure in B-S-J-Z (China). Socio-economically disadvantaged schools are more likely to report that lack of physical infrastructure hinders school capacity, compared to schools from socio-economically advantaged backgrounds. This issue may be linked to the larger class sizes and higher student-teacher ratios observed in socio-economically disadvantaged schools compared to those found in socio-economically advantaged schools in B-S-J-Z (China).

» ICT-related resources have not yet achieved universal access in China

With the prevalence of ICT-integrated teaching in today's classrooms, the adequacy of schools' ICT-related resources is one of the key enabling conditions that support modern teaching and learning processes. Lack of access to ICT equipment and the Internet can hinder innovative pedagogical activities, such as the flipped classroom, flexible learning, etc. At the same time, student learning experiences can be limited. If education systems want to make the best use of technologies, ensuring each school can access both the Internet and ICT devices is key.

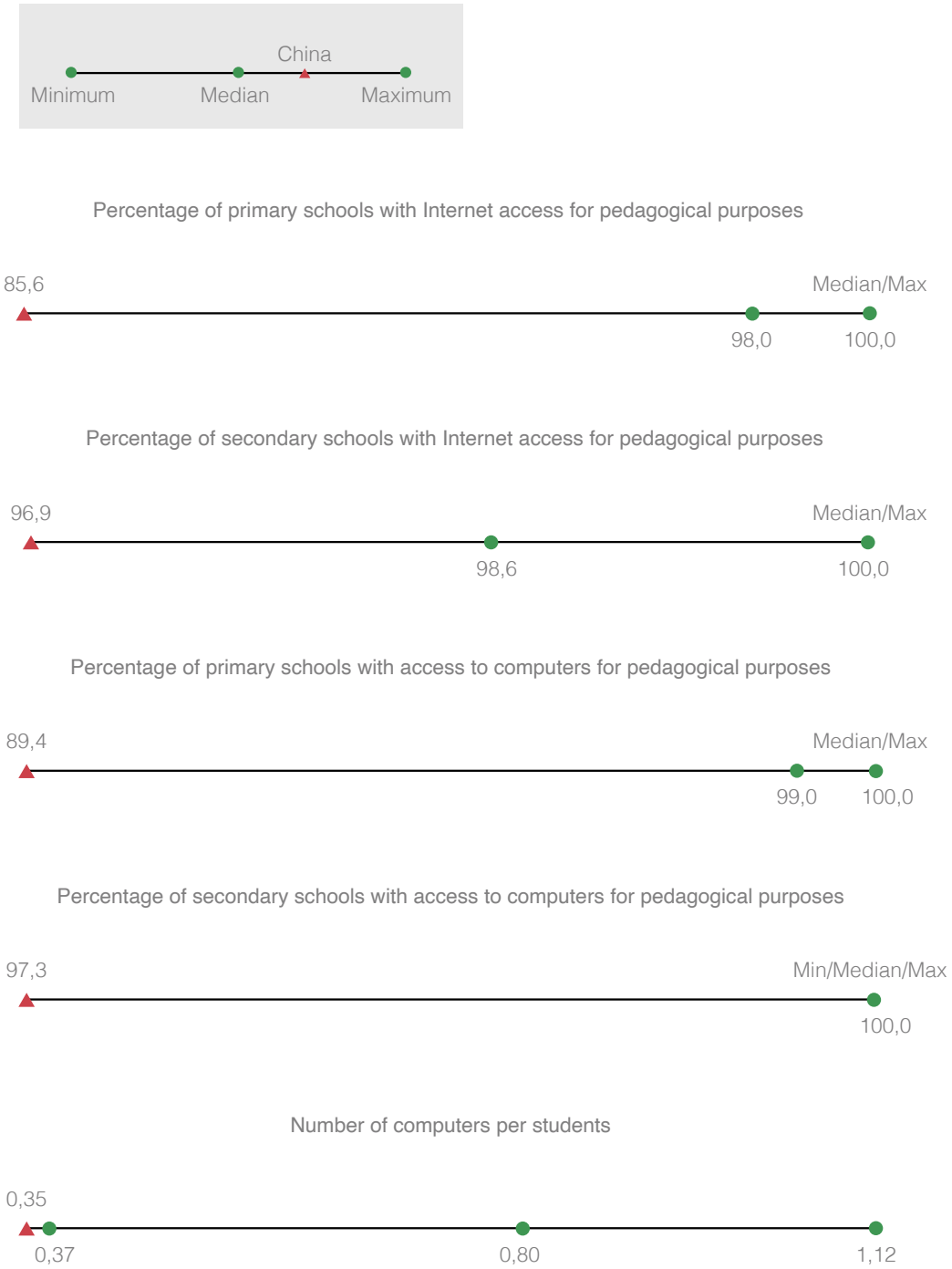
The percentage of schools (from primary to upper secondary level) that have Internet access for pedagogical purposes in China is lagging other high-performing education systems in PISA. Primary and secondary school access is at 85.6% and 96.9% respectively (see Figure 3.16). Similarly, in nearly all high-performing countries in PISA 2018, all schools report having universal access to computers for pedagogical purposes at educational levels ISCED 1-3. This is not the case in China: 89.4% of schools at primary level report access to computers for pedagogical purposes and 97.3% at secondary level report the same (see Figure 3.16).

Some regional samples from China participating in PISA yield similar results, which implies lagging ICT resources in Chinese schools. On average, around three students have to share one computer in schools in Beijing, Shanghai, Jiangsu and Zhejiang. The number of computers per student is more than double in high-performing countries in PISA (see Figure 3.16).

However, no direct evidence suggests that lagging ICT resources hamper schools' capacities in China. According to TALIS 2018, schools in Shanghai seem to be satisfied with their digital technology and Internet resources. Compared to the average level of OECD countries, where 24.6% of principals

reported a shortage of digital technology and 19.2% of principals reported insufficient Internet access hinder the schools' capacity, a lower percentage of principals in Shanghai reported so. On the other hand, the results of the regression analysis of PISA results show no strong statistical relation between the number of computers per student and student performance in science in Beijing, Shanghai, Jiangsu and Zhejiang (OECD, 2019[43]). One hypothesis may involve schools' and teachers' loose engagement with ICT resources, in which technology plays a limited role in shaping the teaching and learning process.

Figure 3.16. Access to ICT resources for pedagogical purposes in China, compared with access in selected high-performing education systems



Note: "Median/Max" means the median value and the maximum value are same.
China's data on "number of computers per student" is limited to Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Adapted from (OECD, 2019[43]), *PISA 2018 Results (Volume III): What School Life Means for Students' Lives*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/acd78851-en; UNESCO Institute for Statistics (2020[13]) Education (database) http://data.uis.unesco.org/

School climate

A safe and supportive school climate contributes to a fundamental aspect of a positive learning environment. For students, a healthy school climate will not only promote their learning outcomes but also have positive impacts on their well-being and self-esteem. For teachers, a positive school climate can enhance their job satisfaction and self-efficacy (Xiaofu and Qiwen, 2007[44]; Taylor and Tashakkori, 1995[45]), facilitate their physical and mental well-being and increase the attractiveness of the teaching profession (OECD, 2019[46]).

This section examines the school climate in China and focuses on the following aspects: school diversity, school safety, student-teacher relations, truancy and disciplinary climate. In each aspect, evidence from both student and teacher perspectives is articulated and analysed holistically to present a comprehensive understanding of the school climate in China's education systems.

» Classroom diversity is not prevalent in Shanghai, and schools lack teachers with experience teaching in linguistically and culturally diverse settings

Global mobilisation is developing at an unprecedented level, and student composition in today's classroom is more diverse than ever before. Diversity in the classroom can involve many aspects, such as students' ethnic and cultural diversity, students' social and economic diversity, as well as students' neurodiversity with different learning needs. School systems need to build learning environments that meet the learning needs of students with different characteristics. To achieve this, teachers need to obtain corresponding knowledge, skills, values and attitudes necessary for teaching in diverse settings (European Commission, 2013[47]).

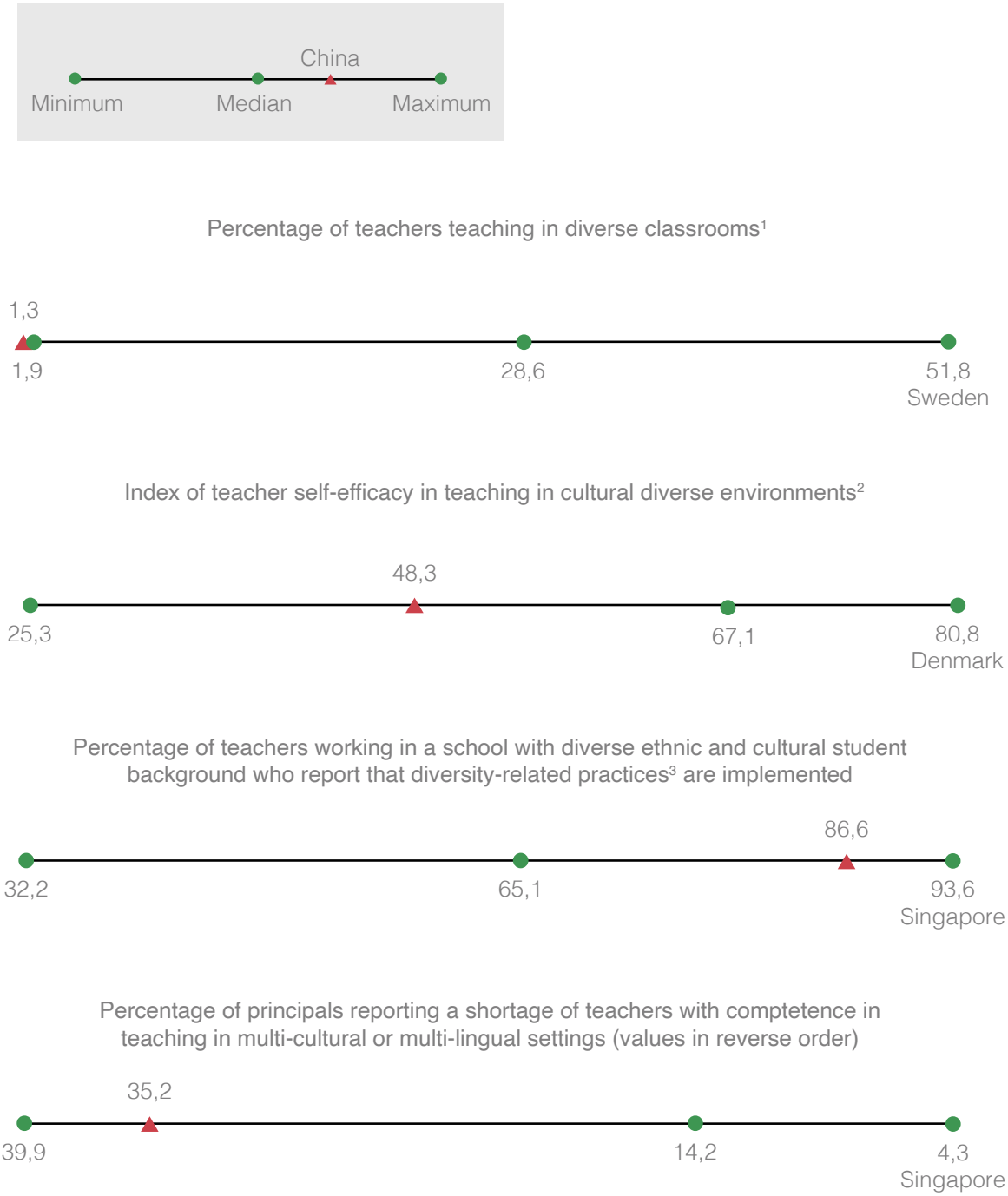
The TALIS 2018 survey collected information on teachers' instruction related to school diversity, involving students who speak different languages, are from different socio-economic backgrounds and/or students with special needs. Overall, compared to most participating countries and regions in the TALIS 2018 survey, a much smaller percentage of teachers in Shanghai teach in diverse classroom settings. Some 0.5% of teachers in Shanghai teach students who are not native speakers; 4.6% teach students from socio-economically disadvantaged backgrounds; and 1.3% teach special needs students. The percentage of teachers who teach special needs students is the only group to have slightly increased from 2013 to 2018 (OECD, 2019[30]).

Although only a small percentage of teachers in Shanghai actually teach in a diverse setting, the majority of these teachers report that their schools have implemented a range of practices to advocate for cultural diversity (see Figure 3.17). Such practices include organising cultural-diverse events, teaching how to deal with ethnic and cultural discrimination, integrating global issues into the curriculum and the like.

However, when teachers are asked about their self-efficacy in teaching in culturally diverse classes, less than half in Shanghai think they can do "quite a bit" or "a lot" to cope with the challenges of a diverse classroom. Overall, Shanghai teachers' self-efficacy in teaching in culturally diverse classes is lower than that found in high-performing countries in PISA as well as among OECD countries on average (see Figure 3.17). Likewise, based on principals' views in Shanghai, their teachers are less likely to hold beliefs about cultural diversity, compared to the average level found in OECD countries. This result is somewhat worrisome, as teachers' beliefs play an important role in shaping their thinking and instruction process, which then influences student learning.

Research shows that teachers' beliefs about diversity are positively linked to their exposure to diversity issues (Flores and Smith, 2009[48]). Given the shortage of teachers with competency to teach in multi-cultural and meta-linguistic settings as reported by Shanghai principals (see Figure 3.17), more professional development opportunities may need to be made available so teachers can gain authentic diversity experiences and construct their belief and self-efficacy regarding teaching in a diverse setting. Factors related to teachers' personal attitudes and values, student compositions, as well as the broader socio-economic factors, can also contribute to shaping teachers' responsiveness to teaching in a diverse setting. Effective policy interventions also need to consider these factors.

Figure 3.17. Teachers' teaching experience in diverse classrooms in Shanghai, compared with such experience in selected high-performing education systems



Note: China's data for this figure is limited to Shanghai only.
1. "diverse classroom» include schools with «more than 10% non-native speaking students", "more than10% of students have special needs", "more than 30% of students come from socio-economically disadvantaged homes", "more than 10% of students are immigrants or with a migrant background" and "at least 1% of students are refugees".
2. The index is calculated as the mean value of the percentage of teachers who feel capable to do the following practices: "cope with the challenges of a multicultural classroom", "adapt my teaching to the cultural diversity of students", "ensure that students with and without a migrant background work together", "raise awareness of cultural differences amongst students" and "reduce ethnic stereotyping amongst students".
3. "Diversity-related practices" include "supporting activities or organisations encouraging students' expression of diverse ethnic and cultural identities", "organising multicultural events", "teaching how to deal with ethnic and cultural discrimination", and "adopting teaching and learning practices that integrate global issues throughout the curriculum".
Source: Adapted from OECD (2019[30]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

» School bullying is rare in Chinese jurisdictions, but disparities exist between rural and urban areas, as well as between socio-economically advantaged students and disadvantaged students

The level of school safety directly concerns students' and teachers' physical and mental well-being. Issues around school safety can involve multiple dimensions, from the physical (e.g. safety of school infrastructures or school services) to social (e.g. student-student relations, student-teacher relations) to technology (e.g. cyberbullying). Information collected from school educators regarding safety issues along these dimensions can facilitate a better understanding of school safety from the eyes of practitioners.

Nearly no safety-related incidents happen on a weekly basis in schools in Shanghai, according to principals' reports in the TALIS 2018 survey. They reported 0.7% for "vandalism and theft" and 0.0% for each of the following categories: "physical injuries caused by violence among students"; "intimidation or verbal abuse of teachers or staff"; "possession/use of drugs and alcohol"; "harmful information on the Internet about students". However, concerning technology-related safety, "unwanted electronic contact among students" (1%), e.g. bullying on line or via texts, seems to be more frequent in Shanghai's schools compared to other phenomena.

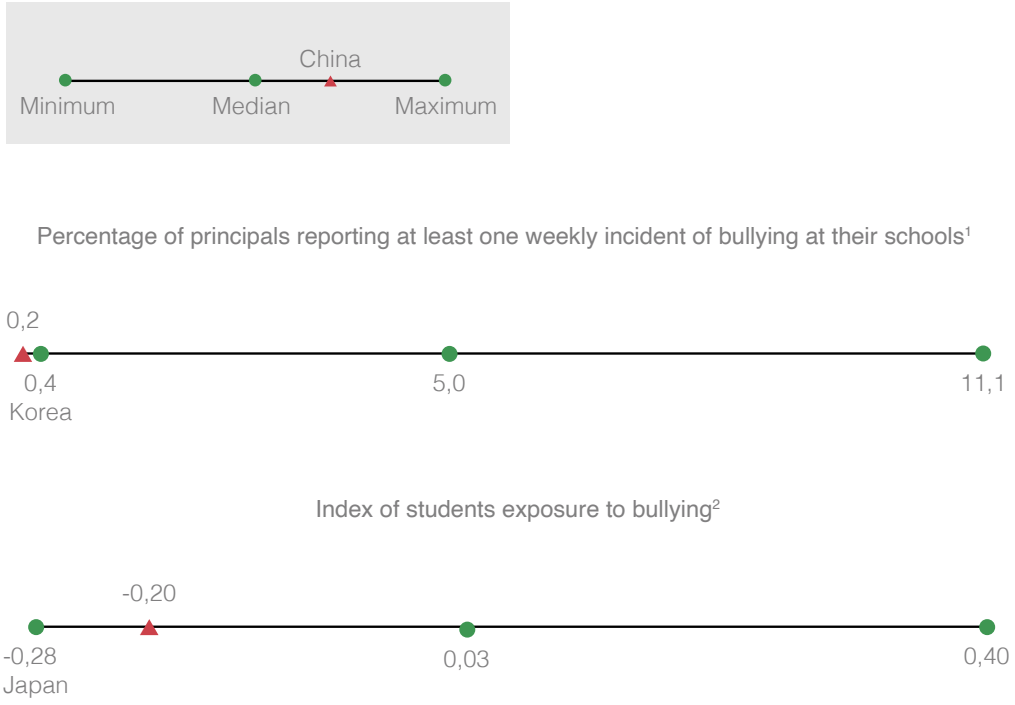
Students' exposure to bullying at school can have severe physical and mental consequences for their lifelong development. How to minimise bullying at school is a key area of concern for policy makers, school educators and parents across the world. PISA 2018 collected information regarding bullying at school from the student perspective, which reveals the actual level of bullying at school experienced by students. It found that students who experience bullying on a monthly basis tend to score 21 points lower in reading than their counterparts who report less exposure to bullying. Meanwhile, students who are being frequently bullied tend to report lower life satisfaction, more fragile emotional well-being and a lower sense of belonging compared to students who are less exposed to bullying (OECD, 2019[43]).

Across OECD countries, "intimidation or bullying among students" tends to be the most frequent safety-related incident happening in schools. Some high-performing countries in PISA 2018, like Finland and New Zealand, have an even higher frequency of intimidation or bullying among students in their schools. In Shanghai, this phenomenon is rather rare. PISA 2018 yields similar results from the student perspective. Less than 5% of students in Beijing, Shanghai, Jiangsu and Zhejiang reported that they were frequently bullied at school, much lower than OECD average and the majority of selected high-performing education systems (see Figure 3.18).

Verbal bullying ("other students make fun of me") and physical bullying ("other students took away and destroyed things that belong to me") are more prevalent than other types of bullying-related behaviours (including relationship bullying) in schools in Beijing, Shanghai, Jiangsu and Zhejiang.

Rural schools tend to see a higher prevalence of bullying than urban schools in Beijing, Shanghai, Jiangsu and Zhejiang. The disparities between urban and rural schools are significant, and above the OECD average. Similar patterns are also observed between socio-economically advantaged and disadvantaged students. It is more prevalent for socio-economically disadvantaged students to be exposed to bullying on a monthly basis than socio-economically advantaged students. For Beijing, Shanghai, Jiangsu and Zhejiang, the socio-economic disparity in the percentage of students who experienced bullying at least a few times a month is higher than the average among OECD countries.

Figure 3.18. Bullying at school in China, compared with bullying at school in selected high-performing education systems



Note: 1. Data are limited to Shanghai. 2. Data are limited to four Chinese regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Adapted from OECD (2019[43]), *PISA 2018 Results (Volume III): What School Life Means for Students' Lives*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/acd78851-en and OECD (2019[30]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

» Teachers who support students tends to be a common feature of all high-performing education systems in PISA

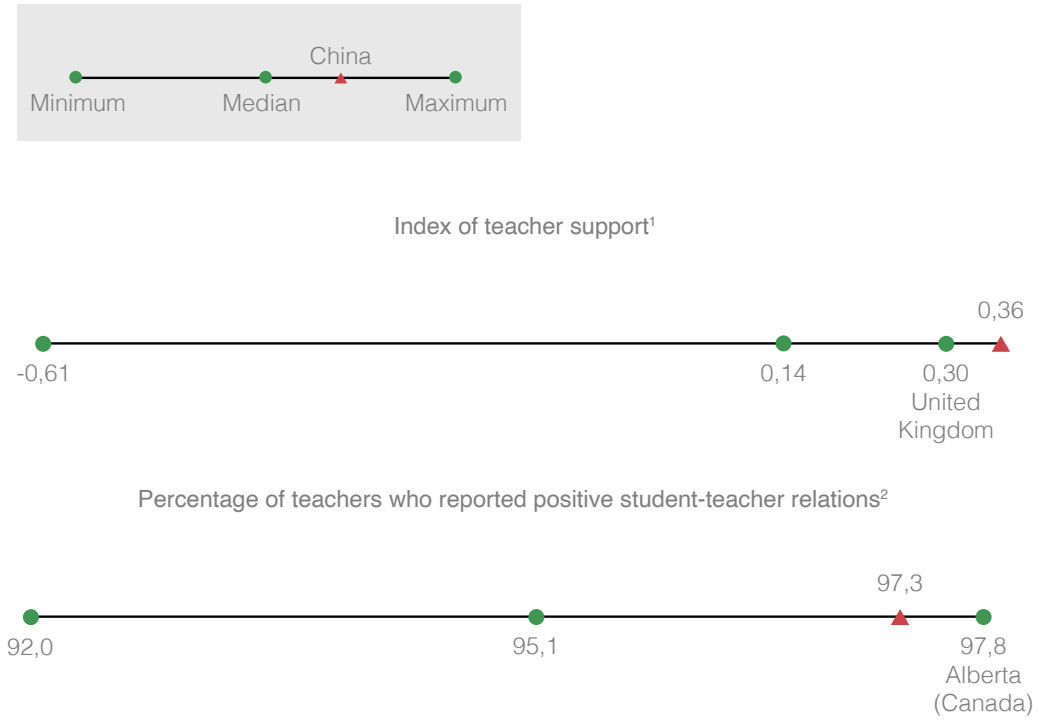
A positive student-teacher relationship is a cornerstone for a trust-oriented and supportive learning environment. As school-aged children are likely to spend more time in schools with their teachers than with their parents, teachers play a key role in supporting not only student learning but more importantly, their mental and physical well-being. A trust-oriented and supportive student-teacher relationship encourages students to seek help from teachers when they encounter intimidation, bullying and other difficulties (Konishi et al., 2010[49]).

All high-performing countries in PISA demonstrate strong, positive student-teacher relations in their schools. The index of teacher support provided to students in high-performing countries exceeds the OECD average. Chinese jurisdictions demonstrated the highest teacher support index when compared with all other high-performing countries in PISA (see Figure 3.19). TALIS 2018 results are consistent with this finding as well. In the vast majority of the high-performing countries in PISA, the share of teachers who hold positive opinions of student-teacher relations are noticeably higher than the OECD average.

Most Shanghai teachers reported that teachers and students often get along well with each other (see Figure 3.19). Likewise, the majority of Shanghai teachers value student well-being and are interested in what students have to say. If students need extra assistance, most teachers believe that the schools provide it.

It is also worth noting that Shanghai teachers commonly hold positive attitudes towards their relations with colleagues; they feel that they can rely on each other. The share of teachers who felt this way in Shanghai is significantly higher than teachers found in all other high-performing education systems.

Figure 3.19. Student-teacher relations in China, compared with student-teacher relations in selected high-performing education systems



Note: 1 Data are limited to four Chinese regions: Beijing, Shanghai, Jiangsu and Zhejiang.
2 Data are limited to Shanghai.
"Teacher support" includes "the teacher shows an interest in every student's learning", " the teacher gives extra help when students need it", "The teacher helps students with their learning" and "The teacher continues teaching until students understand".
Source: Adapted from OECD (2019[43]), *PISA 2018 Results (Volume III): What School Life Means for Students' Lives*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/acd78851-en. *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

» Disciplinary climate is of high quality in Chinese jurisdictions

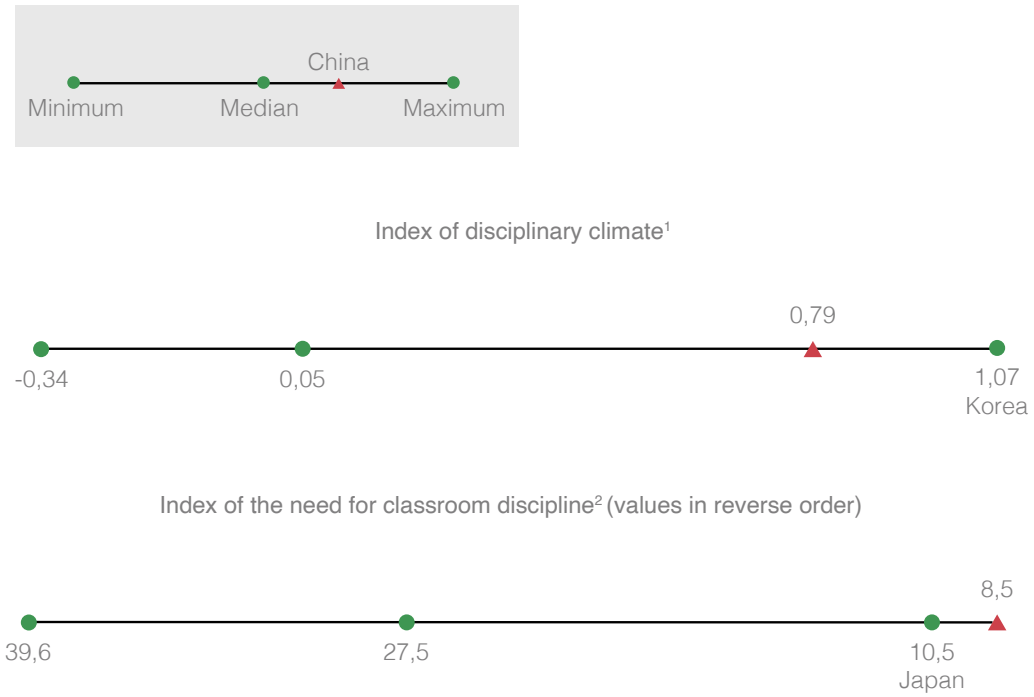
The quality of teachers' instruction is largely influenced by the disciplinary climate in the classroom, which in turn shapes the quality of student learning experiences. Classrooms with frequent disruptions tend to reduce teachers' instruction time and distract teachers from their intended instruction plans (Rivkin and Schiman, 2015[50]). Building a disciplinary climate in the classroom means promoting a pleasant learning environment where teachers and students are actively engaging in the teaching and learning process.

Classroom discipline is of high quality in Shanghai, according to its lower secondary teachers. Nearly most teachers in Shanghai schools think students work to create a pleasant learning atmosphere in their classes, which is significantly higher than in most high-performing PISA countries and among OECD countries, on average (see Figure 3.20). A further regression analysis suggested that the quality of classroom discipline in Shanghai's schools is negatively associated to the share of students with behaviour problems. Teachers' gender and years of experience appear to be the two most vital factors that influence the quality of class discipline in Shanghai schools. Both female and novice teachers tend to report a greater lack of discipline in their classrooms. Targeted training support may need to be provided to these two groups of teachers to support them in managing classroom discipline more effectively.

PISA 2018 also surveyed students regarding the disciplinary climate in language-of-instruction lessons. Data from Shanghai, Beijing, Jiangsu, and Zhejiang – were collected and analysed as a whole. The data indicate that nearly one in three students across OECD countries do not listen to their teachers, or there is noise and disorder in every, or most, lessons. In Beijing, Shanghai, Jiangsu, and Zhejiang, the share of students who reported similar issues is much lower compared to the OECD average.

Disciplinary climates vary between socio-economically advantaged and disadvantaged schools in B-S-J-Z (China). The disciplinary climate is, in general, better in socio-economically advantaged schools in B-S-J-Z (China). Similarly, students with advantaged socio-economic status tend to report a better disciplinary climate than their disadvantaged peers. This gap is much wider compared to all other countries that performed well in PISA.

Figure 3.20. Disciplinary climate in China's classrooms, compared with disciplinary climate in selected high-performing education systems



Note: 1. Data are limited to four Chinese regions: Beijing, Shanghai, Jiangsu and Zhejiang. Higher values in this index indicate a more positive disciplinary climate.
2. Data are limited to Shanghai. Higher values in this index indicate a higher need for classroom discipline.
Source: Authors' own work, based on OECD (2019[43]), *PISA 2018 Results (Volume III): What School Life Means for Students' Lives*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/acd78851-en;

» Truancy is rare in Chinese schools; however, students who attend socio-economically disadvantaged schools tend to skip classes more often than their peers in advantaged schools

Student truancy can result in many unwanted consequences that matter to student academic and overall well-being and development. Those unwanted consequences may include lower academic achievement, unwanted pregnancies and drugs and alcohol abuse (Aucejo and Romano, 2016[51]); (Hallfors et al., 2002[52]); (Henry and Huizinga, 2007[53]). Evidence on student truancy can provide effective insights into a wider range of quality factors associated with student truancy, reflecting the quality of the overall learning environment. The factors that contribute to student truancy, for instance, can be students' sense of belonging, student engagement in school learning or student relationships with peers and teachers.

The PISA 2018 results revealed that education systems with higher average reading performance tend to have fewer students who skipped a whole day of school. These systems include Beijing, Shanghai, Jiangsu and Zhejiang (B-S-J-Z) and other overall high-performing PISA countries like Estonia, Finland, Japan, Korea, Singapore and Sweden. In B-S-J-Z (China), nearly all students had never skipped a whole day of school, which is the highest percentage of students compared to students in all other high-performing PISA countries. This pattern also can also be observed in the share of students skipping classes or arriving late at school.

Despite a low frequency of student truancy behaviour, differences can still be observed between the socio-economic profiles of schools in B-S-J-Z (China). Students from socio-economically advantaged schools are less likely to skip a whole school day than their peers in socio-economically disadvantaged schools. A further regression analysis indicates that, compared to other possible indicators, such as student reading performance, sense of belonging, the value of school and disciplinary climate, student exposure to bullying is the most significant factor to influence the likelihood of student truancy (defined as skipping a whole day of school) in Beijing, Shanghai, Jiangsu and Zhejiang.

Note: 1 Data on expenditure per student is retrieved from Ministry of Education of China in yuan (CHY) and converted into equivalent USD by dividing CHY by the purchasing power parity (PPP) of the year 2016.

NOTE:

1 **Data on expenditure per student is retrieved from Ministry of Education of China in yuan (CNY) and converted into equivalent USD by dividing CNY by the purchasing power parity (PPP) of the year 2016.**

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Chapter 4

Curriculum and Pedagogy

This chapter discusses the typical teaching and learning practices in Chinese education systems, paying particular attention to the positive links between practices and student outcomes. This chapter also examines some key features of China's national curriculum and discusses its relevance with regard to preparing its students for the future.

Trends emerging in the 21st century are requiring our education systems to adapt to meet the evolving needs of today's knowledge-driven society. As a curriculum sets the content that students learn, today's curricula also require regular updating to make learning more relevant. To be aligned with the needs of today's world, curricula should be crafted in such a way that it provides students with updated competencies that can help them thrive in an uncertain future.

To achieve this, a curriculum needs to foster student development across a wide range of future-oriented competencies, including but not limited to, digital skills, social and emotional skills and financial literacy. What is more, while focusing on core competencies, a curriculum should take a step further, to foster students' transformative competencies. Transformative competencies are skills that empower students to actively transform society and shape the future.

Theory, however, is not practice. Teaching and learning practices are decisive factors in translating what is envisaged in a curriculum to what students learn. Education systems thus need information about successful, evidence-based teaching and learning practices – and to implement them – to be fully effective.

This chapter looks at the education system in the People's Republic of China (hereafter "China") from two perspectives: curriculum and pedagogy. The first section focuses on China's curriculum. As there are currently no international benchmarking studies analysing China's curriculum, this section provides exclusive information. In addition, this chapter explores the relevance of China's curriculum in view of preparing its students to be future-ready. The second section examines the ways that teachers teach and students learn in classrooms in China, based on available data. It also takes a look at some distinctive features of China's teaching and learning practices, as found when comparing its education system with other high-performing education systems.

Developing a curriculum framework that renders students future-ready

A curriculum framework, as a clear set of definable standards, defines the content that students need to learn, and should be aligned with society's social and economic development needs. As students acquire knowledge and skills through a curriculum, a curriculum sets out what students are expected to know and be able to do, which to some extent reflects a country's social and economic priorities.

A curriculum framework is often considered a key part of standards-based education design, which not only focuses on content delivery but on the standards that every student should achieve. Curriculum standards are central to student assessment, but their purpose would be distorted if they were built only to produce skilled test-takers or high-scorers, rather than also cultivating citizens who think and act with intelligence (OECD, 1998[1]). As a high-performing education system is dedicated to preparing its students for thriving in the future, the curriculum framework should encompass a wide range of competencies necessary and fundamental for students' lifelong development.

» 21st-century competencies

There is growing consensus that 21st-century competence is more than the acquisition of knowledge and skills. Dewey (1958[2]) suggested that education has no end beyond itself; it is its own end. The learning process is the essential part of human development that concerns the growth of the mind over a lifetime. However, while the acquisition of knowledge and skills is necessary, what is considered increasingly important for 21st-century learners is the use and co-ordination of knowledge and skills in coherence with attitudes and values to solve real-life problems and meet complex demands in work and life.

Broadly speaking, there is universal consensus that defines competence as a dynamic integration of knowledge, skills, attitude and values (Rychen and Salganik, 2003[3]). When developing a future-oriented curriculum, the fundamental question is what knowledge, skills, attitude and values should be prioritised and are most relevant for today's learners and societies. Several OECD projects have collected evidence from researchers, policy makers, educators and students to identify the core competencies that are highly relevant for the future. They include, but are not limited, to:

- **cognitive skills, including digital literacy and data literacy**
- **social and emotional skills and awareness, including morality and ethics**
- **health awareness, including physical and mental health and well-being**
- **financial literacy**
- **transformative competencies derived from the foundations above:**
  - creating new values
  - reconciling tension and dilemmas
  - taking responsibility (OECD, 2019[4])

The core competencies required in the 21st century are likely to be much broader than those listed above. This section primarily discusses China's curriculum with regard to how it encourages student development in the above future-relevant competencies only. Due to limited data sources, the curriculum framework and polices reviewed in this section mainly cover those at the compulsory education levels.

» China's curriculum

China centralised the design and regulation of its national curriculum until 1988. The situation began to change from 1988 when China's Ministry of Education started to encourage diverse provision of textbooks based on the national curriculum framework. Since 1988, there have been many reform efforts carried out by the central government to improve its curriculum framework. The general trend in this reform process has been to shift the responsibility from the state towards lower-level authorities. Currently, the management of the curriculum typically involves three levels: the country, regional and school levels. The three levels share responsibility for developing curricula suitable for each local context.

Since the beginning of this century, there have been two notable curriculum reforms carried out by the central government. One is the Basic Education Curriculum Reform initiated in 2001 (Ministry of Education, 2001[5]). The other concerns the National Medium- and Long-term Educational Reform (2010-20) published by China's State Council in 2010 (State Council, 2010[6]). The curriculum reforms have promoted the shift from focusing on student academic development to student comprehensive development; from a knowledge-based curriculum framework to a competency-based one.

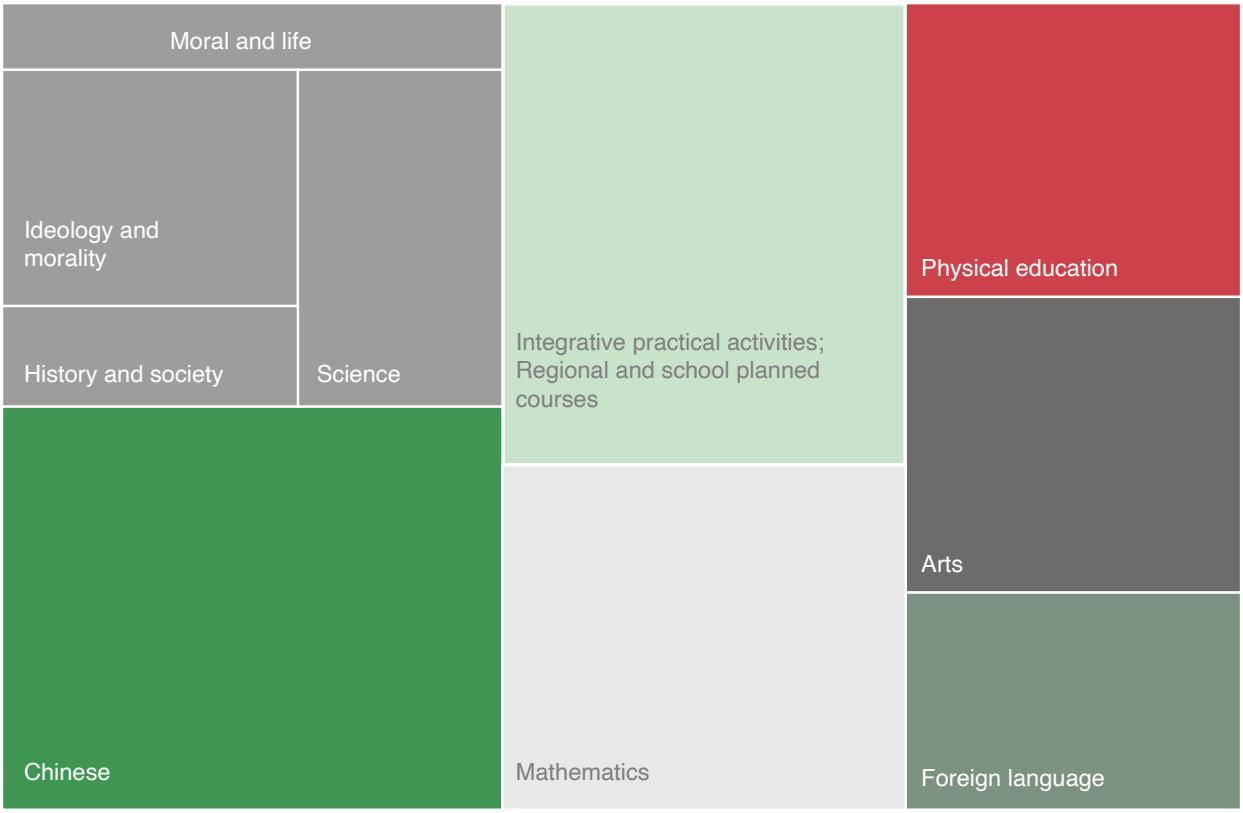
» Curriculum provision for compulsory education

The curriculum framework for compulsory education should lay a solid foundation for students' lifelong, sustainable and comprehensive development.

In China, courses from ISCED 1 to ISCED 2 mainly

comprise Chinese, mathematics, foreign language, morality, arts and integrative practical activities, according to the "Experiment plan of compulsory education curriculum provision" (Ministry of Education, 2001[7]) (see Figure 4.1). The curriculum also leaves room for local authorities and schools to implement other courses suitable for the local context.

Figure 4.1. Curriculum provision in ISCED 1 and ISCED 2 in China



Note: The proportion of time each subject takes up in the curriculum is ranked first from left to right, then from top to bottom. "Moral and life" is a broad subject category consisting of three sub-courses. It is replaced by "Ideology and morality" and "History and society", starting from the 7th grade. Courses in Science and English start from the 3rd grade. "Integrative practical activities" mainly include information and communication technology (ICT) courses, research-based learning, community service, labour and technical education.
Source: Authors' own work, based on Ministry of Education (2001[7]), *教育部关于印发《义务教育课程设置实验方案》的通知(Notification about the issuance of "The experiment plan of compulsory education curriculum provision")*, http://old.moe.gov.cn//publicfiles/business/htmlfiles/moe/moe_711/201006/xxgk_88602.html.

As part of the global movement towards competence-based education in recent decades, China has initiated efforts to enhance its curriculum towards building student "core competencies" (State Council, 2016[8]). Researchers, educators and policy makers identified a list of core-competencies that curricula should foster. The core competencies revolve around three dimensions: cultural foundation; autonomous development; and social participation. Many of the competencies listed as core competencies are in line with the international discourse around 21st century competencies. The key categories of core competencies is presented as follows:

- **Cultural foundation**
  - Humanistic quality
  - Scientific spirit
- **Autonomous development**
  - Learn how to learn
  - Live a healthy life
- **Social participation**
  - Take social responsibility
  - Competence in innovation and practice

To guide the curriculum reform, the core competencies are further broken down into several key constructs, which are integrated as the basis of the teaching objectives for each discipline.

» How can China create a curriculum that prepares its students for the future?

Raising digital literacy and data literacy

Given the fact that digitalisation is penetrating nearly every aspect of human life in the developed world, there is an emerging need to develop students' digital literacy and data literacy. Digital literacy is defined as the ability to find, evaluate and organise information in a digital context, and draws on digital tools and competencies. Data literacy refers to an individual's ability to read, work with, analyse and dispute data. Both digital literacy and data literacy are new facets

of "traditional" literacy, requiring today's curriculum frameworks to make corresponding changes to improve these two "modern" literacies among students.

According to the National Medium- and Long-term Educational Reform (2010-20) (State Council, 2010[6]), China's curricula are required to respond to the changes brought by information and communication technologies (ICTs) and the curriculum content should be updated accordingly. As indicated in Figure 4.1, ICT is one of the subjects under the scheme of integrative practical activities, which together with other integrative activities, account for 16-20% of total classes in the Chinese compulsory education curriculum.

It is difficult to judge whether China's integrative curriculum approach can foster student digital literacy effectively, given limited information and data. However, results from the Programme for International Student Assessment (PISA) 2018, which surveyed the amount of computer resources in four Chinese provinces, shows that computer availability in China's schools is relatively low compared to the average level of OECD countries (see Chapter 2). This result may hinder the quality of ICT courses in China's curriculum.

Data literacy seems to receive less attention compared to digital literacy and other traditional literacies in the Chinese curriculum framework. There is little curriculum policy at the national level that explicitly mentions the need to develop student data literacy. However, the curriculum standard of mathematics suggests that mathematics as an independent subject has covered some content of data literacy, including data collection and data analysis (Ministry of Education, 2012[9]). As data literacy is more than just collecting and analysing data, more content that targets raising students' data literacy is needed to further enhance the current Chinese compulsory education curriculum.

Developing students' social and emotional skills

Students' social and emotional skills are directly associated with their capacity to collaborate, perform tasks, regulate their emotions, have an open mind and engage with others (Chernyshenko, Kankaraš and Drasgow, 2018[10]). Morality and ethical values are closely connected to social and emotional skills, as having strong morals guides individuals to utilise their social and emotional skills to think and act in accordance with what they consider to be morally or ethically justified. It is essential for future citizens to not only think critically and act responsibly when it comes to applying emerging digital and biological technologies but to avoid risky behaviours (e.g. cyber-crime, illegal genetic engineering).

China's new curriculum reform has prioritised moral education, in which student social and emotional competence is a key component. "Morality" is designed as an independent subject and is obligatory for every student. This subject takes up 7-9% of students' total learning hours and plays a key role in building the basis for their social and emotional skills. A key characteristic of this subject is that it adopts a broad sense of "morality": it tends to integrate social and emotional skills with a moral and ethical foundation, together as an aggregated subject. However, it is unclear how much social and emotional skills-related content is included in the moral and ethical education.

Typically, social and emotional skills can be taught either as a stand-alone subject or as cross-curriculum content infused into a school curriculum. A stand-alone subject on social and emotional skills has its advantages: comprehensive content can be created for it, and students can enjoy dedicated time and resources on the subject. However, a stand-alone course can risk crowding a curriculum and increasing student academic burden. Infusing social and emotional learning content into a wide range of curricular activities is another way to deliver such content, as observed in several OECD country education systems (e.g. Japan). From communication with Chinese educators, we were told that in China, student social and emotional skills are taught not only through stand-alone subjects, but also integrated in other subjects, school activities and events. Box 3.4.1 presents a recent initiative of promoting social and emotional skills in Chinese schools.

Box 4.1. Prompting social and emotional learning in Chinese schools

The Chinese Ministry of Education and UNICEF are currently working in partnership to develop and implement the Social and Emotional Learning project (SEL) in Chinese schools. This project adopts a whole-school approach to improve school climate, and provides students systematic support to develop their social and emotional skills through a safe, positive and pleasant school environment.

This project promotes social and emotional learning both through a stand-alone course and through integrating social-emotional aspects of learning into other subjects. The teaching materials for the SEL course are developed based on the SEAL (Social and Emotional Aspects of Learning) model. This model is provided by Northampton Centre for Learning Behaviour in the UK. Based on the SEAL model, the SEL teaching materials are further adapted in light of China's educational and cultural context. The teaching materials consist of six books corresponding to the social and emotional needs of students from 1st to 6th grade. Some key characteristics of this SEL curriculum are summarised below.

- **Systematic and spiralling curriculum:** The SEL curriculum targets seven social and emotional themes. These themes are circulated throughout the learning content across six grades. Students are able to review and enhance their experiences regarding these social and emotional themes on a yearly basis.
- **Whole school participation:** Prior to the start of each SEL theme, whole-school gathering activities are organised to encourage all teachers and students to participate in activities related to that SEL theme.
- **Developmental teaching and learning goals:** The design of teaching and learning goals in the SEL curriculum is aiming to support student self-development. Implementation of the curriculum is centred on promoting sustainable student development.
- **Activity-based teaching:** Teaching and learning take place mainly in student-centred activities. Activities are flexible and open. Students are encouraged to express themselves, and develop their social-emotional capacity from interaction with others.

Multi-level integrative activities (classroom level, school level, family-community level) also contribute to student social emotional learning. School leaders, teachers, and parents are the key actors participating in this project. A number of manuals are devoted to guide and train school leaders, teachers and parents on how to support student social and emotional development through a family-school-community mechanism. Currently, this project is implemented in five pilot counties in China.

Source: Ministry of Education and UNICEF (2016[11]), *社会情感学习教师指导手册 [Social and Emotional Learning teacher's manual]* and Ministry of Education and UNICEF (2016[12]), *社会情感学习课堂教学材料 [Social and Emotional Learning Class Teaching and Learning Materials VI]*

Promoting student health and well-being

Promoting student health and well-being has always been an indispensable social responsibility, in which education as a social enterprise should take part. Solid knowledge, skills, attitudes and values regarding health and well-being support students in making healthy and responsible choices, which has also been found to be positively associated with their learning outcomes (OECD, 2016[13]). Promoting student health and well-being can also help students develop their agency to prevent disease and promote health in their communities (WHO, 2016[14]), which as evidenced by the 2020 coronavirus (COVID 19) crisis, is increasingly vital in today's interconnected world, where an epidemic in one community can quickly evolve into a global pandemic. Today's curriculum should, therefore, build its capacity to cultivate students' knowledge, skills and agency in health and well-being.

China's Ministry of Education requires that the national curriculum "ensure the implementation of physical education and ensure students have time for extracurricular activities" (State Council, 2010[6]). Students' physical health and well-being have been emphasised in the curriculum at all levels of education, particularly in compulsory education where schools are required to ensure students do at least one hour of physical exercise per day.

Promoting student mental health and well-being is set as a cross-curriculum objective in China's compulsory education curriculum. Mental health and well-being content is primarily delivered through two subjects: physical education and morality.

While there is an explicit emphasis on the provision of physical activities to students, it remains unclear how much content in physical education and morality can be devoted to developing student mental health and on building knowledge and skills on disease prevention and health promotion.

Research on the Chinese curriculum has revealed that provision of sex education in China is largely insufficient or ill-constructed (Li, King and Winter, 2009[15]) (Liu and Su, 2014[16]). A survey conducted among 30 Chinese secondary schools by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the United Nations Population Fund (UNFPA) (2018[17]), found that merely half of surveyed students agree that "girls should have a say as to who and when to marry", and "under no circumstance should a husband beat his wife". Meanwhile, over half of students hold negative attitudes, or even discriminatory attitudes, towards sexual diversity. Lack of appropriate curriculum provision of comprehensive sexuality education in China could hinder student awareness of gender equality and gender rights, and put young people's sexual health and well-being at risk.

Developing financial literacy

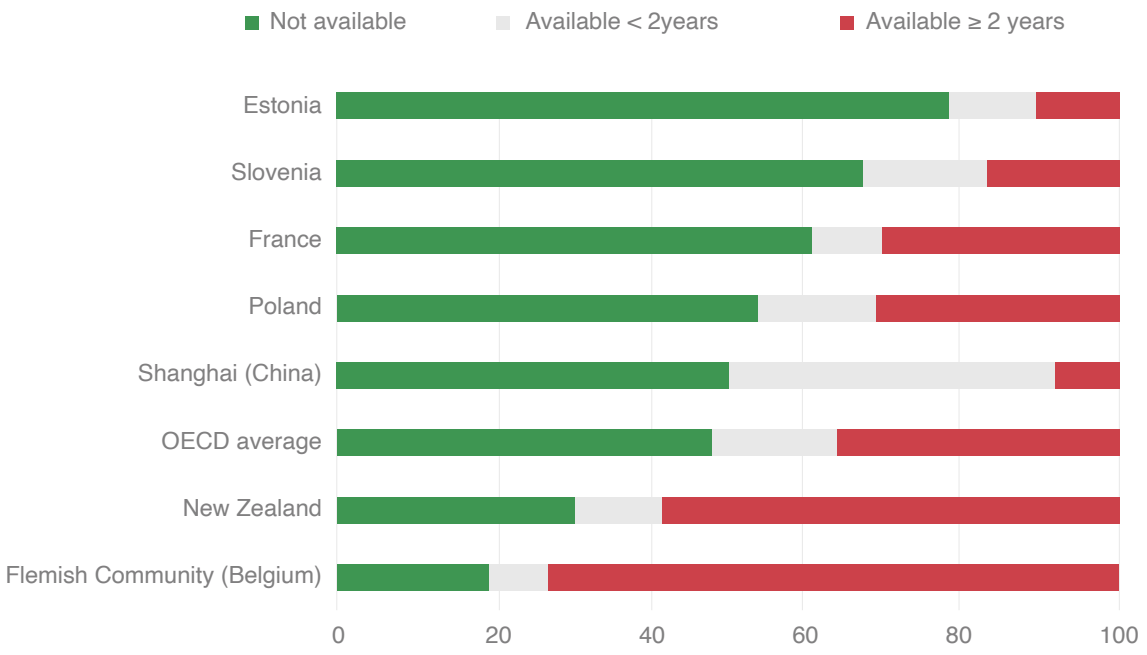
Financial literacy is a combination of awareness, knowledge, skill, attitudes and behaviours necessary to make sound financial decisions and ultimately achieve individual financial well-being (Atkinson and Messy, 2012[18]). As the global economy is increasingly complicated and unpredictable, future generations will face more challenging choices in terms of how to protect, manage, invest and consume their financial resources appropriately. Moreover, developing student financial literacy can potentially help address the growing inequality gap in income and wealth, as adults' financial knowledge is proven to correlate positively with their income and wealth (Lusardi and Mitchell, 2014[19]).

While student financial literacy is recognised as an important competence worth developing, there are only a few education systems across the world that have introduced financial education into the national education framework (see Figure 4.2). China's education system is not one of those. In fact, PISA 2012 results show that the majority of school curricula in Chinese regions provide neither a separate subject nor a cross-curricular subject on financial education (OECD, 2014[20]).

A review of China's curriculum policies suggests that the development of student financial literacy has not yet been prioritised for curriculum reform at the national level. However, China's education systems in Beijing, Shanghai, Jiangsu and Guangdong (B-S-J-G), are the top performers in the PISA assessment on student financial literacy (OECD, 2017[21]).

There is no direct connection between student achievement on financial literacy and the curriculum provision of financial education in the case of China. While half of the schools did not provide financial education to its students, Shanghai students still managed to achieve top performance on financial literacy in PISA 2012 and PISA 2015. However, the positive correlation between student financial literacy, mathematics and reading scores in PISA (OECD, 2017[21]) have suggested that literacy and numeracy are likely to contribute to student financial literacy. This pattern emerging from China may provide an interesting case for exploring effective curriculum approaches to integrating financial literacy content into curricula.

Figure 4.2. Percentage of students according to the availability of financial education at school in Shanghai and other high-performing education systems, 2015



Note: OECD average is the average value of OECD countries and economies participating in the PISA 2015 financial literacy assessment.
Source: Adapted from (OECD, 2017[21]), *PISA 2015 Results (Volume IV): Students' Financial Literacy*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264270282-en.

Building transformative competencies

Standing on the shoulders of the competencies mentioned above (cognitive, health, socio-emotional, etc.), transformative competencies are high-level competencies that derive from core knowledge, skills, attitude and values, aggregating those qualities as an integrative whole that empowers students to create a better world. The OECD "Education 2030" project has recognised three key transformative competencies most relevant for the future:

- **Creating new value** means individuals can innovate and act entrepreneurially (OECD, 2019[4]), which is an increasingly valuable quality in a rapidly changing world. Fostering student capacity for creating new value requires an orchestration of a number of qualities, including critical thinking, creativity, adaptability, an open mindset, collaboration, agility, risk management, curiosity and a sense of purpose.
- **Reconciling tensions and dilemmas** is regarded as another important transformative competency, which requires individuals to be able to understand different or sometimes conflicting ideas and opinions and to find constructive solutions. Some key qualities that shape an individual's ability to reconcile tensions and dilemmas can be cognitive flexibility, perspective-taking skills, empathy, respect, creativity, problem-solving skills, conflict resolution, resilience and tolerance for complexity and ambiguity, and responsibility.
- Equally important, developing an individual's agency to address challenges and dilemmas requires that individuals **take responsibility and consider the consequences of their actions**. To take responsibility means individuals should think reflectively and critically about the context and situation, the environment and society; have a sense of integrity, compassion, respect and willingness to trust others and society; and should develop self-awareness, self-regulation and locus of control to manage their emotions and behaviour.

Building students' transformative competencies requires that an education system provide a curriculum that offers students equal learning opportunities that cover the content of these targeted competencies in a comprehensive manner. While the need for transformative

competencies is widely acknowledged, it is rather a complicated task to integrate them properly into a curriculum, particularly when a curriculum is already crowded.

Developing student transformative competencies has not yet been put forward explicitly as a curriculum reform agenda item in China. There is, however, some evidence suggesting that the national curriculum framework may implicitly cover some key elements of building students' transformative competencies. For instance, the Basic Education Curriculum Reform emphasises that the curriculum should shift towards developing students' spirit of innovation, having a moral compass, and the ability to communicate and collaborate with others (Ministry of Education, 2001[5]). Such qualities, in fact, are considered as key constructs for building students' transformative competencies.

Some key abilities that shape student competence to create new value, reconcile tension and dilemmas and take responsibility can also be traced to several subject-specific standards published by China's Ministry of Education, e.g. mathematics, Chinese and foreign languages. However, only an in-depth analysis of the curriculum would reveal the extent to which the curriculum framework might cover enough content or provide sufficient support for students to build transformative competencies.

Another possible curriculum provision to develop student transformative competencies would be through the integrative practical activities. According to the national curriculum, integrative practical activities can involve research-based learning, community services or labour or technical education, which is largely at each school's discretion (Ministry of Education, 2017[22]). Along with other school or regionally planned courses, integrative activities take up of 16-20% of all curriculum hours, as mentioned above, which gives schools and teachers' greater autonomy to plan and design content to contribute to students' transformative competencies. See Box 4.2 for an example from Shanghai.

Box 4.2. Example of integrative curriculum design from Shanghai

Developing student transformative competencies through outdoor integrative practical activities

A primary school in Shanghai, China developed its integrative practical curriculum on the theme of natural resources using outdoor activities. The wider theme was "Wind, Water, Soil, Light and Air". On each of the sub-themes, the school organised a series of integrative educational activities.

On the sub-theme of "Wind", students first extracted their knowledge of wind from examples from their daily lives. One of the activities involved collecting questions about the wind that students observed from their lives. Then teachers worked with students to explore the answers. Students' problem-based thinking and problem-solving skills were developed through these activities.

Another activity involved senior students guiding the junior students in research-based learning. Students were also encouraged to visit power stations and a wind tunnel laboratory to explore how wind can benefit human life. Through these activities, students developed their collaborative skills, which are important for building their competencies to reconcile conflicts and dilemmas.

The school also encouraged students to express their ideas about wind through art. A school competition was organised on painting and scriptwriting, in which students created works on the theme of "wind". In so doing, students developed their competencies to create new values.

Source: Huang (2019[23]) *小学全学科主题创意活动课程实践案例 [A case study of an innovative curriculum of integrative activities in primary school]*, presented at the 17th Shanghai international curriculum forum, Shanghai, 2019

Promoting quality teaching and learning practices

Quality teaching is at the heart of quality education. Teaching practices are considered the most important variables in influencing student learning performance and outcomes (Hattie, 2012[24]). In return, learning outcomes provide feedback on the quality of teaching practices, contributing to the evidence of "what works" in the classroom and what does not. A sustainable high-performing education system needs to promote effective teaching practices based on empirical evidence, to ensure effective translation from classroom practices into student learning gains.

Teachers' teaching practices are not an isolated instructional process. Rather, it involves multiple dimensions of teachers' knowledge, skills, attitudes and beliefs. A good instruction practice often requires teachers to effectively orchestrate their competencies related to teaching methods, lesson planning, classroom management, cognitive activation and knowledge of student learning, as well as other abilities.

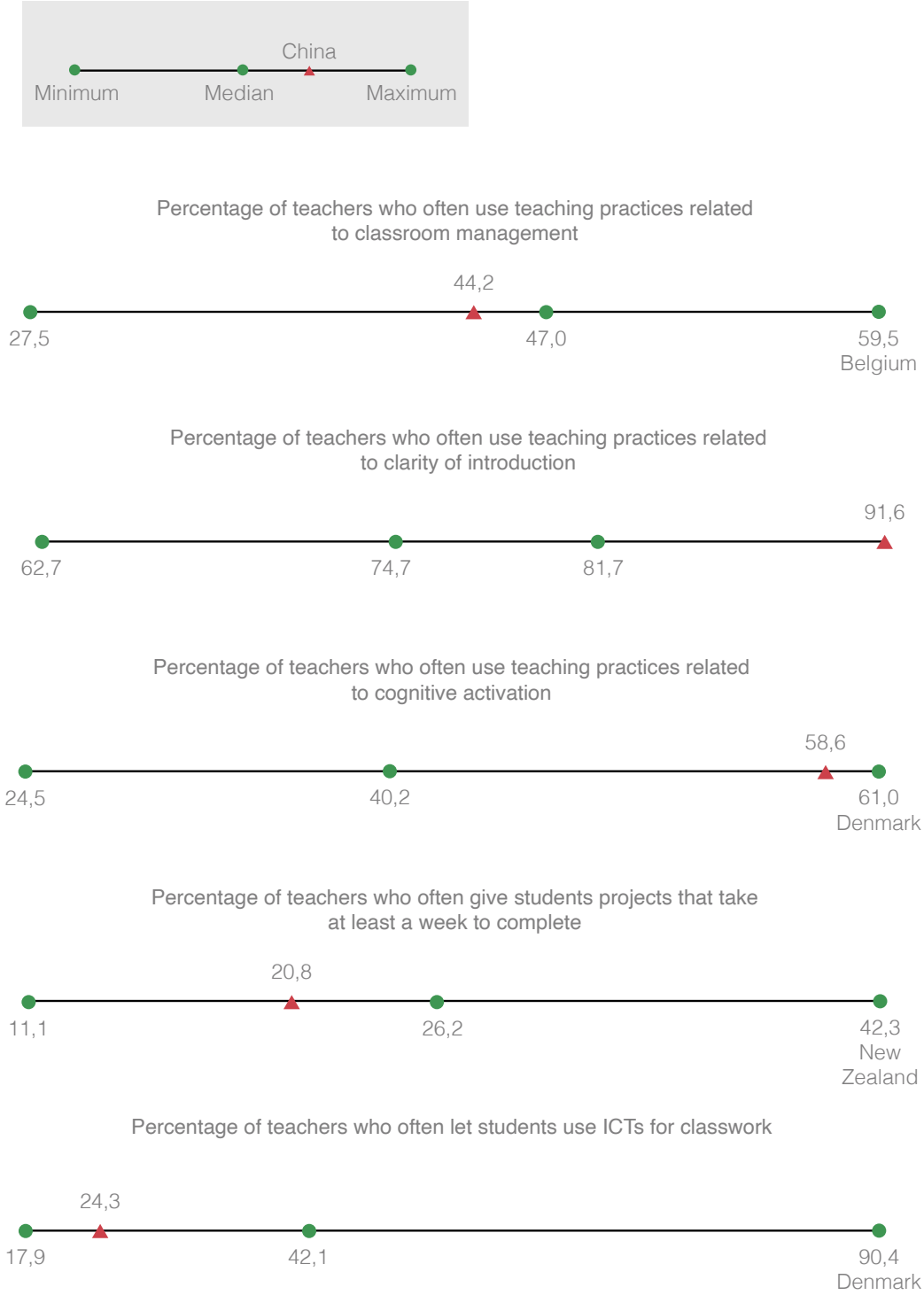
Research and teaching experiences continually enrich the evidence on effective teaching practices, which suggest the kind of teaching competencies necessary to help teachers perform certain teaching practices. For instance, student-centred instruction is found to be beneficial for cultivating student creativity and learning motivation in mathematics (Mann, 2006[25]). To conduct this instruction effectively, teachers need to use corresponding strategies in their teaching practices, such as assigning tasks to students, facilitating student group discussion or brainstorming or letting students correct their own homework.

This section discusses teachers' practices in classroom management; clarity of instruction; cognitive activation; student assessment; and some innovative practices, such as project-based learning and ICT integration. Moreover, it also examines the attitudes that teachers hold towards innovation in Chinese jurisdictions.

» Classroom management: A good disciplinary climate helps Shanghai teachers devote more time to teaching

Classroom management is an essential component of teachers' teaching strategies. Appropriate classroom management enables teachers to establish and maintain an orderly classroom environment and effectively use their instruction time (Barkley, Major and Cross, 2013[26]). Poor classroom management can often lead to a waste of class time and distract students from the learning process (Emmer, 2014[27]). Teachers in high-performing countries tend to use the teaching practices pertaining to classroom management less often compared to the OECD average. This holds for Shanghai as well. Under half of teachers often use classroom-management-related practices (see Figure 3.3), even though they often need to manage bigger classes (see also Chapter 2) than the average class size found in OECD countries.

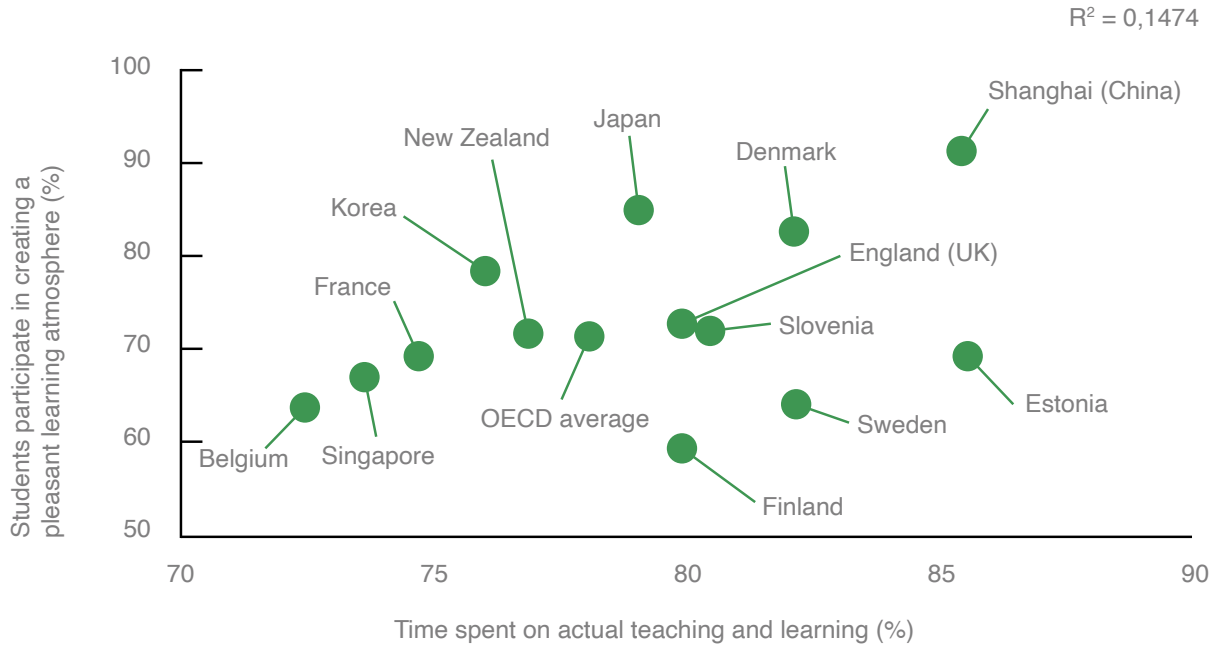
Figure 4.3. Teaching practices in Shanghai, compared with teaching practices in selected high-performing education systems



Note: For the list of high-performing education systems used for this comparison, see Chapter 1 (Methodology). China's data for this figure is limited to Shanghai only.
Source: OECD (2019[28]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

Shanghai teachers' less frequent use of teaching practices related to classroom management is linked to the positive disciplinary climate found in the Shanghai school system. Disruptive behaviours among students are less frequent in Shanghai schools compared to many OECD countries, and often, the majority of students are willing to help their teachers build a pleasant learning atmosphere in class. Having an orderly learning environment is likely to save teachers' efforts to use classroom management practices, leaving teachers more time to implement other teaching practices. In fact, Shanghai teachers report spending less than 8% of class time on keeping order in the classroom and 85% of class time on actual teaching and learning. In many high-performing education systems, a positive disciplinary climate and teaching time are positively correlated (see Figure 4.4).

Figure 4.4. Time spent on teaching and learning in relation to a positive disciplinary climate in selected high-performing education systems, 2018



Source: Authors' own work, based on OECD (2019[28]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

Another important factor that contributes to an orderly atmosphere is that teachers managed to establish organised and efficient routines in the classroom. Efficient routines help teachers to save time from repetitive activities and to keep students orderly with little guidance. It is observed that classrooms in Shanghai have remarkably well organised and efficient routines in place (OECD, forthcoming[29]). Such routine practices help Shanghai teachers minimise the time spent on non-teaching related tasks while enhancing the quality of classroom management.

» Clarity of instruction: The most prevalent type of teaching practice used by Shanghai teachers

Clarity of instruction is defined as a set of instruction practices that teachers use to help students come to a clear understanding of a topic. Examples include teachers' explanations of a subject matter, asking questions to see if students understand the subject matter or not, using examples to explain the topic, etc. Clarity of instruction is an essential part of effective teaching and is directly linked to student achievement and learning satisfaction (Hines, Cruickshank and Kennedy, 1985[30]).

Shanghai teachers tend to use this type of teaching practice the most. Compared to other countries and economies that participated in the OECD Teaching and Learning International Survey (TALIS), clarity of instruction is more widespread in Shanghai (see Figure 4.3 and Figure 4.5). Clarity of instruction is often associated with teacher-directed instruction, where teachers take the primary role of explaining or demonstrating a skillset or subject. PISA results also suggest that teacher-directed instruction tends to be the most common teaching strategy used by science teachers. Teachers' use of this strategy is further found to positively correlate with higher student outcomes in science as well as higher expectations of pursuing a scientific career (OECD, 2016[13]). Other research also suggests a similar relationship between instructional clarity and student interest and performance in mathematics.

Figure 4.5. Percentage of teachers who reported that they «frequently» or «always» use the following practices related to clarity of instruction, in Shanghai and OECD countries, 2018

Source: OECD (2019[28]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

Classroom observation also shows that teachers in Shanghai often explain clearly and explicitly the learning activities and learning goals in their classrooms (OECD, forthcoming[29]). Nevertheless, this is not the case in many other education systems in which the learning goals tend to be stated less often by teachers in class. Instructional materials emerge as a powerful tool for Shanghai teachers to explain the learning goals. Nearly all teachers in Shanghai specified their learning goals through instructional materials, such as handouts, student assignment and lesson plans.

Chinese student performance in science and mathematics demonstrated in PISA 2015 may provide evidence of the positive effects of teachers' use of clarity of instruction and teacher-directed instruction on Chinese student cognitive outcomes. In addition to student outcomes, previous research finds that clarity of instruction can also help reduce student disruptive behaviours (Nelson, Johnson and Marchand-Martella, 1996[31]), which may be another factor contributing to the positive disciplinary climate in Shanghai's classrooms, as mentioned above.

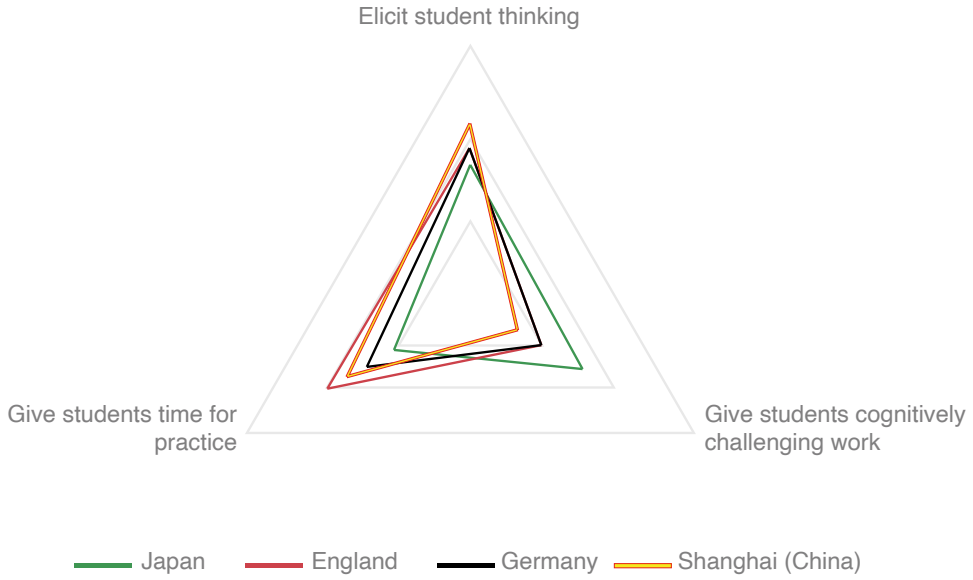
» Cognitive activation: Shanghai teachers use this teaching practice more frequently than teachers in many other higher-performing countries

Teaching and learning practices related to cognitive activation aim to support and foster students' cognitive learning processes. Cognitive activation provides students with the opportunity to think critically and deeply to integrate their knowledge to solve problems. Teachers' use of cognitive activation has proven to be positively associated with student mathematics scores (OECD, 2016[13]). Typical examples of cognitive activation used in mathematics lessons include challenging students' beliefs based on their prior knowledge or encouraging students to work in a group to experiment with multiple solutions.

Across OECD countries and partner economies, teaching practices related to cognitive activation are less common than practices related to clarity of instruction. This finding holds for Shanghai as well. This may be due to the complex demands of conducting effective cognitive activation activities. They require not only strong pedagogical knowledge but also teacher knowledge of cognitive strategies, subject content and learner characteristics (Vincent-Lancrin et al., 2019[32]).

Compared to most other high-performing countries, however, teachers' use of practices related to cognitive activation are relatively more frequent in Shanghai (see Figure 4.3). It is observed in classrooms in Shanghai that teachers often elicit students' higher-level thinking concerning their answers, procedures for solving the problems, and sometimes even abstract ideas and concepts (see Figure 4.6). In addition, teachers in Shanghai tend to give students many opportunities for practice, through which students can develop a deep understanding of a complicated subject matter.

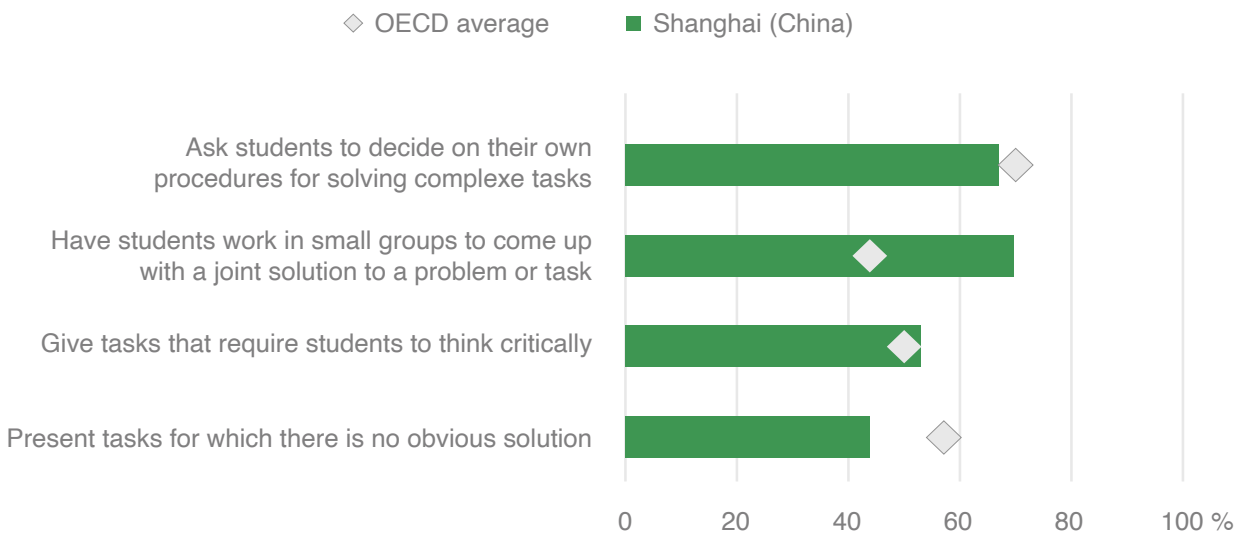
Figure 4.6. Teachers' use of three specific teaching practices in four high-performing systems



Note: The score is based on video observers' rating that ranges between 1 to 4 with 1 representing a lower level of teachers' use of this type of practice and 4 presenting a higher level of teachers' use of this type of practice. For more details, refer to (OECD, forthcoming[29]).
Source: Authors' own work, based on OECD (OECD, forthcoming[29]) *TALIS Video Study Policy Report*, OECD Publishing, Paris.

Task-based learning is one of the most effective instruction practices to facilitate student ability to think critically. As tasks often place students in a complex situation, students have to analyse problems on their own and apply their knowledge to solve problems. Using this process, students can learn how to transfer their acquired knowledge across different situations and critically apply this knowledge to solve new problems (Qing, Ni and Hong, 2010[33]). This practice is less common in Shanghai classrooms, however, than in classrooms in OECD countries and economies, on average (see Figure 4.7).

Figure 4.7. Percentage of teachers who reported that they "frequently" or "always" use the following practices related to cognitive activation, in Shanghai and OECD countries, 2018



Source: Authors' own work, based on *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

Similarly, project-based learning (PBL), which requires students to complete a project over a longer period, is also a teaching practice that is less frequently used by Shanghai teachers (see Figure 4.3). Although PBL is a relatively new teaching approach, a growing body of literature suggests that it has positive influences on engaging students actively in thinking critically and should be encouraged for use in classrooms (Bell, 2010[34]) (Blumenfeld et al., 1991[35]). However, implementing this teaching strategy is often limited if teachers have to teach a large amount of content, as projects that take more than a week can pose problems for keeping the pace of new teaching content. More research is needed to identify the constraints that limit teachers using practices related to cognitive activation in Shanghai.

Teacher use of critical thinking-centred teaching strategies is closely linked to their preparedness, self-efficacy, and beliefs and attitudes around critical thinking (OECD, 2019[28]). In the case of Shanghai, the relatively infrequent use of task-based learning activities for critical thinking may be associated with these factors, which influence teachers' decisions to use cognitive activation strategies in their classrooms. Critical thinking is widely recognised as a key competence needed to prepare students for an uncertain future with potentially significant social and environmental challenges ahead. Thus, teaching practices that develop critical thinking among students are of high importance and deserve more research attention.

» The use of assessments in China

Education systems are tasked with optimising their teaching and learning practices to equip citizens with cognitive, social, emotional and transformative competencies and lifelong skills. However, learning and teaching practices cannot improve if assessment does not improve along with them (Redecker and Johannessen, 2013[36]). As the goals of education evolve as society develops, assessments need to be updated in alignment with new learning goals, so as to provide useful feedback on teaching and learning practices. By doing this, changes in teaching and learning practices can enhance their effectiveness, and thereby respond to the objectives of a future-oriented education system.

Two fundamental assessments underpin teaching practices: the formative assessment and the summative assessment. Formative assessment takes place during the learning process, during which teachers collect evidence and provide feedback to students. Formative assessment is regarded as a prominent feature of the 21st-century learning environment, where learners gain constant and meaningful feedback, and in return, improve the teaching and learning process (Wiliam, 2010[37]). Summative assessment assesses student learning outcomes, often after the completion of a programme or unit. Typical methods of summative assessment include end-of-term or mid-term exams, chapter tests or standardised tests. Summative assessments often can directly reflect students' mastery of content and easily benchmark students' performance (Guerriero, 2017[38]).

Across a wide range of education systems, summative assessment tends to be more widely used than formative assessment in teachers' practices (OECD, 2019[28]). However, as there is a growing tendency to assess students on a broad set of transformative competencies and soft skills in today's education systems, the advantages of using formative assessment in assessing a broader range of student competence has started to attract increasing attention.

This being said, like many education systems in the world, China's education system tends to place a high value on the student outcomes from summative assessments. Standardised exams and tests are the most prevalent assessment practices that determine students' progression from one education level to the next, such as the national, standardised university entrance exam, Gaokao. The high-stakes exam culture in China's education system has raised significant debate in both research and policy spheres. In particular, the adverse effects of an exam-oriented culture on student well-being has become of wide public concern (China Daily, 2019[39]).

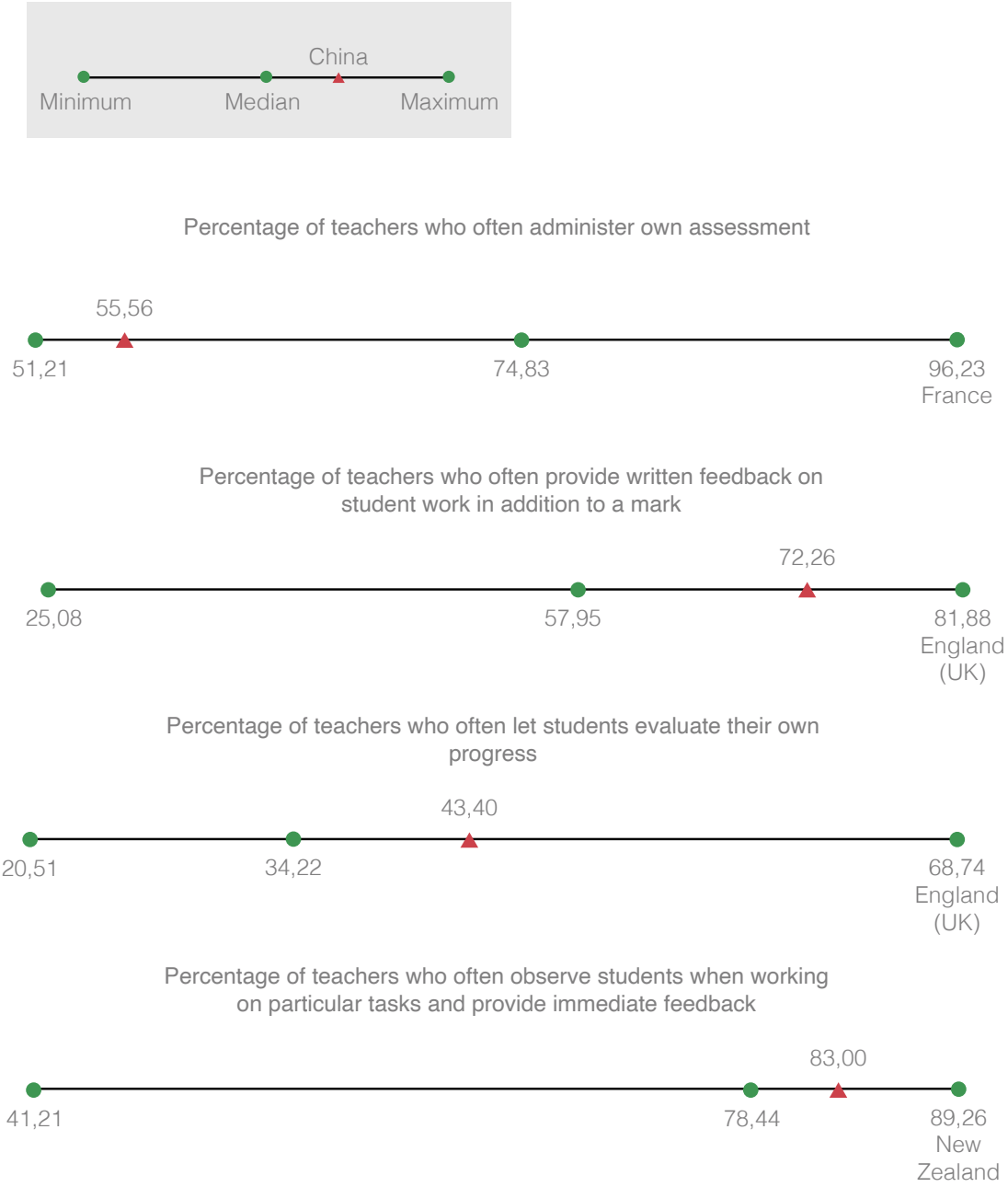
In an exam-oriented culture, student scores become the inextricable component that determines a school system's accountability. Therefore, schools and teachers tend to devote most of their attention to improving student scores. Consequently, this leaves little time to develop practices that support students' comprehensive development. Besides shaping teachers' practices, research also reveals that summative assessment, particularly high-stake tests and examinations, have seriously detrimental effects on students' motivation to learn (Harlen, 2005[40]).

Striking a balance between formative and summative assessments is a feasible strategy to redress the prevalence of the exam-oriented culture in China's education system. Yet, promoting teacher practices that include formative assessment is not easy to achieve. Formative assessment often requires teachers to have a wide spectrum of knowledge and competencies (Heritage, 2007[41]), and requires students to be more responsible for their own learning, with the support of the institutional learning environment (OECD, 2005[42]). It is suggested, therefore, that formative assessment should be featured as part of a comprehensive system in which

all components function together and promote learning (Bennett, 2011[43]).

Evidence from the TALIS 2018 survey suggests that there was a noticeable improvement from 2013 to 2018 on teachers' use of the formative assessment, e.g. observing students on a particular task and providing immediate feedback (see Figure 4.8). This tendency is in line with the increase of teacher participation in professional development activities on student assessment practices. The changes in Shanghai teachers' use of certain formative assessment methods are likely associated with many other interventional factors that have been implemented in Shanghai schools. Box 4.4 presents an example from Shanghai on how schools can take effective action to promote and improve formative assessment practices in China's current education systems.

Figure 4.8. Teaching assessment practices in Shanghai, compared with teaching assessment practices in selected high-performing education systems



Note: China's data for this figure is limited to Shanghai only.
Source: OECD (2019[28]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

Box 4.3. Shanghai develops "green indicators" to reform its assessment system

Shanghai has initiated a new assessment system called "Green Indicators of Academic Quality of Primary and Secondary School Students". These indicators aim to improve education management and ecology. The indicators extend beyond student academic outcomes to include indicators on student motivation, students' academic workload, teacher-student relations, students' mental and physical well-being and teachers' instruction styles. Annual progress on such indicators is tracked and reported.

Municipal and district-level education authorities in Shanghai further develop intervention plans targeted at specific schools in areas under their administration, based on feedback from the Green Indicators assessment.

Source: (Liang, Kidwai and Zhang, 2016[44]) *How Shanghai Does It: Insights and Lessons from the Highest-Ranking Education System in the World Human Development*, World Bank publishing, Washington

» Innovation and teaching and learning for the future

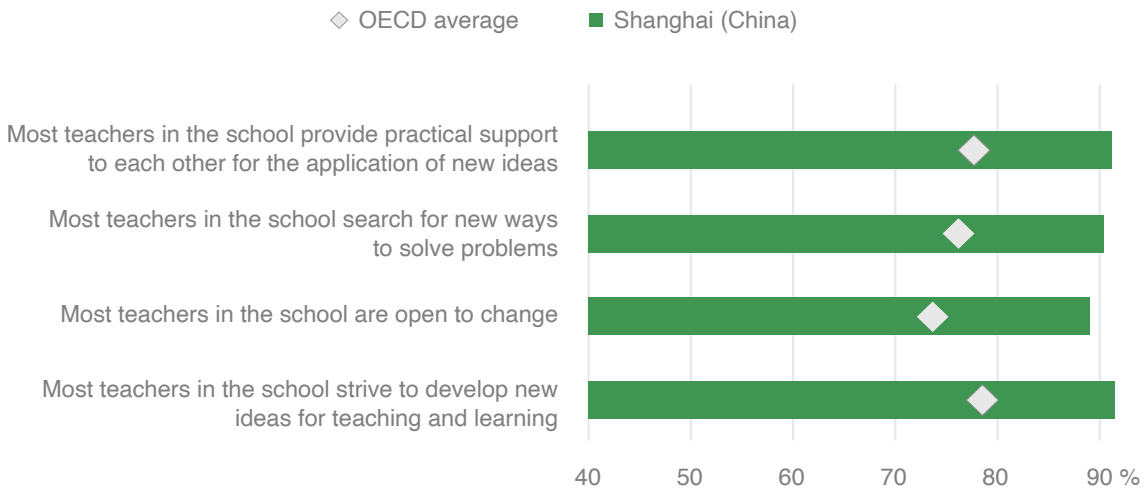
In the face of rapid, global changes, innovation is considered a powerful driver for increasing an economy's competitiveness and developing its society. Education, as a fundamental system for providing qualified human capital, cannot, and should not, be left behind as society races toward innovation.

Innovation in education is proven to have positive influences on student outcomes (Vincent-Lancrin et al., 2017[45]). Pedagogical innovation directly reflects how innovation is implemented in the classroom, which is critical for examining the level of innovation in an education system. For example, when the concept of individualised learning in education is aligned with innovation in teaching and learning practices, it can contribute to a diversity of teaching and learning methods that meet learners' diverse learning needs.

While technology is one of the main factors that contribute to innovation, educational innovation can take many different forms without necessarily involving technology. Shifting epistemology from a traditional teacher-centred classroom towards a student-centred classroom is a type of innovation that results from changes in teaching and learning practices. As student-focused education epistemology encourages students to take responsibility for their own learning process, teachers and educators who subscribe to this epistemology are more likely to perform innovative teaching practices, such as assigning problem-based tasks to students, encouraging students to acquire knowledge independently, and other student-centred learning and assessment practices. Therefore, how teachers perceive innovation matters to the implementation of innovative practices in the classroom. It is unlikely to see innovation in teaching practices if teachers are sceptical or against educational innovation in the first place (Owston, 2006[46]).

When it comes to China, the majority of Shanghai teachers, for example, holds a positive view of their colleagues' attitudes towards innovation. In particular, most Shanghai teachers agree that their colleagues strive to develop new ideas related to teaching and learning (see Figure 4.9). While young teachers and novice teachers across many OECD countries and economies are less likely to report that their colleagues are open to change, Shanghai teachers show a different pattern. Shanghai teachers' perception of their colleagues' openness to change is, interestingly, not affected by age and teaching experience. One plausible hypothesis for this might be the broad coverage of continuous professional development in which Shanghai teachers of varying ages and teaching experience actively participate together.

Figure 4.9. Percentage of teachers who "agree" or "strongly agree" with the following statements, in Shanghai and OECD countries, 2018

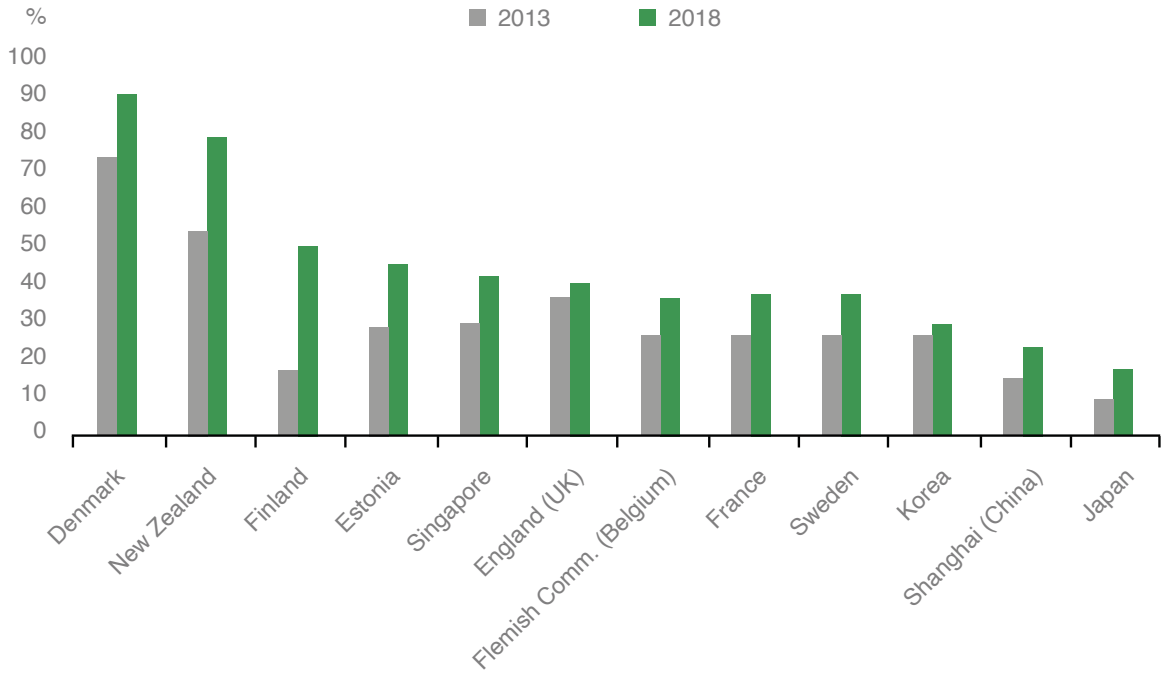


Source: adapted from OECD (2019[28]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en

While teachers' attitudes towards innovation is an important indicator when determining the level of innovation in schools, teachers' use of innovative practices in daily teaching is another. Although innovative teaching practices are not necessarily limited to technology, technology-enabled teaching practices remains one of the most visible and widespread innovations in today's classrooms.

In past decades, student use of ICTs for school work has grown increasingly popular across many education systems. This is observed in Shanghai as well (see Figure 4.10). However, compared to the OECD average, teachers in Shanghai use ICT-facilitated teaching practice is still less frequently (see Figure 4.3 and Figure 4.10). Through classroom observation, it is found that the majority of teachers in Shanghai use technology in the classroom only for communication purposes. Only a very small portion of teachers in Shanghai use technology to help students develop higher-order understanding (OECD, forthcoming[29]). This pattern exists in many education systems around the world. Technology may not matter directly to student learning outcomes, but it has the potential to enrich teachers' toolboxes and facilitate innovative teaching. It could be a loss for future education systems if teachers cannot effectively capitalise on the benefits of technology for teaching and learning.

Figure 4.10. Changes in teacher practices in letting students using ICTs for projects or classwork in Shanghai and other selected high-performing education systems, 2013 and 2018



Source: OECD (2019[28]), *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/1d0bc92a-en.

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Chapter 5

Outcomes

This chapter analyses the relative standing of China's education system in terms of student performance and equity in comparison to other high-performing education systems. It also analyses the factors that contribute the most to education performance both in terms of cognitive and non-cognitive outcomes. These factors are examined on the individual, school and institutional levels, and are compared with corresponding data from other high-performing countries.

Equipping citizens with the knowledge and skills necessary to achieve their full potential, contribute to an increasingly interconnected world, and ultimately convert better skills into better lives is a central preoccupation of policy makers in education systems around the world. The measures of students' cognitive and non-cognitive skills included in the Programme for International Student Assessment (PISA) indicate how close countries are to achieving this goal. At the same time, PISA can help countries better understand how equitable educational systems are by looking at the extent to which they provide equal opportunities to all students to benefit from education, regardless of, for example, their family background or gender. Much of the existing research based on PISA consistently finds a positive relationship between greater equity and high performance, which makes equity one of the most important features of successful education systems.

In 2018, four regions in the People's Republic of China (hereafter "China") participated in the PISA assessment: Beijing, Shanghai, Jiangsu and Zhejiang (hereafter "B-S-J-Z [China]"), and their results topped the league tables in mathematics, science and reading. While these four municipalities in eastern China do not represent China as a whole, the size of each compares to that of a typical OECD country, and their combined populations amount to over 180 million. What makes their achievement more remarkable is that the level of income of these four Chinese regions is well below the OECD average.

This chapter analyses the relative standing of China's educational system in terms of student performance and equity when compared to other high-performing education systems, on both cognitive and non-cognitive outcomes. As detailed in Chapter 1 (Methodology), the high-performing education systems considered in this chapter and report are Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Ireland, Japan, Korea, New Zealand, Poland, Singapore, Slovenia, Sweden and the United Kingdom. The focus of the analysis will lie on the results of mainland B-S-J-Z (China) in 2018 and, to a lesser extent, 2015 (B-S-J-G (China)).

This chapter also analyses the factors that contribute the most to education performance both in terms of cognitive and non-cognitive outcomes. These factors are examined on the individual, school and institutional levels, and are compared with corresponding data from other high-performing countries. The purpose here is to reveal how education systems in Beijing, Shanghai, Jiangsu and Zhejiang differ from, or are similar to, other high-performing education systems, and to dig deep into the practices and policies that underline the performance of each dimension of their education outcomes.

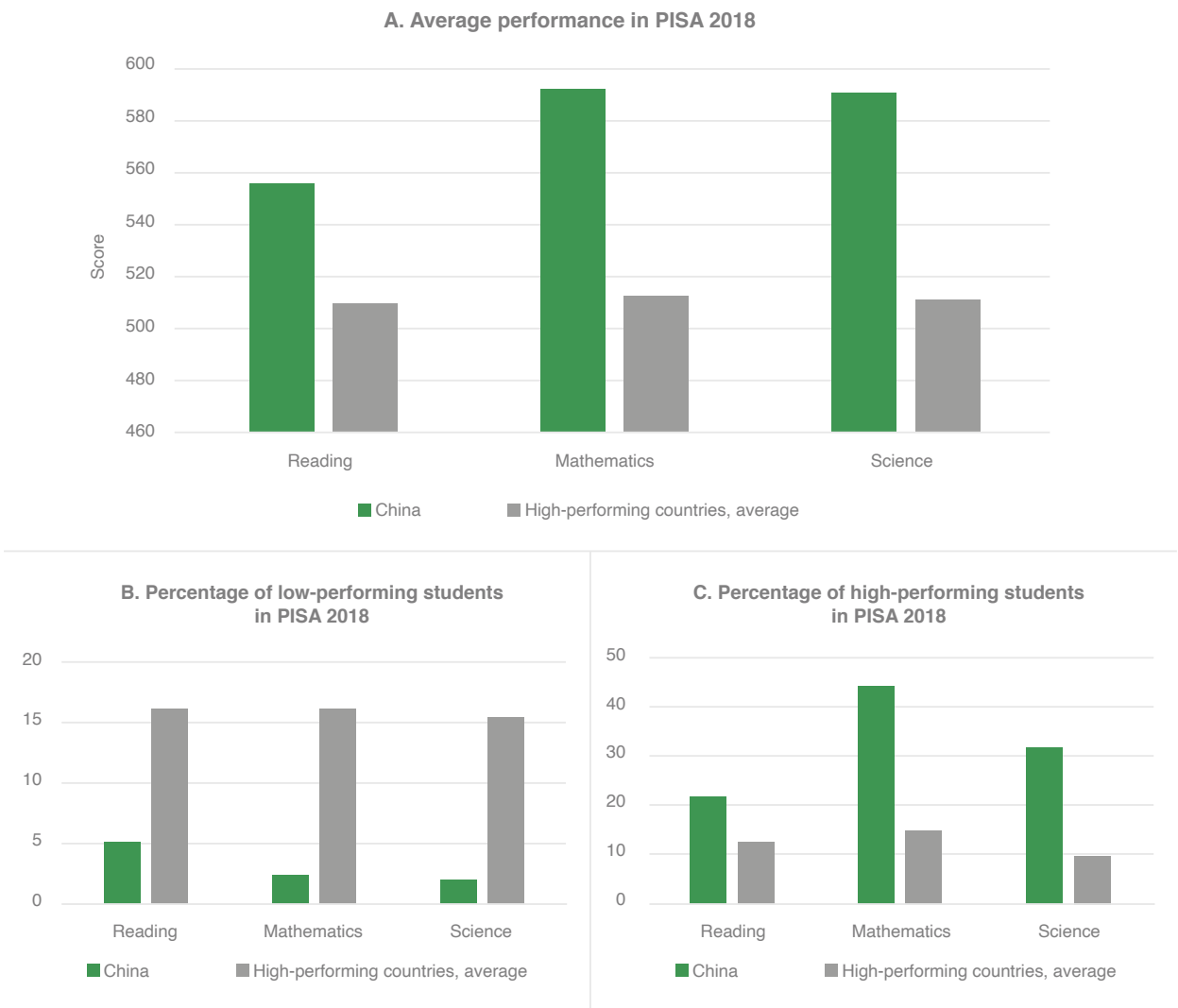
Students' cognitive learning outcomes

» PISA 2018 results for B-S-J-Z (China)

The easiest way to summarise student performance and compare countries' relative standing is through studying students' mean performance in each country and domain assessed by PISA. PISA also describes student performance by levels of proficiency. Several levels of proficiency have been set out to assist in the interpretation of PISA scores. Comparing the proportion of students below and above the baseline levels of proficiency and the proportion who reach the highest levels of proficiency, makes it possible not only to gauge the average achievement level but also the capacity of a given education system to nurture excellence and to ensure minimum standards. The latter is an aspect of inclusiveness, i.e. of an education system's success in guaranteeing children's capabilities to pursue what they value in life.

Figure 5.1 shows the average performance of students in Beijing, Shanghai, Jiangsu and Zhejiang in reading, mathematics and science, in comparison to the average performance of 16 other high-performing countries (as listed above). A number of observations emerge from this figure and the comparisons of B-SJ-Z (China)'s mean performance with other countries in the three subjects.

Figure 5.1. China's performance in reading, mathematics and science, compared with performance in selected high-performing education systems, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **B-S-J-Z (China) outperforms other high-performing education systems in all three domains**

In Beijing, Shanghai, Jiangsu and Zhejiang, almost all of the students attained at least Level 2 proficiency in reading, significantly more than on average across other high-performing systems (84%). Some 22% of students in B-S-J-Z (China) were top performers in reading, meaning that they attained Level 5 or 6 in the PISA reading test. At these levels, students can comprehend lengthy texts, deal with concepts that are abstract or counterintuitive, and establish distinctions between fact and opinion, based on implicit cues pertaining to the content or source of the information. In the 16 other high-performing education systems, 13% of 15-year-old students were top performers, on average.

Some 98% of students in B-S-J-Z (China) attained Level 2 or higher in mathematics (average of the other high-performing countries: 84%), while 44% of students scored at Level 5 or higher in mathematics (other high-performing countries' average: 15%). Six Asian countries and economies had the largest shares of students who scored at Level 5 or higher in mathematics: Beijing, Shanghai, Jiangsu and Zhejiang (China) (44%); Singapore (37%); Hong Kong (China) (29%); Macao (China) (28%); Chinese Taipei (23%); and Korea (21%). These students can model complex situations mathematically, and can select, compare and evaluate appropriate problem-solving strategies for dealing with them.

Some 98% of students in B-S-J-Z (China) attained Level 2 or higher in science, significantly more than on average across the other high-performing countries (85%). In B S-J-Z (China), 32% of students were top performers in science, meaning that they were proficient at Level 5 or 6 (high-performing countries' average: 10%). These students can creatively and autonomously apply their knowledge of and about science to a wide variety of situations, including unfamiliar ones.

In sum, 15-year-old students in four municipalities/municipalities of China – Beijing, Shanghai, Jiangsu and Zhejiang – outperformed their peers in all of the other 16 high-performing education systems in mathematics and science by a wide margin, and in reading, only Singapore came close (Figure 5.1). In fact, the 10% most disadvantaged students in these four provinces showed better reading skills than those of the average student in OECD countries, and performed on par with the 10% most advantaged students in some of them. At the same time, the social and emotional outcomes, and other aspects of students' well-being that were measured by PISA 2018, are the areas where other high-performing countries excel (see the section on Students' non-cognitive outcomes).

» PISA 2015 results for B-S-J-G (China)

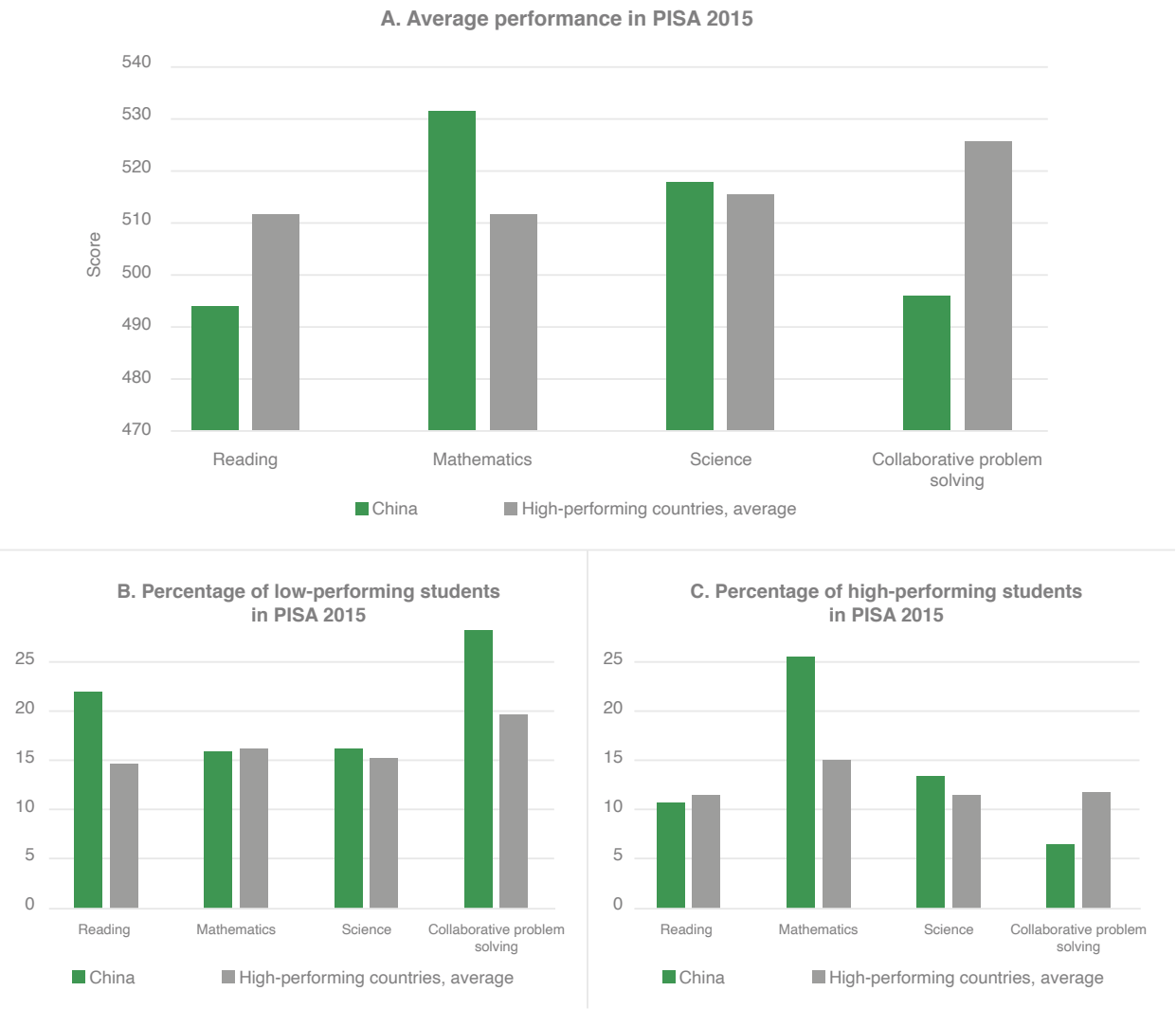
Apart from the 2018 test, China also participated in the 2015 PISA cycle. This should make it possible to conduct trend analyses and map changes in performance over time. Unfortunately, the participating municipalities changed between the 2015 and 2018 cycle. In 2015, students from Beijing, Shanghai, Jiangsu, and Guangdong (hereafter "B-S-J-G [China]") took the test, while in 2018 Guangdong was replaced with Zhejiang province. This means that changes in performance between the two cycles cannot automatically be attributed to changes in education quality. Therefore, in this section, China's PISA 2015 performance will be discussed in isolation.

In addition to the reading, mathematics, and science domains, the 2015 PISA cycle also included items aiming to measure students' collaborative problem-solving skills. The OECD defined this competency as students' capacity to engage in a process whereby multiple individuals attempt to solve a problem by sharing and pooling their knowledge, skills and efforts to reach a solution (OECD, 2017[2]). It was subdivided into three competencies: establishing and maintaining shared understanding, taking the correct action to solve the problem, and establishing and maintaining team organisation. These skills are becoming increasingly crucial both in education and in the workplace (National Research Council, 2011[3]; Rosen and Rimor, 2012[4]), as they allow for a more effective division of labour, optimally combining different sources of knowledge, and enhanced creativity and quality of solutions by incorporating viewpoints from multiple perspectives.

» **Students in B-S-J-G (China) had higher performance in mathematics, but lower problem-solving and reading skills than their peers in high-performing countries**

Figure 5.2 shows the average performance of Chinese students and the share of low- and high-performing students compared to the average of other high-performing countries across the 2015 PISA domains. In 2015, Chinese students outperformed students from other countries on mathematics but were less proficient in reading and collaborative problem solving. In science, the difference between B-S-J-G (China) and the rest is relatively small.

Figure 5.2. China's performance in reading, mathematics, science and collaborative problem solving compared with performance in selected high-performing education systems, 2015



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Guangdong.
Source: Authors' own calculations based on OECD (2015[5]), *PISA 2015 Database*, https://www.oecd.org/pisa/data/2015database/.

» Top-performing students drove high mathematics achievement in B-S-J-G (China)

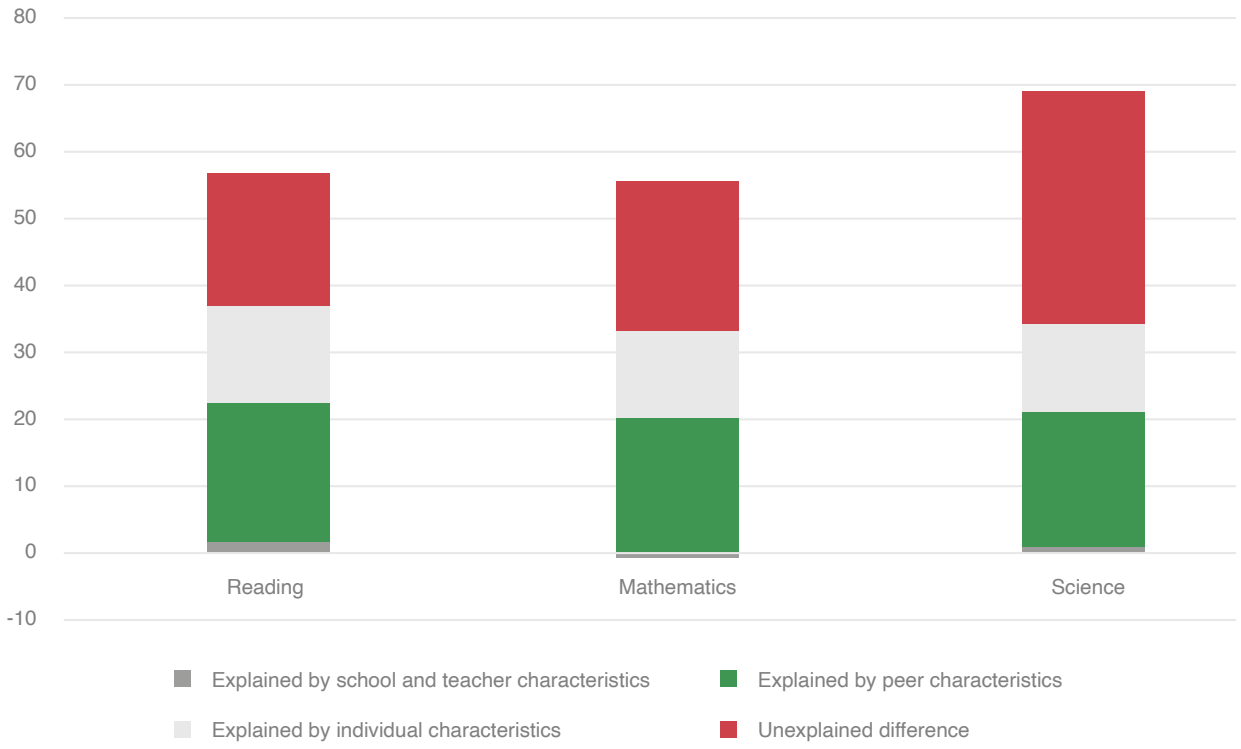
The share of low-achieving students in Beijing, Shanghai, Jiangsu and Guangdong is relatively high in terms of reading and collaborative problem solving, and similar to the other high-performing countries in science and mathematics. The positive average difference in mathematics performance is driven mostly by a relatively high percentage of high-performing students in B-S-J-G (China), rather than by a low percentage of low-achieving students.

» Explaining the gap in performance between 2015 and 2018

Overall, B-S-J-G (China)'s results on the 2015 PISA test are less exceptional than in the 2018 PISA test. As mentioned earlier, it is difficult to compare the results from the two cycles because of the change in participating provinces. Nevertheless, in this section, the performance gap between 2015 and 2018 will be decomposed to investigate how much of the achievement gap between the two cycles can be accounted for by differences in observable characteristics between the students that took the test between the two cycles.

For this, the Oaxaca-Blinder decomposition method (Oaxaca, 1973[6]; Blinder, 1973[7]) is used. This method allows for the decomposition of the difference between two groups in the mean level for a particular outcome into a part that is explained by group differences in the observable characteristics, and a part caused by differences in the outcomes associated with these characteristics. Figure 5.3 shows the results of this exercise on the differences in Chinese students' reading, mathematics and science scores between the 2015 and 2018 PISA cycles.

Figure 5.3. Oaxaca-Blinder decomposition of the difference between B-S-J-G (China) in PISA 2015 and B-S-J-Z (China) in PISA 2018



Note: B-S-J-G stands for Beijing, Shanghai, Jiangsu and Guangdong; B-S-J-Z stands for Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2015[5]), *PISA 2015 Database*, https://www.oecd.org/pisa/data/2015database/ and OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **The main determinants of the differences in performance between 2015 and 2018 are students' individual and peer characteristics**

For reading, 65% of the performance gap between 2015 and 2018 can be explained by differences in the observable characteristics between PISA cycles. For mathematics and science, 60% and 50% can be explained respectively. The main determinants of the differences between cycles are differences between students' individual and peer characteristics. In particular, individual- and peer socio-economic status, and the grade which students are in at the time of taking the PISA test contribute strongly to explaining the difference in performance between the two cycles. Differences in school- and teacher characteristics (e.g. the share of qualified teachers, prevalence of ability tracking, class size) contribute relatively little.

A sizeable proportion of the differences in Chinese students' performance between 2015 and 2018 cannot be explained by differences in students' observable characteristics. The remaining unexplained gap could be the result of improvements in the Chinese education system. It could also be that differences in unobserved student, school, and teacher characteristics are responsible. In light of the change in Chinese provinces sampled between the two cycles, the results of cross-time comparisons should be interpreted with caution.

» Delving deeper into science and reading skills

In PISA, one subject area is more thoroughly examined than the other two every three years, even though all subjects are assessed every time PISA is administered. In addition to assessing whether students can reproduce knowledge, PISA seeks to examine how well students can extrapolate and apply their knowledge in unfamiliar settings. The detailed test of "subscale" skills of a given subject area is an in-depth assessment with a larger set of questions. The detailed assessment was on science in 2015, and on reading in 2018. In this section, China's relative performance on the different subscales is compared to the performance of students from other high-performing countries.

» **Science skills in 2015**

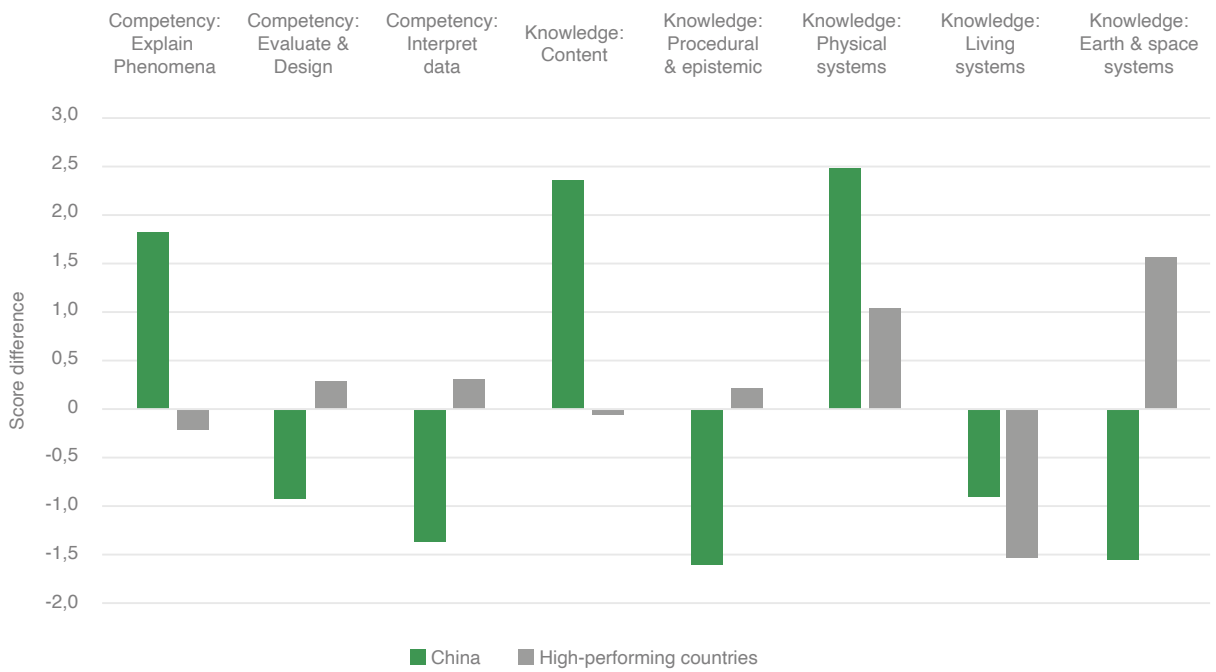
PISA defines scientific literacy as the ability to engage with the ideas of science and science-related

issues as a reflective citizen (OECD, 2016[8]). Three competencies are required to achieve this literacy: the ability to explain phenomena scientifically, the ability to evaluate and design scientific enquiry, and the ability to scientifically interpret data and evidence. All three of these competencies require scientific knowledge to acquire, both about the content of science (knowledge of science) as well as procedural and epistemic knowledge (knowledge about science). PISA 2015 included subscales for the three competencies, subscales for content knowledge and procedural and epistemic knowledge, as well as three subject-specific content subscales: knowledge about physical systems, about living systems, and about earth and space systems.

Students from B-S-J-G (China) demonstrate high scientific content knowledge

Figure 5.4 shows the performance of students in Beijing, Shanghai, Jiangsu and Guangdong on the different subscales as the deviation from the average performance on the science scale, compared to the average of the other high-performing countries. What can be seen is that Chinese (B-S-J-G) students are relatively strong in terms of content knowledge, especially with regard to the physical systems, as well as explaining phenomena scientifically. Compared to the other high-performing countries, they are slightly less knowledgeable about the earth and space systems, and interpreting data and evidence scientifically. However, in absolute terms, the variation between the different subscales of scientific literacy is rather low, suggesting a balanced overall scientific skillset in B-S-J-G (China) as well as in the other high-performing education systems.

Figure 5.4. Deviation from the overall average science score on the PISA 2015 science subscales: China and selected high-performing education systems



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Guangdong.
Source: Authors' own calculations based on OECD (2015[5]), *PISA 2015 Database*, https://www.oecd.org/pisa/data/2015database/.

» Reading skills in 2018

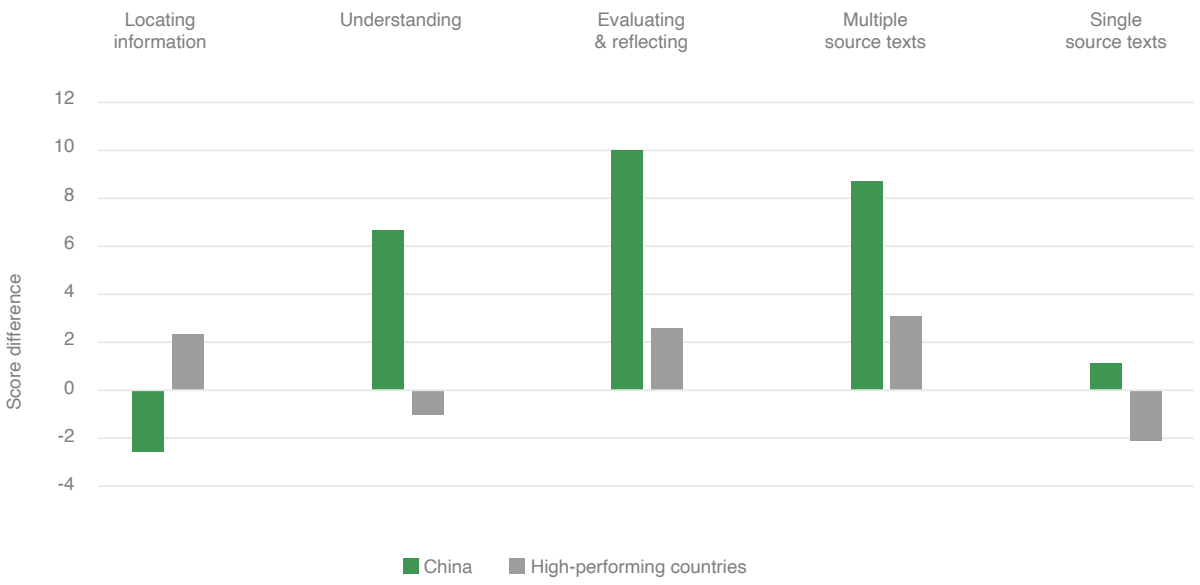
PISA 2018 defines reading literacy as the ability to understand, use, evaluate, reflect on and engage with texts in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society (OECD, 2019[9]). To achieve reading literacy in this framework, students need to be able to execute a wide range of reading processes, including text processing. The subscales related to text processing assess students' abilities to locate information, understand what is written, and evaluate and reflect on the text. Additionally, a distinction was made between texts from a single source and texts that contain excerpts from multiple sources.

Students from B-S-J-Z (China) excel at understanding, as well as evaluating and reflecting on what they have read

In Figure 5.5, the relative performance of students in Beijing, Shanghai, Jiangsu and Zhejiang on the resulting five subscales is compared to that of the average of the students from other high-performing

countries. The results show that (B-S-J-Z) Chinese students are particularly good at evaluating and reflecting on what they have read. This means that they are capable of reasoning beyond the literal meaning of the text and can critically assess the quality and validity of the information that they have been presented. They are also relatively good at combining information from multiple text sources. However, students in the other high-performing countries appear to be relatively stronger in locating the relevant information within a given text.

Figure 5.5. Deviation from the overall average reading score on the PISA 2018 reading subscales: China and selected high-performing education systems



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

Students' non-cognitive outcomes

In addition to a number of institutional features (such as an excellent teacher force and the right balance between autonomy and accountability), the outstanding performance of Chinese students in cognitive domains has been attributed to the East Asian model of learning. Students in these countries typically have high values and aspirations, are motivated to advance in socio-economic terms and perfect themselves through education (Ho, 2009[10]). The analyses of the cognitive results above indeed provide a very encouraging picture of the education in Beijing, Shanghai, Jiangsu and Zhejiang.

However, cognitive outcomes portray only one aspect of educational success. Following the more holistic approach to education outcomes, this section examines student performance in China with respect to social and emotional status and student well-being. Student well-being has become an important indicator of the quality of education, as increasing evidence points to the importance of student well-being for health, educational achievement, socialisation and social values.

Measuring the well-being of 15-year-old students, the target PISA population, is particularly important, as students at this age are in a key transition phase of physical and emotional development. Asking students about themselves allows adolescents to express how they feel, what they think of their lives and whether they believe they can grow and improve (OECD, 2017[11]). While it is important to examine the cross-country differences in the well-being of students, it should also be noted that comparing average levels of subjective well-being across countries is challenging. Variations in students' reports of their personal well-being across countries might be influenced by cultural or local interpretations of what defines a happy life and well-being in general (OECD, 2019[9]). In this section, the outcomes of B-S-J-Z (China) will be compared to the 16 high-performing countries using several PISA indices that summarise responses from students to a series of questions about their social and emotional status and well-being.

» Chinese students' social and emotional status and well-being

» Students in B-S-J-Z (China) report slightly lower life satisfaction than students in other high-performing countries

Children, like adults, strive to do their best when they are joyful and have a strong sense of purpose in their lives, while they suffer when they are unhappy and cannot find meaning in their own lives. This is particularly true for 15-year-olds, who are in the middle of adolescence – a period of rapid emotional and physical change (Patton et al., 2016[12]). Adolescence is a time of emerging independence and self-discovery, when certain vulnerabilities may be revealed, and challenges – to the adolescent and his or her environment – may arise (Wigfield, Byrnes and Eccles, 2006[13]).

Against this background, in both PISA 2015 and PISA 2018 students were asked to rate their life satisfaction on a scale from 0 to 10, where 0 means the worst possible life, and 10 means the best possible life. On average, across high-performing countries, students reported a level of 6.9 on a life-satisfaction scale (Table 5.1), suggesting that the "average" adolescent in a high-performing country is satisfied with life. Compared to other high-performing countries, students in Beijing, Shanghai, Jiangsu and Zhejiang are slightly less satisfied with their lives, even if the majority of Chinese (B-S-J-Z) students are moderately or very satisfied with their lives.

Table 5.1. Chinese students' life satisfaction, compared with students' life satisfaction in selected high-performing education systems, 2018

	Percentage of students who reported the following levels of life satisfaction				
	Average life satisfaction	Not satisfied (0 to 4)	somewhat satisfied (5 - 6)	Moderately satisfied (7 - 8)	Very satisfied (9 - 10)
	Mean	%	%	%	%
High-performing country average	6,88	17,77	18,01	33,64	30,57
B-S-J-Z (China)	6,64	18,7	22,1	34,2	25,0
United Kingdom	6,16	26,3	21,2	32,3	20,2
Japan	6,18	24,7	25,0	30,4	19,8
Korea	6,52	22,8	20,5	30,7	26,1
Ireland	6,74	18,4	20,2	35,1	26,3
Poland	6,74	19,4	18,8	32,5	29,4
Slovenia	6,86	19,6	16,3	30,0	34,1
Sweden	7,01	16,6	16,7	34,1	32,6
Germany	7,02	16,7	16,7	32,8	33,7
OECD average	7,04	16,2	17,0	33,7	33,2
France	7,19	11,8	18,6	39,1	30,5
Estonia	7,19	14,5	15,7	35,2	34,6
Finland	7,19	10,4	12,0	34,8	42,8

Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang. Countries are listed in ascending order of students' life satisfaction, on a scale of 0 to 10.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, Table III.B1.11.1, https://www.oecd.org/pisa/data/2018database/.

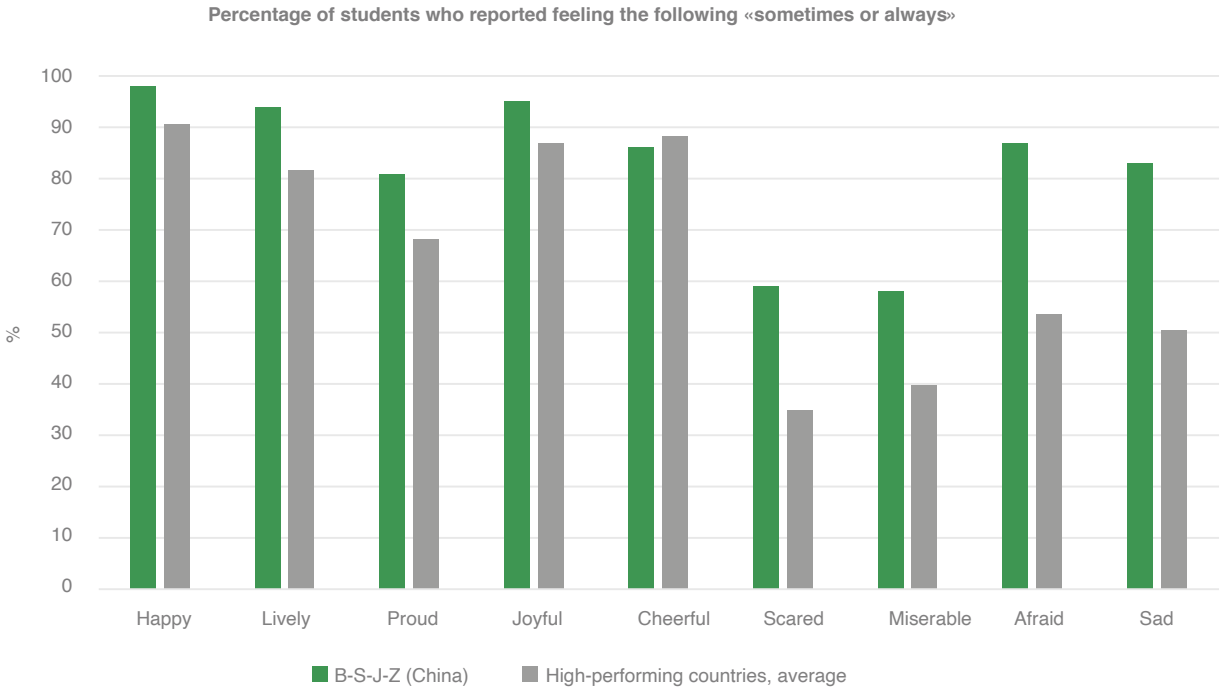
» 15-year-olds in B-S-J-Z (China) frequently experience both positive and negative feelings

Given growing interest in student well-being, PISA 2018, for the first time, asked students how they normally feel in their lives. Students reported their positive – "happy", "lively", "proud", "joyful" and "cheerful" – and negative – "scared", "miserable", "afraid" and "sad". Positive and negative feelings are important student outcomes in themselves, but they are also related to students' academic growth and well-being. According to the broaden-and-build theory, the experience of positive emotions, such as happiness, pride, enjoyment and love, urges students to play, explore, aspire and be creative, broadening and improving their skills in the process (Fredrickson, 2001[14]). In the school context, positive affect is positively associated with motivation, self-efficacy and engagement at school, and indirectly with academic achievement (King et al., 2015[15]; Mega, Ronconi and De Beni, 2014[16]; Weber, Wagner and Ruch, 2016[17]). The positive effects extend beyond the school

context as well. Experiencing positive emotions, for instance, has been correlated to better health, fewer sleep problems, greater life satisfaction and other positive life outcomes.

Overall, students reported feeling good in their lives in all high-performing countries (Figure 5.6). On average across these countries, more than 80% of students reported sometimes or always feeling happy, cheerful, joyful and lively; 68% reported feeling proud with the same frequency. Among all high-performing countries, students in Beijing, Shanghai, Jiangsu and Zhejiang represented the highest proportion of students who feel happy, lively or joyful most of the time. Overall, B-S-J-Z (China) scores very high in terms of positive feelings that students sometimes or always have.

Figure 5.6. Chinese students' positive and negative feelings, compared with students' positive and negative feelings in selected high-performing education systems, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, Tables III.B1.12.1 and III.B1.12.2, https://www.oecd.org/pisa/data/2018database/.

By contrast, B-S-J-Z (China) also has a very high proportion of students that feel scared and miserable sometimes or most of the time, and an extremely high proportion of students that feel afraid and sad. More than 80% of Chinese students stated that they have these feelings sometimes or always. While negative feelings have a role to play in students' lives – for instance, they prevent people from engaging in risky behaviours (Warr, 2000[18]) – they can be very harmful in the long run. Experiencing negative emotions, such as sadness, anger and despair, is often negatively correlated to further academic and life outcomes (Kuppens, Realo and Diener, 2008[19]; Ong et al., 2013[20]; Pressman, Jenkins and Moskowitz, 2019[21]). Therefore this outcome can be seen as worrisome, but also quite surprising given that a very high percentage of students in B-S-J-Z (China) reported frequently experiencing positive feelings such as happiness and joy.

» **Students in B-S-J-Z (China) report high self-efficacy and moderate levels of fear of failure**

Self-efficacy is the extent to which individuals believe in their own ability to engage in certain activities and perform specific tasks, especially when facing adverse circumstances (Bandura, 1977[22]). According to social cognitive theory, students are more likely to set challenging goals for themselves, try harder and persist longer when they believe they will succeed (Bandura, 1977[22]; Ozer and Bandura, 1990[23]). The other side of this coin is fear of failure, which is the tendency to avoid mistakes because they may be regarded as shameful and could signal a lack of innate ability and perhaps even an uncertain future (Conroy, Willow and Metzler, 2002[24]).

When compared to other high-performing countries, students in Beijing, Shanghai, Jiangsu and Zhejiang have relatively high self-efficacy and a moderate fear of failure (Table 5.2). In B-S-J-Z (China), over 80% of the students feel that they can

"manage one way or another", "feel proud of their accomplishments" and feel that "belief in themselves gets them through hard times". In contrast to many other Asian countries where students expressed higher levels of fear of failure, B-S-J-Z (China)'s outcomes are more in line with European countries, where students expressed less fear. The latter does not hold for only one item, which is the fear of "what others think of me when I am failing".

» **Students in B-S-J-Z (China) are very competitive and motivated while having moderate levels of schoolwork-related anxiety**

PISA provides indicators of how motivated students are to achieve – both in school and beyond. Motivated students tend to do better at school. On average, across OECD countries, students who are among the most motivated score 38 points higher in science (the equivalent of more than one year of schooling) than students who are among the least motivated. Achievement motivation is also related to life satisfaction in a mutually reinforcing way. Students who are highly satisfied with their lives tend to have greater resiliency and are more tenacious in the face of academic challenges. A positive view of the world and life circumstances builds their self-efficacy and their motivation to achieve. In turn, a greater motivation to achieve, paired with realised achievements, gives students a sense of purpose in life.

But there can also be downsides to achievement motivation and competition, particularly when those are responses to external pressure. If a certain amount of tension or concern is essential to motivation and high performance, too much pressure can be counterproductive for a child's cognitive development and psychological well-being. Both teachers and parents need to find ways to encourage students' motivation to learn and achieve without generating an excessive fear of failure.

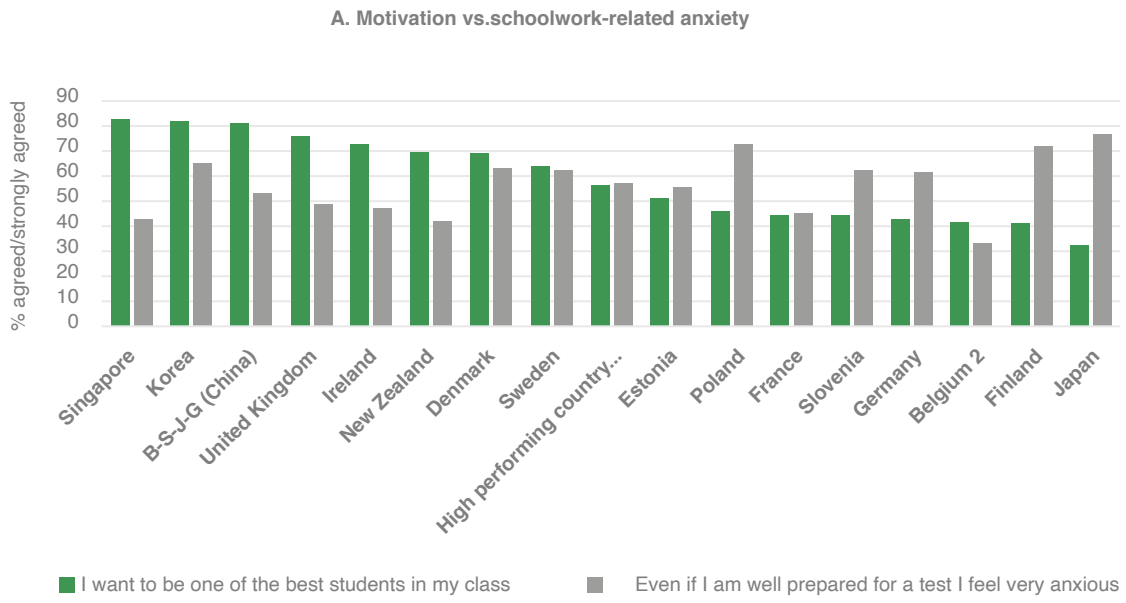
Table 5.2. Chinese students' self-efficacy and fear of failure, compared with student self-efficacy and fear of failure in selected high-performing education systems, 2018

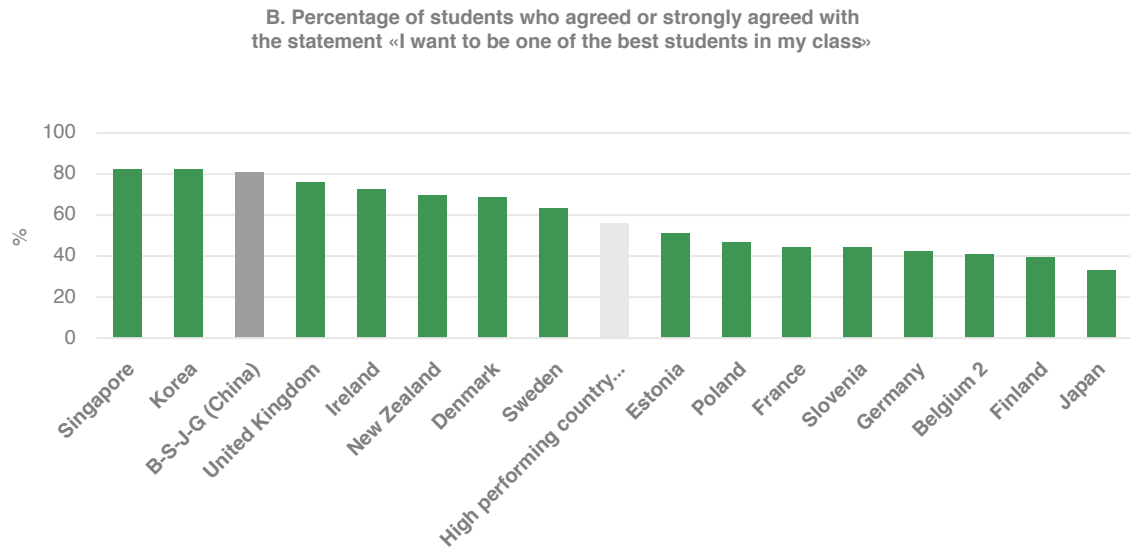
	I usually manage one way or another	I feel proud that I have accomplished things	I feel that I can handle many things at a time	My belief in myself gets me through hard times	When I'm in a difficult situation, I can usually find my way out of it	When I'm failing, I worry about what others think of me	When I'm failing, I'm afraid that I might not have enough talent	When I'm failing, this makes me doubt my plans for the future
	%	%	%	%	%	%	%	%
High-performing country average	89	86	67	68	82	58	57	56
B-S-J-Z (China)	82	90	61	81	74	78	53	51
Belgium (Flemish Community)	89	91	64	57	83	47	44	53
Denmark	91	87	78	71	90	58	58	47
Estonia	92	85	71	71	87	46	48	45
Finland	94	89	68	71	84	50	45	41
France	92	87	67	59	75	47	62	62
Germany	85	82	69	68	84	48	38	37
Ireland	94	90	72	66	85	64	63	65
Japan	65	69	41	56	59	77	74	61
Korea	86	91	55	77	81	75	66	54
New Zealand	94	93	68	66	85	65	63	68
Poland	88	90	73	69	83	54	57	58
Singapore	94	95	62	77	86	72	73	78
Slovenia	89	79	75	77	85	63	55	54
Sweden	93	74	74	66	83	53	56	53
United Kingdom	90	86	66	59	80	63	63	70

Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, Tables III.B1.13.1 and III.B1.13.2, https://www.oecd.org/pisa/data/2018database/.

As can be seen from Figure 5.7, motivation to achieve among students in B-S-J-Z (China) is much higher than in many other high-performing countries. Over 80% of students in Beijing, Shanghai, Jiangsu and Zhejiang reported that they want to be the best student in class, while in Finland, for example, only 40% of the students feel this way. While in many countries motivation to achieve often goes hand in hand with work-related anxiety, this does not seem to be as much the case in B-S-J-Z (China), where this outcome is close to the average. Previous literature has suggested that learners in East Asian societies, in particular, are more fearful of tests and assessments and less confident of their school skills than were, for example, children of western countries (Ho, 2009[10]). It was suggested that an explanation for this could be the prevalence of high-stakes examinations in these societies. The findings of PISA 2018 are not consistent with these previous findings.

Figure 5.7. Chinese students' motivation, attitudes towards competition and schoolwork-related anxiety, compared with the same indicators for students in selected high-performing education systems, 2015





Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Guangdong.
Source: Authors' own calculations based on OECD (2015[25]) *PISA 2015 Database*, https://www.oecd.org/pisa/data/2015database/.

» The relationship between non-cognitive skills and student achievement

Prior studies have shown that non-cognitive skills are important for both academic achievement and later life outcomes (Kautz et al., 2014[26]; Borghans, Meijers and ter Weel, 2008[27]). In this section, how Chinese students' performance in the PISA domains is related to their non-cognitive skills, as well as their well-being, will be analysed. How this relationship differs from the relationship found in other high-performing countries will also be examined. While the previous section showed descriptive differences between Chinese students and students from other high-performing countries, this section answers the question of whether these differences are likely to matter in driving academic achievement.

» Non-cognitive skills are strongly related to student performance

Figure 5.8 shows the change in reading, mathematics and science performance associated with a 1 standard deviation increase on the indices of the various non-cognitive skills in students in Beijing, Shanghai, Jiangsu and Zhejiang. The results show that high competitiveness, ambitious learning goals, and high perception of school being valuable relate positively to achievement. High motivation to master tasks and motivation to achieve also increase performance. Students who score high on test anxiety perform worse. These results are in line with prior research showing that competition can be beneficial to student performance (Dennis Madrid, Canas and Ortega-Medina, 2007[28]; Johnson and Johnson, 1974[29]), as well as studies showing test anxiety relating negatively to achievement (Rana and Mahmood, 2010[30]; Hancock, 2001[31]). Mastery motivation, as well as goal setting, have also been correlated to increased performance (Moeller, Theiler and Wu, 2012[32]; Ames, 1992[33]).

Figure 5.8. Relationship between non-cognitive skills and Chinese student performance in reading, mathematics and science

Note: Data for China are limited to four regions, Beijing, Shanghai, Jiangsu and Zhejiang, for attitude towards competition, mastery goal orientation, motivation to master tasks, and value of school. Data for test anxiety and achievement motivation are limited to Beijing, Shanghai, Jiangsu, and Guangdong. Data were controlled for student socio-economic background.
* indicates a statistically significant association ($p < .05$).
Source: Authors' own calculations based on OECD (2015[5]), *PISA 2015 Database*, https://www.oecd.org/pisa/data/2015database/ and OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

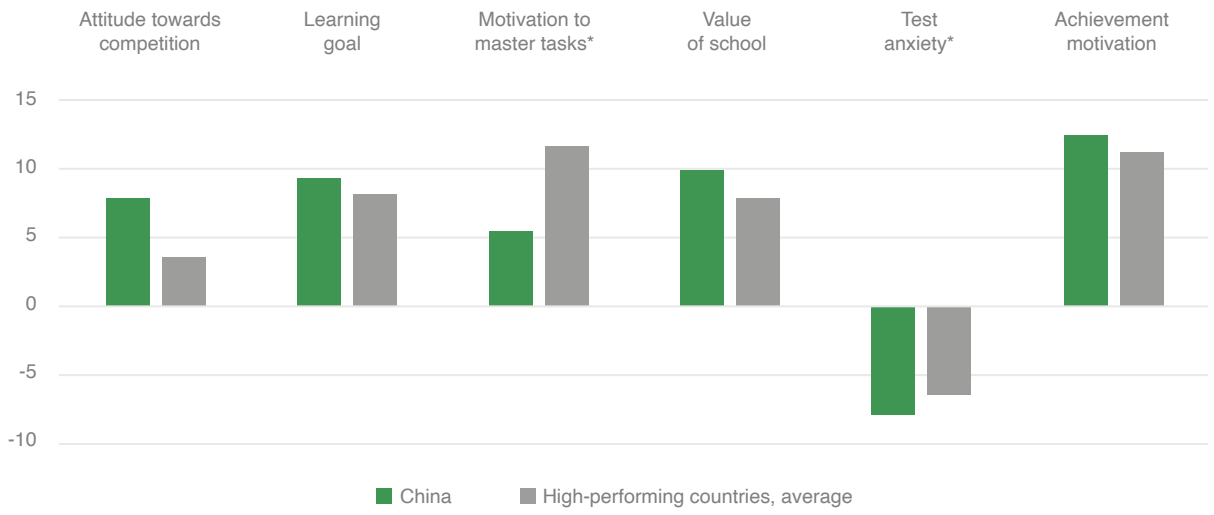
» **Student well-being has a relatively weak relationship with student achievement**

In Annex Figure 1 found in Annex section, the results of similar analyses are plotted for the various student well-being outcomes. A high level of self-efficacy is related to higher mathematics performance but lower reading performance. Students who report high life satisfaction and high levels of experienced positive feelings do neither better nor worse. Interestingly, a high perceived meaning in life negatively relates to cognitive outcomes. Somewhat surprisingly, fear of failure is positively related to reading scores. However, this relationship is driven by gender differences in both reading scores and fear of failure.

» **The influence of non-cognitive skills and well-being on academic performance is similar in B-S-J-Z (China) and other high-performing countries**

Figure 5.9 (on non-cognitive skills) and Annex Figure 2 (on student well-being) in Annex section show how the relationship between non-cognitive outcomes and performance differs between B-S-J-Z (China) and other high-performing education systems. On most variables, the difference between B-S-J-Z (China) and other high-performing countries is not significant. However, high motivation to master tasks is more positively associated with cognitive outcomes in other high-performing countries. Test anxiety relates more negatively to learning outcomes in Beijing, Shanghai, Jiangsu and Zhejiang. In terms of student well-being, fear of failure and self-efficacy are less influential in B-S-J-Z (China). Life satisfaction also differs significantly, however its influence is relatively small in magnitude.

Figure 5.9. Comparing the relationship between non-cognitive skills and reading performance between China and other high-performing education systems

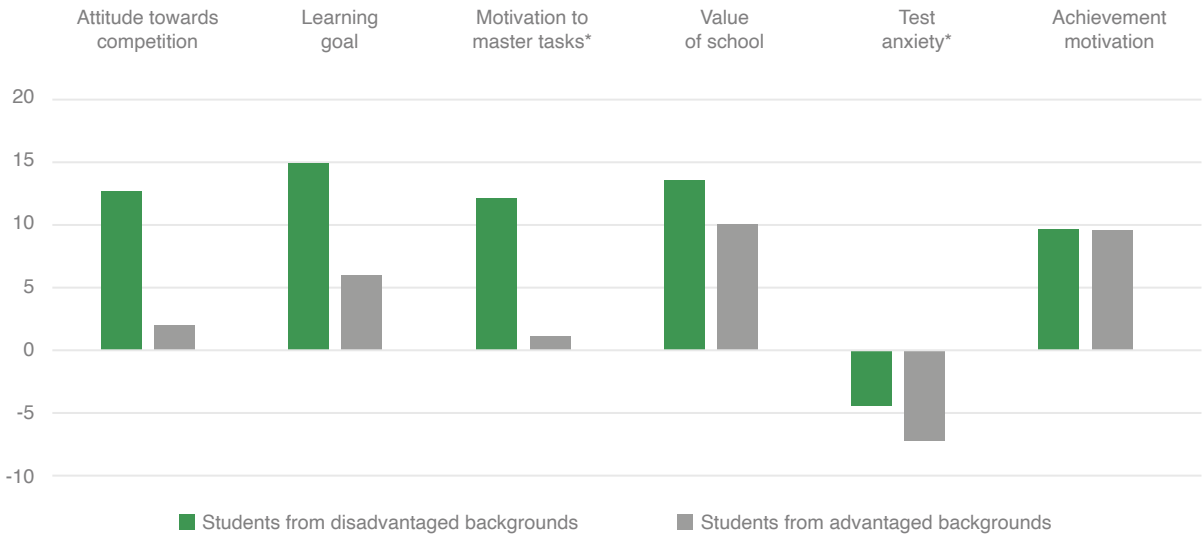


Note: Data for China are limited to four regions, Beijing, Shanghai, Jiangsu and Zhejiang, for attitude towards competition, mastery goal orientation, motivation to master tasks, and value of school. Data for test anxiety and achievement motivation are limited to Beijing, Shanghai, Jiangsu, and Guangdong.
* indicates a statistically significant difference ($p < .05$) between the magnitude of the association in China and the other high-performing countries.
Source: Authors' own calculations based on OECD (2015[5]), *PISA 2015 Database*, https://www.oecd.org/pisa/data/2015database/ and OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **Heterogeneity in the importance of non-cognitive skills in driving academic achievement between subgroups**

The relationship between non-cognitive skills and well-being and learning outcomes may depend on the type of student. Therefore, the heterogeneous impacts of the previously studied non-cognitive outcomes in B-S-J-Z (China) across gender, socio-economic background, and urbanity of the school environment are considered. No striking differences were found between boys and girls and between students from urban and rural schools. However, there were some differences between socio-economically advantaged and disadvantaged students. These analyses are shown in Figure 5.10 (on non-cognitive skills) and Annex Figure 3 (on student well-being).

Figure 5.10. Comparing the relationship between non-cognitive skills and reading performance between students from advantaged and disadvantaged backgrounds in China



Note: Data for China are limited to four regions, Beijing, Shanghai, Jiangsu and Zhejiang, for attitude towards competition, mastery goal orientation, motivation to master tasks, and value of school. Data for test anxiety and achievement motivation are limited to Beijing, Shanghai, Jiangsu, and Guangdong. * indicates a statistically significant difference ($p < .05$) between the magnitude of the association for advantaged and disadvantaged students.
Source: Authors' own calculations based on OECD (2015[5]), *PISA 2015 Database*, https://www.oecd.org/pisa/data/2015database/ and OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **A competitive attitude and task mastery motivation are more important for students from a disadvantaged socio-economic background**

A positive attitude towards competition as well as high motivation to master tasks appear to be more beneficial for students from disadvantaged socio-economic backgrounds than for students from more advantaged backgrounds. The gaps between the importance of ambitious learning goals and experiencing positive feelings are also relatively large but are only significant at the 10% level. These findings could imply that students from advantaged backgrounds have more external stimuli to perform (e.g. highly involved parents, private tutoring), and therefore have to rely less on their non-cognitive skills in order to push themselves to achieve. It could also be that high non-cognitive skills can compensate for lower levels of intrinsic learning ability.

While identifying the exact mechanism behind these results are beyond the scope of this chapter, the results do suggest some improvements in the achievement gap between advantaged and disadvantaged students can be made. Since non-cognitive skills are more malleable than cognitive skills (Cunha et al., 2006[34]), with changes occurring even up to adolescence (Hoeschler, Balestra and Backes-Gellner, 2018[35]), interventions aimed at improving disadvantaged students' task mastery motivation could help facilitate increased learning outcomes for these particular students.

Equality of performance in reading, mathematics and science

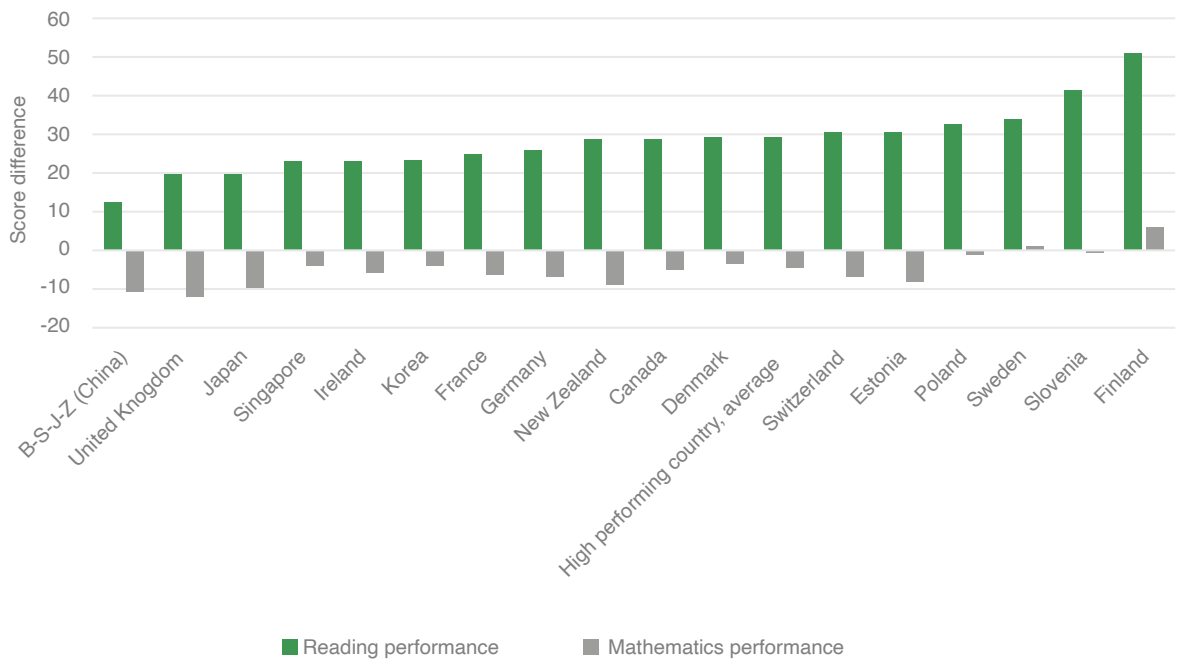
Inclusion and fairness in education require that all children have access to educational opportunities that lead to effective learning outcomes, irrespective of their gender, ethnicity, or their parents' wealth, education or occupation. Thanks to detailed information about the background of participating students, PISA can measure inclusion and fairness among the student population. In this section, the relative performance of B-S-J-Z (China) on the most important indicators of equity traditionally used in the PISA study is examined.

» China's performance on key equity indicators

» The gender gap among students in reading in B-S-J-Z (China) is smaller than in other high-performing countries

Figure 5.11 presents a summary of the differences between boys' and girls' performance in reading and mathematics in Beijing, Shanghai, Jiangsu and Zhejiang compared to high-performing education systems on average. In B-S-J-Z (China), girls outperformed boys in reading by 13 score points. While the advantage in reading in favour of girls is common in all high-performing countries that participated in PISA 2018, this advantage in favour of girls is the smallest in B-S-J-Z (China). Meanwhile, the difference in performance in mathematics, where traditionally boys tend to outperform girls, is even larger in B-S-J-Z (China) than in most other high-performing countries. In this case, the gender gap in B-S-J-Z (China) is the second-largest, after Japan, among high-performing countries. The same is true for the gender gap in science. The difference between B-S-J-Z (China) and other high-performing countries with respect to the gender gaps in all three subjects might indicate a disadvantaged position for girls in the Chinese education system.

Figure 5.11. Gender gaps in reading and mathematics in China and other high-performing education systems, 2018



Note: A positive score difference denotes the difference in favour of girls, while a negative score difference represents a difference in favour of boys. Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» Socio-economic inequalities in performance are relatively low in B-S-J-Z (China)

The equity of education systems with respect to students from different socio-economic backgrounds can be examined through different statistical aspects of the relationship between students' performance in PISA and students' socio-economic status. Four aspects of equity deserve particular attention: 1) the slope; and 2) the strength of the relationship between socio-economic status and performance; 3) the coverage index of the 15-year-old population; and 4) the percentage of resilient students. The slope indicates to what extent students with more advantaged socio-economic backgrounds perform better than disadvantaged students, within each country on average. The strength indicates how small the chances are for disadvantaged students to perform as well as more advantaged students. Policies that promote equity and inclusion in education are expected to "raise and level" this relationship – i.e. to result in higher levels, but milder slopes and weaker relationships. The percentage of resilient students indicates the extent to which excellence in education is apparent among the most disadvantaged students.

Table 5.3 shows the main indicators of socio-economic inequalities in reading and mathematics performance for students in Beijing, Shanghai, Jiangsu and Zhejiang. When examining the inequality in learning outcomes through the slope

and the strength of the relationship between mean performance and socio-economic status, B-S-J-Z (China) stands out as having relatively mild slopes, meaning that socio-economic status is associated with smaller differences in mean performance than across OECD countries on average. Similar conclusions can be drawn when compared to other high-performing countries. At the same time, the relationship between socio-economic status and performance is at least as strong in Poland, OECD countries (on average) and Singapore. On the other hand, in Estonia and Canada, the relationship between socio-economic status and performance is much weaker than in B-S-J-Z (China). This implies that while the outcomes of advantaged and disadvantaged students do not differ as much in B-S-J-Z (China) as in other high-performing countries, the chances of achieving good outcomes remain relatively low for disadvantaged students, compared to their more advantaged peers in countries such as Estonia and Canada. In B-S-J-Z (China), 12% of the most disadvantaged students are able to achieve excellent results. This is in line with many other high-performing countries, except Estonia, where 16 % of students can be categorised as resilient.

Table 5.3. Main indicators of socio-economic inequalities in education

	Mean reading score in PISA 2018	Strength: Percentage of variance in reading performance explained by ESCS (R^2)	Difference between advantaged and disadvantaged students in reading	Percentage of disadvantaged students who are academically resilient
OECD average	487	12,0	89	11
High-performing countries, average	509		86	12
B-S-J-Z (China)	555	12,6	82	12
Canada	520	6,7	68	14
Denmark	501	9,9	78	12
Estonia	523	6,2	61	16
Finland	520	9,2	79	13
France	493	17,5	107	10
Germany	498	17,2	113	10
Ireland	518	10,7	75	13
Japan	504	8,0	72	12
New Zealand	506	12,9	96	12
Poland	512	11,6	90	11
Singapore	549	13,2	104	10
Slovenia	495	12,1	80	12
Sweden	506	10,7	89	11
Switzerland	484	15,6	104	9
United Kingdom	504	9,3	80	14

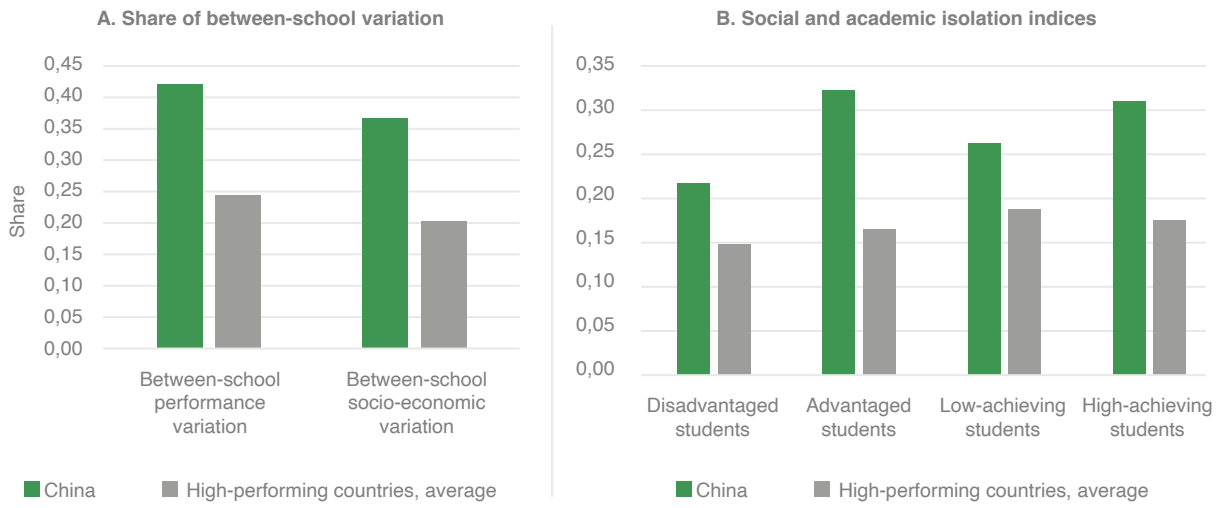
Note: B S-J-Z (China) = Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, Tables I.B1.10, II.B1.2.1, II.B1.2.3 and II.B1.3.1, https://www.oecd.org/pisa/data/2018database/.

» **School segregation based on performance and socio-economic background is relatively high in B-S-J-Z (China)**

Performance differences between advantaged and disadvantaged students could be related to the extent to which these students are exposed to high-quality classmates, as prior studies show that peer effects are commonplace and sizeable (e.g. Sacerdote (2011[36]). In highly segregated school systems, disadvantaged students are less likely to encounter advantaged, high-performing peers, potentially exacerbating the performance gap along socio-economic background. PISA measures the extent to which students are segregated along socio-economic background and performance by comparing the variation in performance and student socio-economic background between and within schools within a certain country, and by isolation indices, where higher values correspond to a higher level of segregation. High levels of variation between-, relative to within-, schools signify higher levels of segregation. The social (academic) isolation index measures the extent to which socio-economically advantaged (high-performing) and disadvantaged (low-performing) students are concentrated within certain schools. Higher values correspond to higher levels of isolation, or segregation.

Figure 5.12 shows the between- school share of the total variation in B-S-J-Z (China)'s performance and student socio-economic status, and the social and academic isolation indices compared to the average across the rest of the high-performing countries. The results show that Chinese schools are more segregated than schools in other high-performing countries. The between-school variation in performance and student socio-economic background is higher than in the rest of the high-performing countries. The isolation indices show that advantaged students are more isolated than disadvantaged students, and to a lesser extent, the same pattern is visible regarding low- and high-achieving students.

Figure 5.12. China's social and academic segregation, compared with social and academic segregation in selected high-performing education systems, 2018

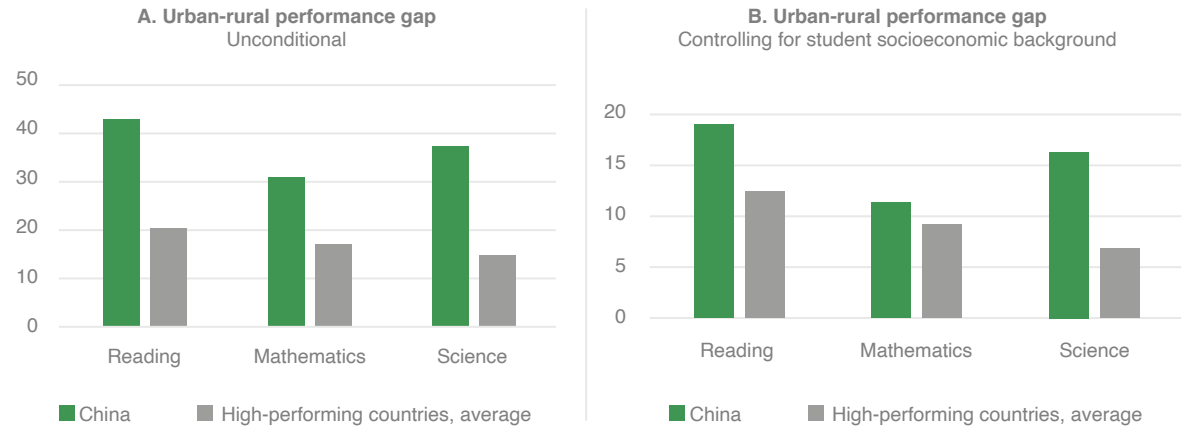


Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, Tables II.B1.4.1, II.B1.4.2, II.B1.4.6 and II.B1.4.7, https://www.oecd.org/pisa/data/2018database/.

» **Differences in performance between urban and rural areas are significant**

In Beijing, Shanghai, Jiangsu and Zhejiang, there is a significant difference between the performance of students in urban and rural schools in all PISA domains, with a 42 score point difference in urban versus rural schools in reading, and 31 and 37 point differences in mathematics and science, respectively. These differences are larger than the average urban-rural performance gap in other high-performing countries, as can be seen in Figure 5.13. It also shows that after accounting for differences in socio-economic background between students in urban and rural schools, the achievement gap halves. However, even after taking this into account, the gaps in B-S-J-Z (China) are larger than in the other high-performing countries, particularly in the reading and science domains.

Figure 5.13. Performance gaps in reading, mathematics and science between students in urban and rural schools in China and selected high-performing education systems, 2018

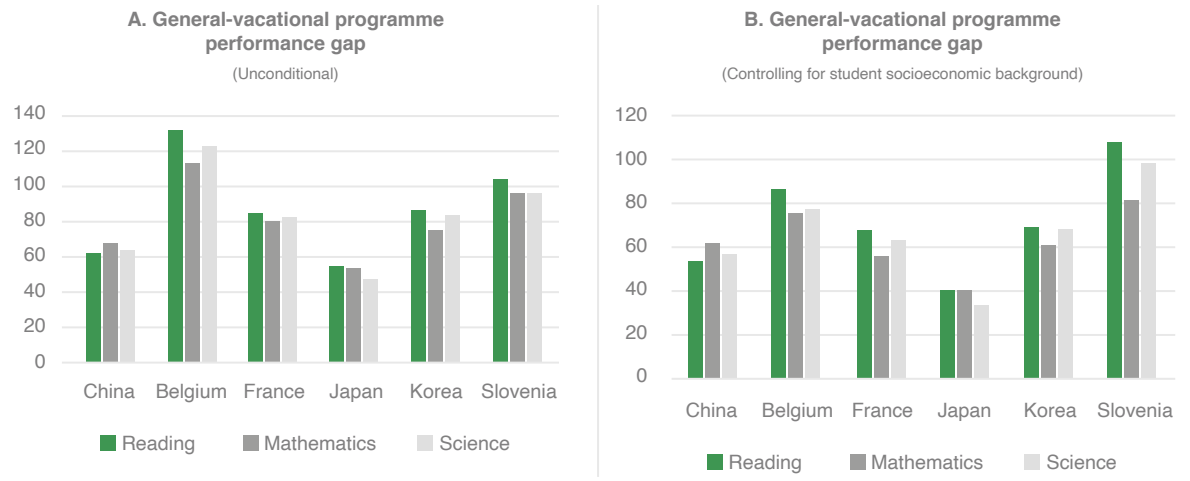


Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **There is a large gap between students in general and vocational programmes, but in this B-S-J-Z (China) is not unique**

Prior studies examining the 2012 PISA performance of Shanghai's students showed that there are sizeable differences between students attending general schools, and students attending vocational schools (Liang, Kidwai and Zhang, 2016[37]). Figure 5.14 shows the performance gap between these groups for Beijing, Shanghai, Jiangsu and Zhejiang in 2018 relative to the other high-performing countries. The results show that the performance gap between students attending general schools and students attending vocational programmes is sizeable in all countries for which data is available. In B-S-J-Z (China), the gap is smaller than the one in Belgium and Slovenia, and comparable to the gap in France, Japan and Korea, especially once differences in students' socio-economic background are accounted for.

Figure 5.14. Performance gaps between students in general and vocational programmes in China and selected high-performing education systems, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» Decomposing gender, socio-economic status and rural/urban gaps

In this section, the Oaxaca-Blinder decomposition method (Oaxaca, 1973[6]; Blinder, 1973[7]) is applied to investigate performance gaps between different subgroups of students within B-S-J-Z (China). The gender gap, differences across socio-economic background, the urban-rural achievement gap and the difference between students in general and vocational programmes are examined. While the gender gap cannot be attributed to differences in other observable characteristics between boys and girls, both the urban-rural gap and the gap between students with an advantaged and disadvantaged socio-economic background can mostly be explained through a combination of other individual, peer, or school and teacher characteristics. The gap between students attending general vs. vocational programmes also remains largely unexplained. In this section, therefore, the main focus will be on decomposing the advantaged-disadvantaged and urban-rural gaps, which are presented in Figure 5.15 and Figure 5.16.[7]

Figure 5.15. Oaxaca-Blinder decomposition of the performance gaps in reading, mathematics and science between Chinese students in urban and rural schools, 2018

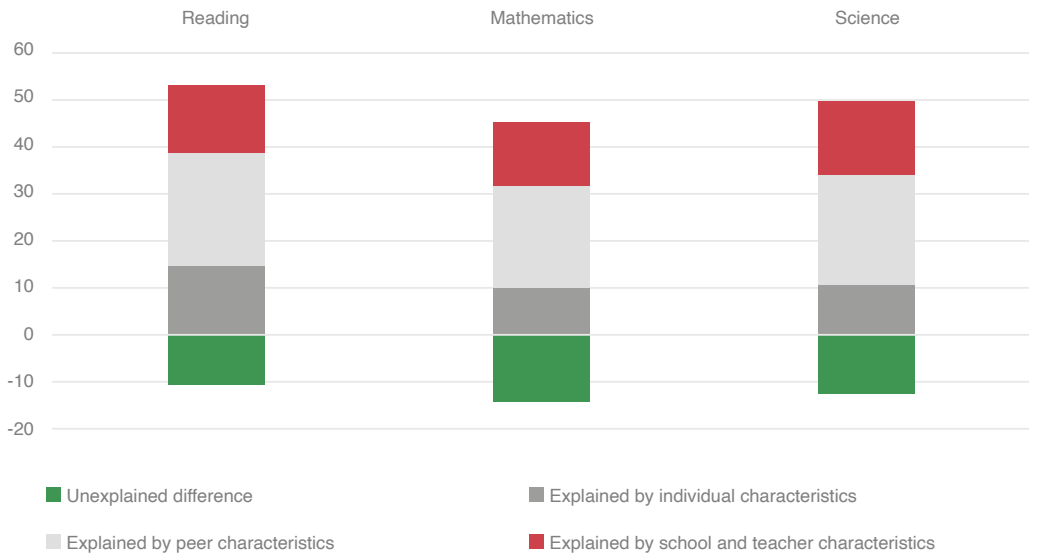
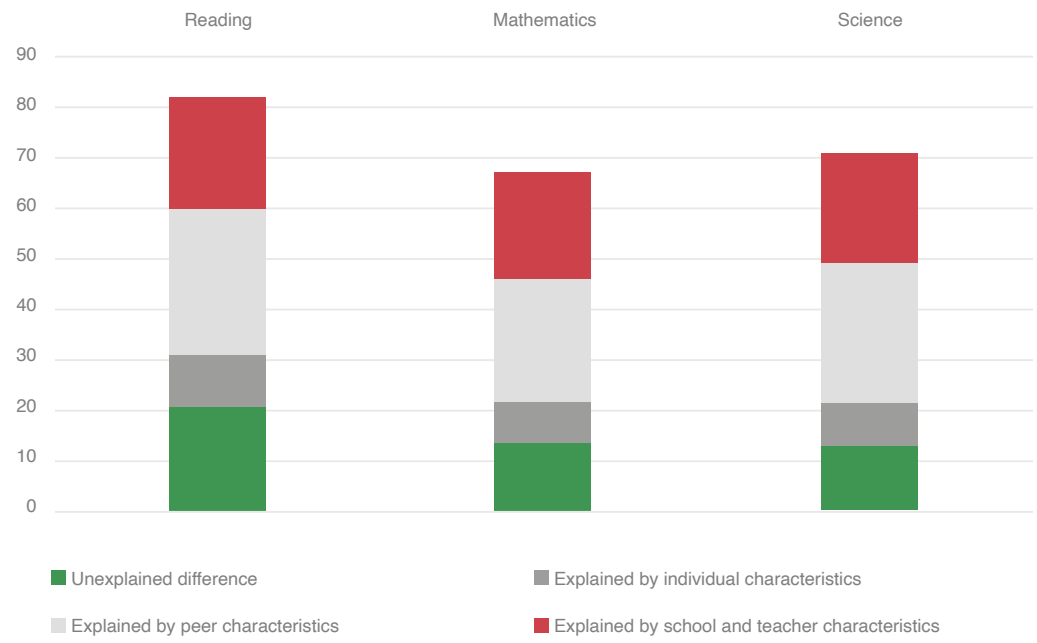


Figure 5.16. Oaxaca-Blinder decomposition of the performance gaps in reading, mathematics and science between Chinese students from advantaged and disadvantaged backgrounds, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **Differences in individual, peer, and school characteristics explain most of the advantaged-disadvantaged and urban-rural achievement gaps**

Peer socio-economic status plays an important role in the performance gaps between advantaged and disadvantaged students. However, it should also be noted that individual and school-average socio-economic background are strongly inter-correlated. Therefore, some of the peer effects might be overstated. The urban-rural gap is also, to some extent, a gap between students from different socio-economic backgrounds. Students in urban schools come from more advantaged backgrounds and are exposed to higher quality peers. In terms of school characteristics, part of both the rural-urban and advantaged-disadvantaged gaps are explained by differential levels of disciplinary climate, perceived teacher enthusiasm, and a more competitive school environment in advantaged and urban schools.

Since policy makers cannot change the characteristics of students attending certain schools, the gap attributable to individual and peer characteristics is unlikely to close. However, policy makers can strive to intervene at the school and teacher levels. School disciplinary climate and perceived teacher enthusiasm are both under the influence of the school's teaching force. Therefore ensuring an equitable distribution of high-quality teachers who can keep order and demonstrate enthusiasm while teaching could help reduce both the advantaged-disadvantaged and urban-rural achievement gaps.

Factors that determine educational performance

This section analyses the determinants of educational performance in Beijing, Shanghai, Jiangsu and Zhejiang. For this, an Education Production Function approach is employed. This framework models the output of education as a function of different inputs [see e.g. Woessmann (2016[38]) and Hanushek (2002[39])]. In this case, the outputs are student performance on the three PISA subjects. The inputs are divided into three groups: student characteristics, school characteristics, and teacher characteristics. The first group is mostly outside the control of school systems. The other two groups of factors reflect the quantity and quality of inputs in the system and the institutional structure. The basic model will later be extended to include interactions between input factors and student characteristics to investigate heterogeneity between subgroups.

» Determinants of educational performance in China

» **Time spent studying is related to increased performance, but only up to a certain point**

Table 5.4 shows the results of the Education Production Function for B-S-J-Z (China) explaining student performance on the three PISA subjects. In terms of student characteristics, socio-economic status is positively correlated to performance in all three subjects. Girls outperform boys on reading but do worse on both mathematics and science. Grade repetition and being in a below-modal grade are negatively related to performance, while being in an above-modal grade relates to higher reading and science test scores.

There is an inverted-U shaped relationship between weekly study time and performance, where study time increases achievement up to a certain point, after which additional time spent studying is related to worse performance. This is not to say that students who increase their time studying would necessarily be worse off. It could also be the case that students with lower innate ability spend more time studying in an attempt to compensate.

Table 5.4. Education Production Function OLS regression of performance on the three PISA 2018 domains in China on student, school, and teacher characteristics: Selected coefficients

	Reading	Mathematics	Science
Student characteristics			
Gender	+	-	-
Economic, social and cultural status (ESCS)	+	+	+
Grade repetition	-	-	-
Below modal grade	-	-	-
Above modal grade	+	o	+
Time spent studying	+	+	+
Time spent studying^2*	-	-	-
School characteristics			
Private school – independent	+	+	+
Private school – government-dependent	o	-	o
School-average ESCS	+	+	+
Student-teacher ratio	-	o	o
Competitive environment	+	+	+
Ability tracking within all courses	o	-	o
General programme (vs. vocational)	+	+	+
Teacher characteristics			
Professional development participation	+	+	+
Disciplinary climate	+	+	+
Teacher-directed instruction	-	-	-
Teacher feedback	-	-	-
Teacher enthusiasm	+	+	+

Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
*A squared term of time spent studying is included to allow for a quadratic effect of additional time spent studying.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **The socio-economic background of a student's peers and a competitive school environment positively affect student performance**

In terms of school characteristics, students who attend independent private schools outperform students who attend public schools as well as government-dependent private schools on all subjects. Likewise, students who attend general programmes do better than vocational students. Further, the socio-economic background of students' classroom peers is strongly positively related to performance in all subjects. A competitive school environment is also positively related to test scores in all subjects. Interestingly, while the average Chinese class size is fairly large (36-40 students), it does not seem to be detrimental to student achievement. This finding runs counter to the established literature, which tends to find negative effects of larger classes [e.g. Krueger (1999[40])]. However, a higher student-teacher ratio does reduce performance in reading.

» **Teacher professional development, teacher enthusiasm and a positive disciplinary climate are related to high student achievement**

Teacher characteristics and behaviour also affect student performance. The share of teachers that participate in professional development relates positively to test scores in all subjects. In line with previous PISA findings (OECD, 2016[41]; Ning et al., 2015[42]), a better disciplinary climate correlates to better test scores. Also in line with prior literature, teacher enthusiasm relates positively to achievement (Keller et al., 2014[43]; Kunter, 2013[44]; Larkins and McKinney, 1982[45]). However, a higher level of teacher-directed instruction practices negatively affects achievement. Somewhat surprisingly, in schools where teachers provide feedback more frequently, test scores are lower. However, these results should be interpreted with caution as the school-average indices of teacher behaviour are highly inter-correlated.

In terms of the explanatory power of all these different inputs, the proportion of test-score variation explained by the full model (the R^2) is 40%. Student characteristics alone explain 22% of the variance, with school characteristics contributing 14%, and teacher characteristics an additional 4%, of variance explained.

Having described which factors relate to student achievement in Beijing, Shanghai, Jiangsu and Zhejiang, it is instructive to see whether the same factors matter in other high-performing education systems and whether they do so to a similar extent. For this, a comparable Education Production Function OLS regression is run for the pooled sample of all students from B-S-J-Z (China) and the other high-performing countries, the results of which are shown in Table 5.5. The pooled regression includes an interaction with a B S J Z (China) dummy for each explanatory variable to test whether the influence of each predictor differs between B-S-J-Z (China) and the other countries. Additionally, country-fixed effects are controlled for by including individual dummies for each country.

Table 5.5. Education Production Function OLS regression of performance on the three PISA 2018 domains for all high-performing countries Interaction between China and student, school, and teacher characteristics: Selected coefficients

	More beneficial in China	More detrimental in China	More beneficial in other high-performing countries	More detrimental in other high-performing countries
Student characteristics				
Gender			Reading	
ESCS			Reading, Mathematics, Science	
Grade repetition				Mathematics, Science
Time spent studying^2*				Reading
School characteristics				
Private school - independent	Reading, Mathematics, Science			
Private school – government-dependent		Mathematics		
Class size				Reading, Mathematics, Science
School-average ESCS			Reading, Mathematics, Science	
Competitive environment	Reading, Mathematics, Science			
Teacher characteristics				
Professional development participation	Reading, Mathematics, Science			
Disciplinary climate	Reading, Mathematics, Science			
Teacher feedback		Reading, Science		

Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
*A squared term of time spent studying is included to allow for a quadratic effect of additional time spent studying.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **Student and peer socio-economic background is less influential in B-S-J-Z (China) than in other high-performing countries**

Looking at the interaction terms, it is clear that there are some interesting differences between B-S-J-Z (China) and other high-performing countries. In particular, students' own and peer socio-economic background are less strongly related to performance in B-S-J-Z (China) relative to other countries. The difference between boys and girls in reading is also smaller in B-S-J-Z (China). Grade repetition relates more negatively to mathematics and science performance, and the return to additional minutes spent studying turns negative more quickly in other high-performing countries.

» **A competitive school environment is more strongly related to performance in B S J Z (China) than in the other high-performing countries**

Relative to B-S-J-Z (China), students enrolled in independent private schools perform worse in other countries on all subjects, while the mathematics scores of students in government-dependent private schools are higher. Further, there is a significant negative relationship between extremely large class sizes and student performance in other high-performing countries, as opposed to in B-S-J-Z (China). A competitive school environment is more beneficial to Chinese students.

» **Teacher professional development and a positive disciplinary climate affect Chinese (B-S-J-Z) students more positively**

In terms of teacher characteristics, professional development activities positively influence student achievement in Beijing, Shanghai, Jiangsu and Zhejiang, but not in other countries. Chinese students are also more positively affected by a positive disciplinary classroom climate, but appear to be more negatively affected by higher levels of teacher feedback.

An important question is how the school- and teacher- level factors that are associated with higher performance relate to students' non-cognitive outcomes and well-being. It could be the case that some factors that improve cognitive outcomes do so at the expense of student well-being. For example, while a competitive school environment might increase performance, it could negatively affect student well-being due to increased stress and pressure to keep up with the rest of the class. In education systems such as B-S-J-Z (China), where students are especially motivated to excel, these negative consequences might even be more severe. To investigate these potential trade-offs, similar OLS regressions of the various non-cognitive skills and well-being outcomes are run on the same set of predictors from the Education Production Function, the results of which are shown in Table 5.6.

» **A co-operative school environment is beneficial to student well-being**

The most consistent finding is that a co-operative school environment is beneficial in terms of student well-being, which is in line with previous studies (Johnson et al., 1981[46]; Roseth, Johnson and Johnson, 2008[47]). In highly co-operative schools, students report experiencing more positive feelings, higher eudaimonic well-being and self-efficacy. They are also less afraid of failure and have more ambitious learning goals. In contrast, a highly competitive school environment is related to decreased life satisfaction. Both perceived co operative and competitive environments are related to higher motivation to master tasks. Interestingly, while strongly beneficial to cognitive outcomes, high peer socio-economic background negatively affects eudaimonic well-being, the frequency of experienced positive feelings, and life satisfaction of students. However, these associations become less pronounced once students' own socio-economic background is taken out of the regression.

Table 5.6. Education Production Function OLS regression of non-cognitive outcomes in B-S-J-Z (China) on student, school, and teacher characteristics: Selected coefficients

	Positive feelings	Eudaimonic	Life satisfaction	Fear of failure	Self-efficacy	Learning goals	Motivation to master tasks
School characteristics							
School-average ESCS	-	-	-				
Co-operative environment	+	+		-	+	+	+
Competitive environment			-				+
Teacher characteristics							
Disciplinary climate				-			
Teacher-directed instruction		+	+	-			+
Teacher enthusiasm						+	

Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **School and teacher characteristics do not explain much of the variation in students' non-cognitive skills and well-being outcomes**

The findings for most other school and teacher characteristics are less consistent. A strong disciplinary climate reduces fear of failure but is unrelated to most other outcomes. Teacher-directed instruction practices, while entering negatively in the regressions on cognitive outcomes, relate positively to students' life satisfaction and eudaimonic well-being, and are associated with reduced fear of failure. Taken together, the inputs explain significantly less variation in students' non-cognitive than in their cognitive outcomes, with an average of 6% variance explained (the R^2) across the regressions.

» **The factors associated with student performance are remarkably similar across different subgroups of students**

Finally, whether the factors that are associated with increased student performance on average are similar for all students or if there are certain subgroups of students that benefit more/less from these factors is analysed. These heterogeneous impacts of inputs in the Education Production Function are important in identifying potential measures to increase equity in educational outcomes between different groups of students.

For this, Education Production Function OLS regressions were conducted, interacting all input factors with student gender, students' socio-economic background, and the urbanity of the school environment separately. Further, quantile regressions were run on the 10th and 90th percentile of the outcome distribution to investigate differences between low- and high-performing students. The results show a striking similarity in the factors that matter for all different subgroups. No inputs are consistently more/less related to student performance for specific types of students. These patterns are similar in other high-performing countries.

» Explaining performance gaps

Previous sections showed that in 2018, Chinese students outperformed all other countries in all three PISA subjects. In this section, the Oaxaca-Blinder decomposition techniques (Oaxaca, 1973[6]; Blinder, 1973[7]) are employed to investigate how much of the difference in performance between Beijing, Shanghai, Jiangsu and Zhejiang and other high-performing education systems can be explained through

differences in observable student, peer, and school characteristics. Due to space constraints, the comparisons in this chapter are limited to 2 of the selected 16 high-performing countries: Finland and Singapore. The explanatory variables included in the analyses are the same as those used in the estimation of the Education Production Functions from the previous section.

» **Differences in observable characteristics reduce the performance gap between B S J Z and other high-performing education systems**

The results of the decompositions between China and Singapore, and China and Finland are plotted in Figure 5.17 and Figure 5.18. What is most striking is that differences in observable characteristics between B-S-J-Z (China) and other high-performing countries reduce, rather than increase, the performance gap. This implies that if Chinese students had similar observable characteristics to those in other countries, the achievement gap would be even larger than the one observed in actuality. Diving deeper into the characteristics contributing to the performance gap, it shows that individual and peer socio-economic status are the largest contributing factors. Chinese students on average score lower on PISA's index on economic, social and cultural status than students from other high-performing countries, and these factors are strongly related to PISA performance.

» **Differences in disciplinary climate and teacher enthusiasm explain some of the performance gaps between B-S-J-Z (China) and Finland**

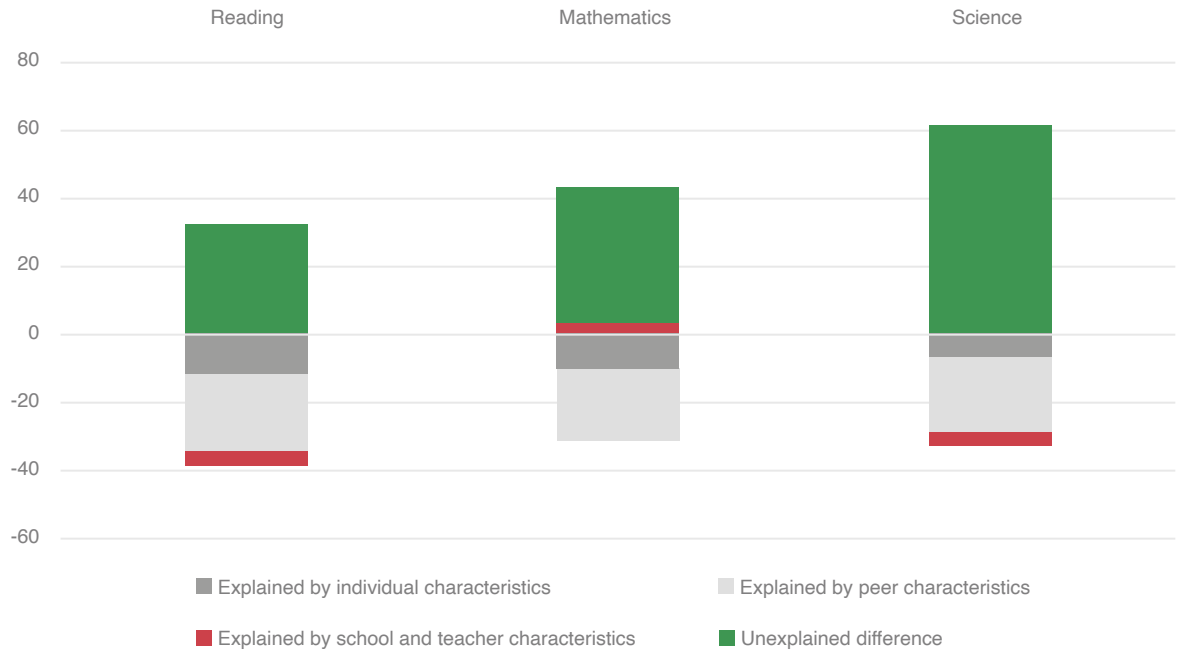
Differences in school and teacher characteristics explain relatively little of the observed achievement gap between B-S-J-Z (China) and Singapore, but do play a significant role in explaining the gap between B-S-J-Z (China) and Finland. Within this category, differences in the disciplinary climate and perceived teacher enthusiasm, which are both higher in B S J Z (China), contribute to explaining the performance gap.

» **Students in B-S-J-Z (China) spend the most time on learning activities per week out of all high-performing countries**

Another individual student characteristic that is related to the observed performance gap is the amount of time studied per week. Descriptively, Chinese students report the highest average amount of minutes per week spent studying, as shown in Figure 5.19.

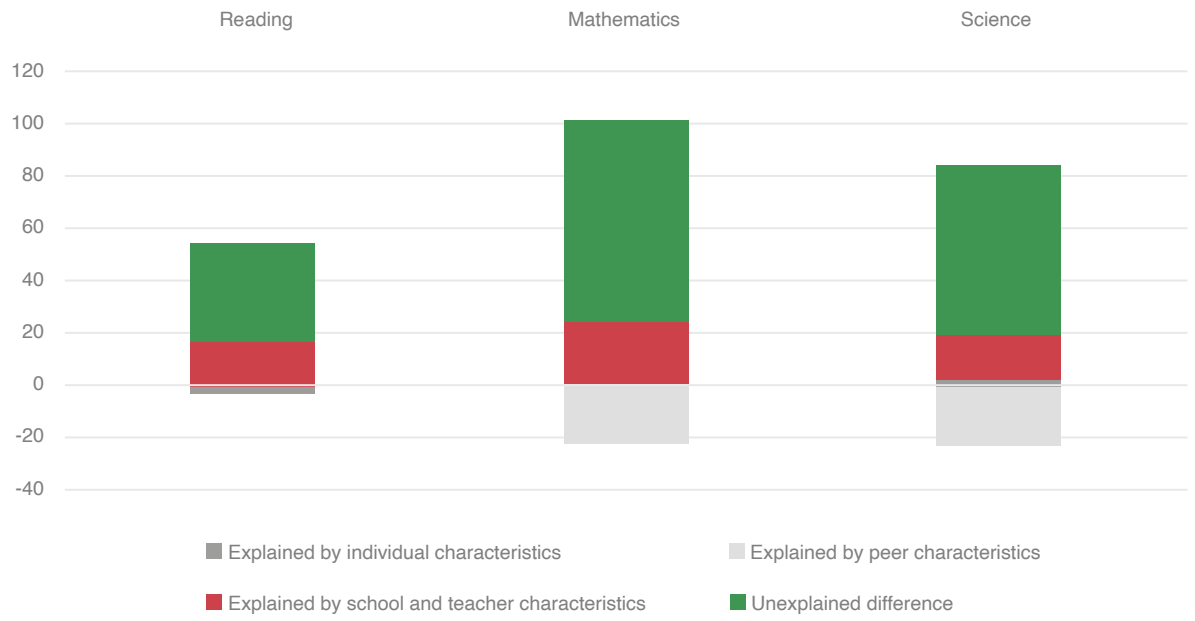
However, as seen above, there is an inverted U-shaped relationship between study time and performance. In this section, how the association between performance and time studying varies between B-S-J-Z (China) and other high-performing countries is shown. For this, a quadratic line between minutes spent studying and performance on the reading test for B S J Z (China) compared to Singapore and Finland is fit, the results of which are shown in Figure 5.20.[11]

Figure 5.17. Oaxaca-Blinder decomposition of the gap in performance between China and Singapore in reading, mathematics and science, 2018



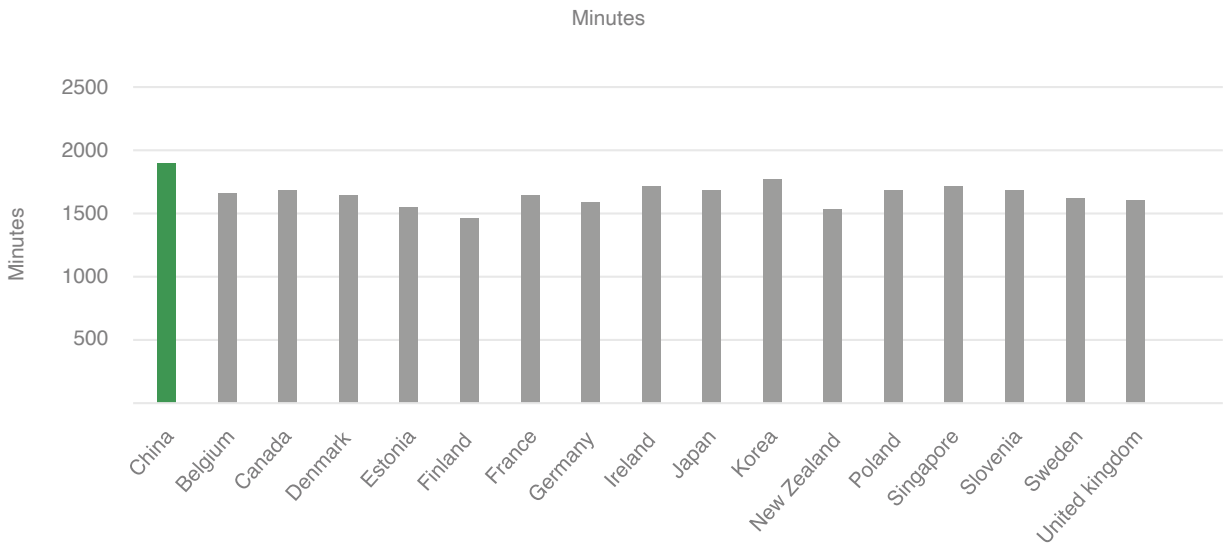
Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

Figure 5.18. Oaxaca-Blinder decomposition of the gap in performance between China and Finland in reading, mathematics and science, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

Figure 5.19. Average total weekly time spent learning in China and selected high-performing education systems, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

Figure 5.20. Learning time per week and reading performance in China, Singapore and Finland, 2018

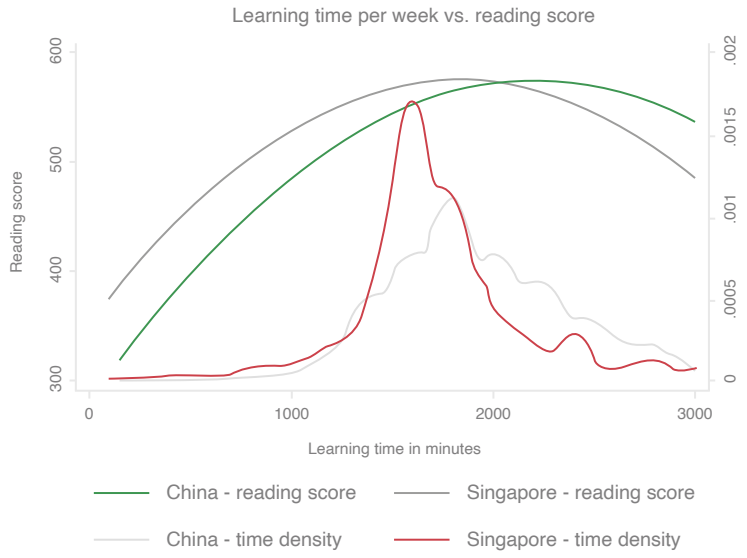
Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

» **Students in Singapore achieve similar levels of reading performance to students in B-S-J-Z (China) with less study time**

Interestingly, students in Singapore seem to be able to achieve a comparable reading score to Chinese students with less study time. Further, Chinese students that report spending less than 20 hours per week (1 200 minutes) perform much worse than students from Finland reporting similar time spent studying. In general, the marginal return to an additional minute of study time appears to be higher in Asian countries than in European ones.

In Figure 5.21, the graph depicting this relationship is overlaid with one that plots the distribution of time spent studying for B-S-J-Z (China) and Singapore. This shows that while Singaporean students achieve higher results for a given amount of study time across most of the distribution, Chinese students can compensate for this by spending more time on their studies on average.

Figure 5.21. Relationship between learning time per week and performance in reading and the distribution of time spent learning: China and Singapore, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

Conclusion

This chapter analysed the relative standing of the Chinese (B-S-J-Z) education system compared to 16 other high-performing countries. Data from the 2018 and 2015 PISA cycles were used to compare Chinese students' performance in terms of cognitive outcomes, non-cognitive skills, and student well-being to the outcomes of students in other countries. Further, performance gaps were mapped between different subgroups of students to investigate the extent to which the Chinese (B-S-J-Z) education system performs in terms of equity in education outcomes. Finally, the factors at the individual, school and teacher levels associated with high levels of student performance, non-cognitive skills and student well-being were analysed.

In terms of cognitive outcomes, Beijing, Shanghai, Jiangsu and Zhejiang outperformed all other participating education systems on all three PISA domains (reading, mathematics and science). In reading literacy, Singapore comes close to the Chinese (B-S-J-Z) level of performance, but in both mathematics and science, B-S-J-Z (China) is relatively far ahead of the other high-performing countries. There are very few low-performing students in B S J Z (China) and a large percentage of high performers, particularly in mathematics. Analyses decomposing the performance gap between B-S-J-Z (China) and other high-performing countries show that the differences cannot be explained by differences in observable student and peer characteristics. In fact, under certain assumptions, the performance gap would even widen if Chinese (B-S-J-Z) students had similar observable characteristics to those in other countries. However, compared to other high-performing countries, Chinese (B-S-J-Z) students spend a lot more time studying per week. Analyses of the relationship between study time and cognitive outcomes suggest that in the lower half of the study time distribution, Chinese (B-S-J-Z) students are outperformed by students from other high-performing countries given the time spent studying.

In terms of equity, Beijing, Shanghai, Jiangsu and Zhejiang does relatively well on the gap between students from disadvantaged and advantaged socio-economic backgrounds, and the gap between students attending general and vocational programmes, as they are lower than in the other high-performing countries. However, the gap between students in urban and rural schools is larger in B-S-J-Z (China) than in other countries. Further, the difference between boys and girls is smaller in favour of girls in reading, and larger in favour of boys in mathematics and science than in other high-performing countries. This could imply a relatively disadvantaged position for girls in the Chinese education system.

Ideally, the progression of student performance over time would also be compared between the different education systems. Unfortunately, the Chinese that participated in PISA changed between 2015 (when Guangdong participated instead of Zhejiang) and 2018. This means that changes in education performance are confounded by changes in the sampled population, which renders comparisons difficult. When looking at the performance of Beijing, Shanghai, Jiangsu and Guangdong in isolation, their results are less exceptional than the 2018 results for Beijing, Shanghai, Jiangsu and Zhejiang. This somewhat calls into question whether the results of the B-S-J-Z provinces can be generalised to the rest of mainland China, particularly since Oaxaca-Blinder decomposition analyses showed that a sizeable proportion of the performance gap between 2015 and 2018 can be attributed to differences in observable characteristics of the sampled student and school population.

In terms of non-cognitive skills and student well-being, the results are more mixed. Chinese (B-S-J-Z) students report a slightly lower level of life satisfaction, and report experiencing both more negative and positive feelings. However, Chinese (B-S-J-Z) are also highly competitive and highly motivated to achieve. Both of these non-cognitive skills are related to increased cognitive performance, especially for students from disadvantaged socio-economic backgrounds.

School- and teacher-level factors associated with high student performance in Beijing, Shanghai, Jiangsu and Zhejiang are a competitive school environment, high peer socio-economic status, a strong disciplinary climate, teacher professional development, and teacher enthusiasm. Apart from peer socio-economic status, which matters more in other high-performing countries, these factors are more strongly associated with performance in B-S-J-Z (China) than in other high-performing countries. However, a highly competitive school environment is also associated with decreased life satisfaction, while a highly co operative school environment is beneficial for various student well-being outcomes.

NOTES:

1. For a more in-depth explanation of PISA's collaborative problem-solving framework, see OECD (2017[2]).

2. For a more in-depth explanation of PISA's scientific literacy framework see OECD (2016[3]).

3. For a more in-depth explanation of PISA's reading framework, see OECD (2019[9]).

4. Overall, the relationship between student well-being and student achievement is less pronounced than the relationship between student achievement and non-cognitive skills. For this reason, the figures depicting the results on well-being are found in Annex 4.A1.

5. Results are shown for performance on the reading test. The results for the other PISA domains are qualitatively similar and are available upon request.

6. In PISA 2018, many of the high-performing countries did not survey students from vocational education, or they comprise such a small percentage of the total amount of students surveyed that no meaningful performance gap can be calculated.

7. The results for the gender- and general-vocational performance gaps can be found in Annex Figure 4.A1.4 and Annex Figure 4.A1.5 in Annex 4.A1.

8. For the full list of variables included in the Education Production Function, see Annex Table 4.A1.1.

9. The results of these analyses are omitted for brevity and are available upon request.

10. The decomposition results for the other high-performing countries show qualitatively similar results, and are available upon request.

11. Results are similar for the math and science scales, and are available upon request.

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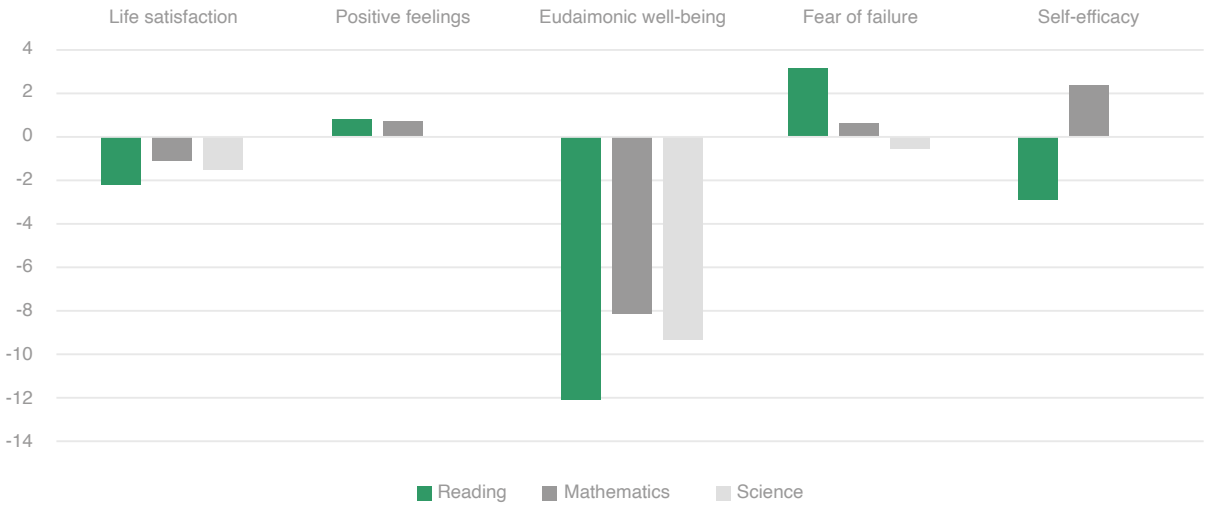
ANNEX: SUPPLEMENTARY TABLES AND FIGURES

Table 5.A1 Variables included in the Education Production Function regressions

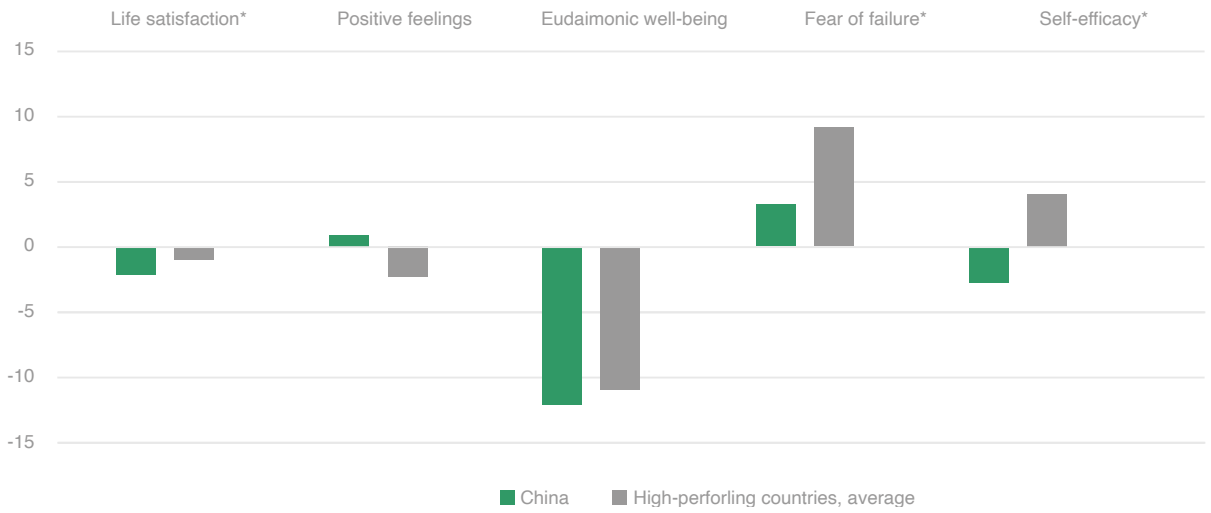
Student characteristics	School characteristics	Teacher characteristics
Gender	Urbanity	Teacher behaviour hindering learning
Immigrant status	School type (public/private)	Teacher certification
ESCS	General/Vocational programme	Teacher participation in professional development programmes
Grade repetition	Amount of competing schools in the area	Teacher-directed instruction School level
Grade relative to the modal grade for 15-year-olds	Ability tracking between courses	Adaptive instruction School level
Time spent studying per week	Ability tracking within courses	Perceived teacher enthusiasm School level
Time spent studying per week^2	Class size	Perceived teacher feedback School level
	School size	Perceived teacher support School level
	Student-teacher ratio	
	Shortage of educational material	
	Staff shortage	
	School-level ESCS	
	Perceived co-operative school environment	
	Perceived competitive school environment	

Annex 5.A1 Relationship between student well-being and performance in reading, mathematics and science in China, 2018



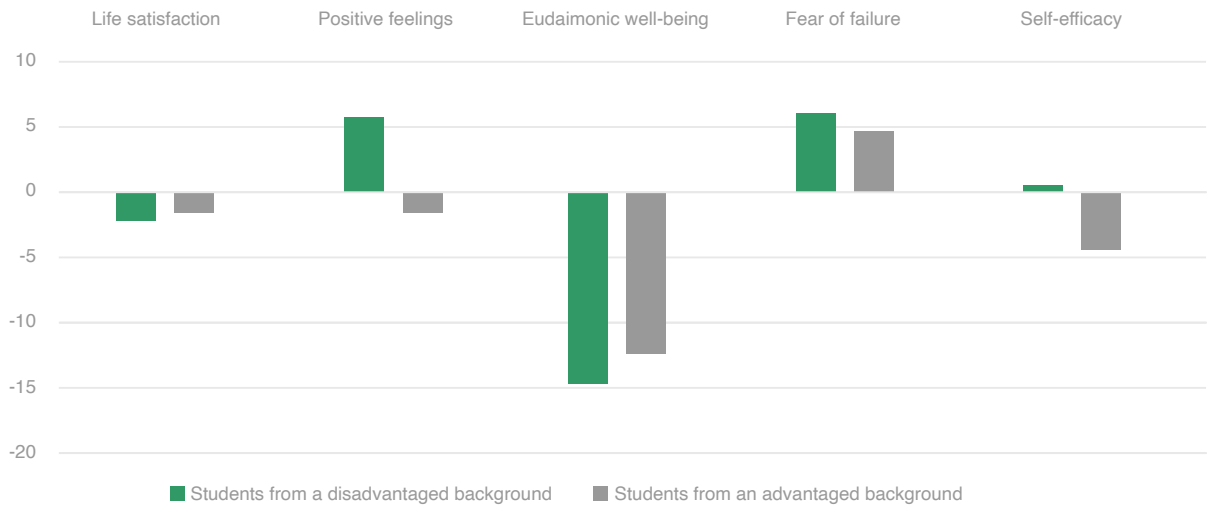
Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang. Data were controlled for student socio-economic background.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/

Annex 5.A2 Comparing the relationship between student well-being and reading performance between students from China and the average of the other high-performing countries, 2018



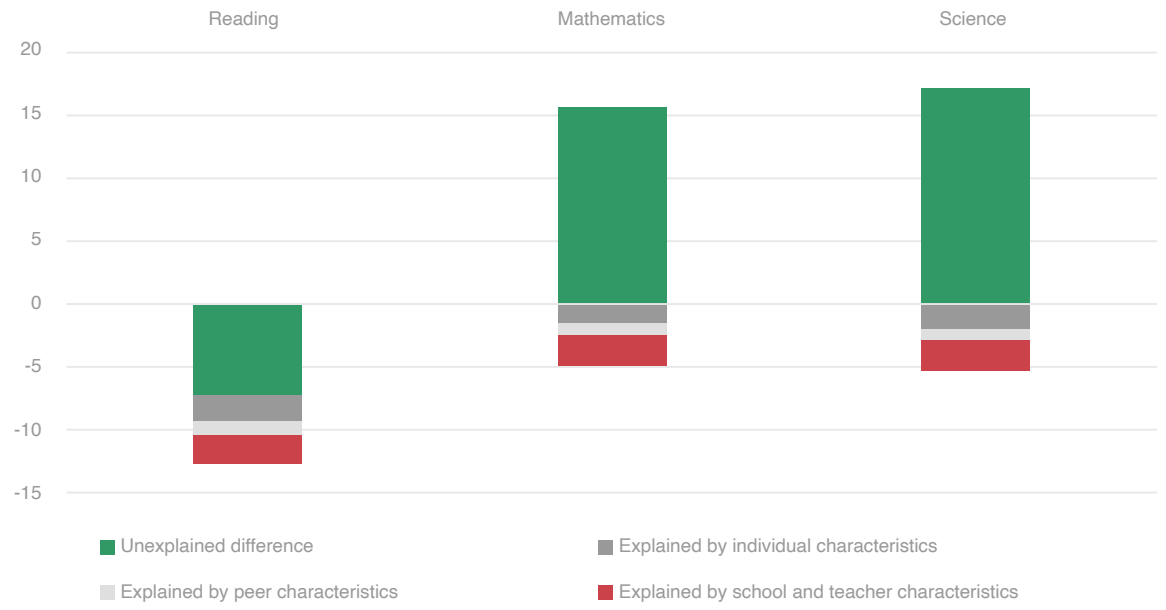
Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang. Data were controlled for student socio-economic background. * indicates a statistically significant difference ($p < .05$) between the magnitude of the association for students from China and students from the other high-performing countries.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

Annex 5.A3 Comparing the relationship between student well-being and reading performance between students from advantaged and disadvantaged backgrounds in China, 2018



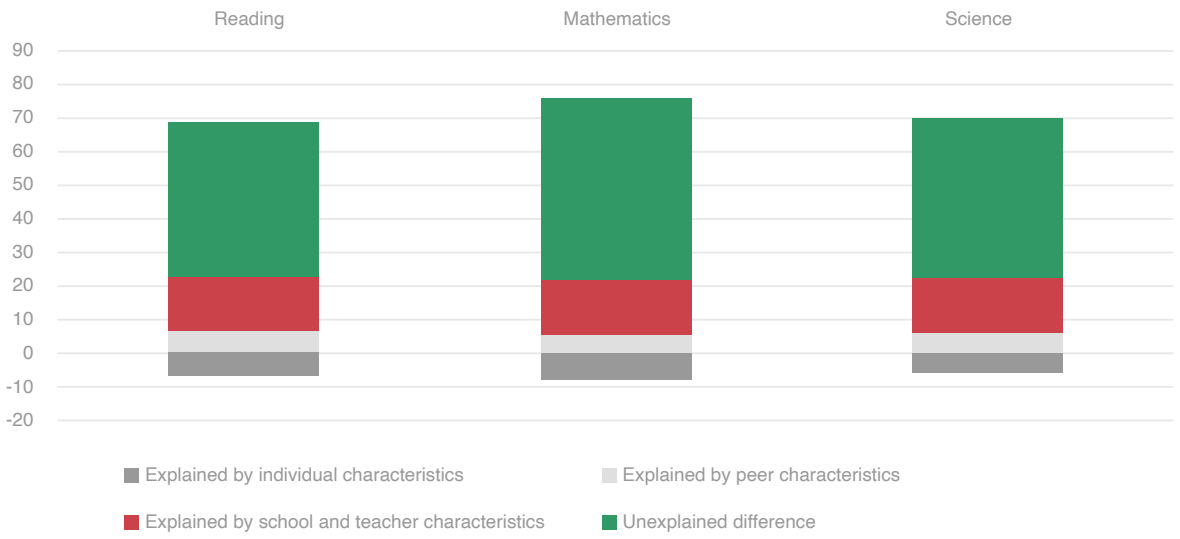
Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang. Data were controlled for student socio-economic background
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

Annex 5.A4 Oaxaca-Blinder decomposition of the gender gap in performance on the three PISA 2018 domains in China, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), *PISA 2018 Database*, https://www.oecd.org/pisa/data/2018database/.

Annex 5.A5 Oaxaca-Blinder decomposition of the gap in performance between students in general and vocational programmes on the three PISA 2018 domains in China, 2018



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Zhejiang.
Source: Authors' own calculations based on OECD (2018[1]), PISA 2018 Database, https://www.oecd.org/pisa/data/2018database/.

Chapter 6

Education Governance

This chapter examines education governance in Chinese education systems. First, drawing on data and policy evidence, it looks at the accountability practices implemented at the classroom, school and system levels, providing insight into the accountability culture in China's education systems. It then focuses on school governance and school autonomy in four Chinese jurisdictions that participated in the Programme for International Student Assessment. Finally, this chapter focuses on education governance during an emergency: drawing on policy evidence and practices in the face of the coronavirus (COVID-19) crisis as a case study, it discusses key strategies promoted in the education governance process in China.

A culture of accountability

Accountability plays an essential role in supporting effective education governance. Accountability in education fundamentally concerns "who renders an account to whom, and for what an account is rendered" (Burns and Köster, 2016[1]). Many countries across the world are decentralising education responsibilities and controls, giving rise to increasingly complicated governance relationships and the participation of new and diverse stakeholders. To build an effective accountability system in education, it is vital to strike a balance between meeting the various education demands of local stakeholders and pursuing the overarching goals of education systems that are assumed to reflect true social priorities (OECD, 2019[2]).

In the context of complex education systems, achieving quality accountability can hardly be fulfilled by only focusing on the "performance sense" of accountability. Although educational outcomes have been considered the most important factor for school evaluation in many education systems, it is difficult to use educational outcomes alone to identify deficiencies in education that need to be improved. Instead of focusing on outcomes, a quality education system should promote an accountability culture in which teachers can learn from their peers, schools can learn from each other, and stakeholders across various levels can engage to pursue common goals (Fahey and Köster, 2019[3]). To achieve this purpose, education systems should build a well-constructed legal framework that clarifies accountability demands; allow stakeholders at all levels of systems to access and exchange information freely; and promote local engagement in the policy development and implementation process (Burns, Köster and Fuster, 2016[4]).

Accountability is a continuous and dynamic process, which involves the generation of accountability demands, corresponding activities to fulfil the demands, the generation of outcomes and the generation of feedback. The feedback then reshapes the accountability demands, which connect back to the beginning of the process (Levin, 1974[5]). To achieve an effective accountability system, it is important to ensure that this process is supported by evidence.

This section focuses on accountability at three levels of education in the People's Republic of China (hereafter "China"): the classroom, school and system levels.

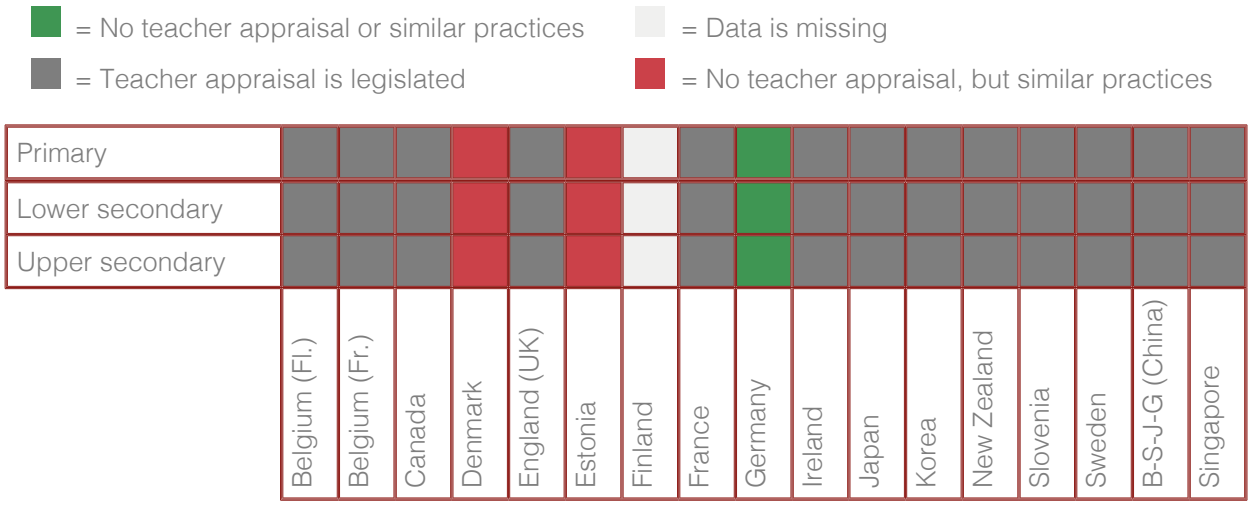
It closely examines the implemented practices and policies that hold its teachers, schools and education systems accountable, presenting a holistic picture of the culture of accountability in China's education system.

» Holding teachers accountable

Teachers' primary responsibility is to teach and encourage students to learn. As a key stakeholder in education systems, teachers should not only be held accountable to students and parents but to their colleagues, school management and communities. To ensure teacher accountability in education, it is essential to adopt scientifically constructed approaches to evaluate comprehensive perspectives of teachers' performance and competencies.

Across the world, formal evaluations are the most common mechanism used to measure teacher accountability in many education systems and are usually legislated and covered by education policies (OECD, 2016[6]) (see Figure 5.1).

Figure 6.1. Existence of teacher appraisal by education levels in selected high-performing education systems, 2015



Note: Belgium (Fl.) stands for Belgium (Flemish Community) and Belgium (Fr.) stands for Belgium (French Community). B-S-J-G stands for the four Chinese jurisdictions that participated in PISA 2015: Beijing, Shanghai, Jiangsu and Guangdong.
Source: Adapted from OECD (2016[6]), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264267510-en.

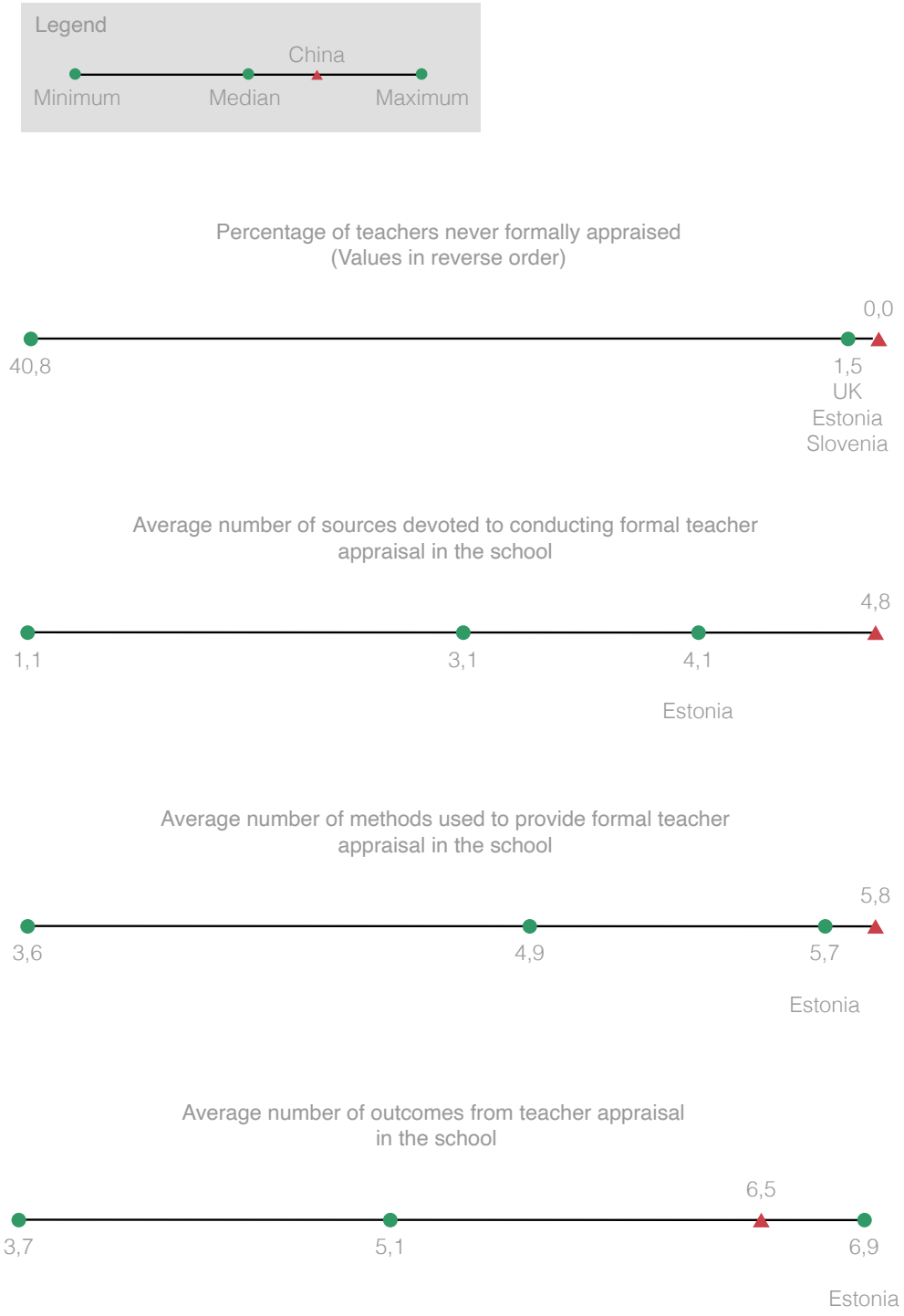
Teacher appraisal should be reliable and valid for both evaluators and teachers so that teachers can gain meaningful feedback to improve their professional practices. Lack of reliability and validity in teacher appraisal would result in teachers' distrust of the result, which would make the appraisal less meaningful for teachers and schools. The following section provides some insights into how schools in Shanghai leverage teacher appraisals for fostering its teachers' professional growth.

» Formal teacher appraisal in Shanghai

Every teacher in Shanghai has participated in a formal teacher appraisal, according to TALIS 2018 survey (OECD, 2019[7]). In fact, Shanghai schools have the highest amount of diverse resources available, compared to other high performing systems, to conduct formal teacher appraisals (see Figure 6.2). These resources include school principals, school management teams, teachers' mentors, other teachers and external resources. Teacher appraisal conducted by each of these resources is relatively more prevalent than in the average OECD countries (see Figure 6.3).

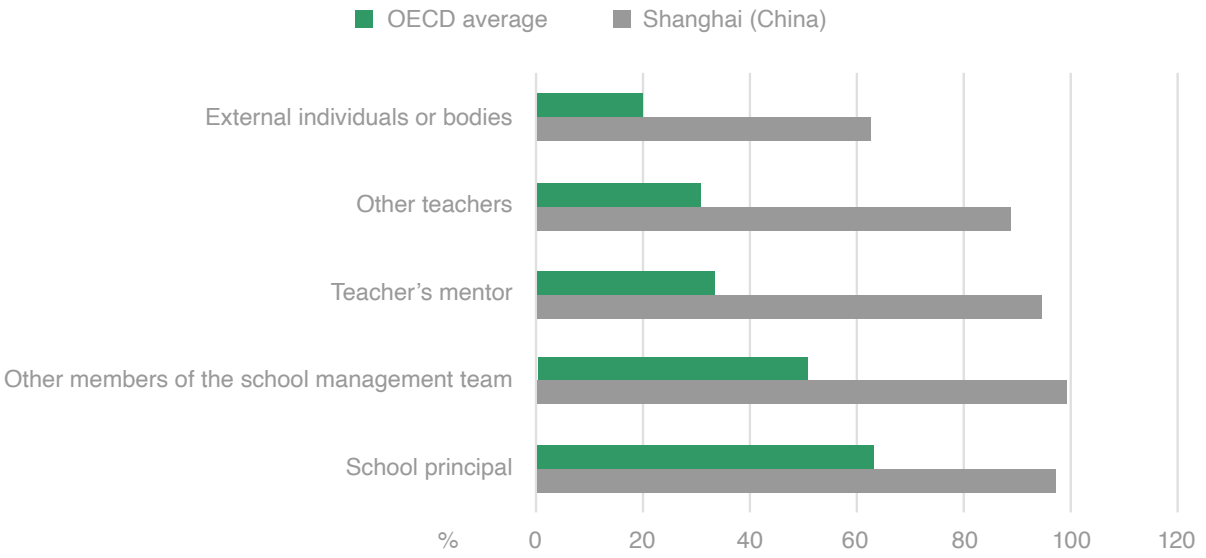
As in many other education systems, teacher appraisal is often led by school principals or school management teams in Shanghai. Meanwhile, teacher appraisal conducted by peer teachers (mentors or other teachers) is also equally common in Shanghai schools. Peer appraisal tends to differ from school-led appraisal. Where the former serves formative purposes, the latter is more oriented to school administrative purposes, in which teacher evaluation is part of school management. Some argue that the two types of purposes can hardly co-exist in one evaluation system, as the difference of purposes naturally requires different sets of appraisal approaches and procedures (Baker et al., 2013[8]). The evidence from Shanghai demonstrates that it is possible to build one teacher evaluation system that serves both formative and administrative purposes in an efficient manner.

Figure 6.2. Formal teacher appraisal in Shanghai, compared with formal teacher appraisal in selected high-performing education systems



Note: Data for China are limited to Shanghai only.
Source: Authors' own work, based on OECD (2020[9]), *TALIS 2018 Results (Volume II): Teachers and School Leaders as Valued Professionals*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/19cf08df-en.

Figure 6.3. Percentage of teachers whose school principals report that their teachers are formally appraised at least once a year by the following sources of appraisal in Shanghai and OECD countries, 2018



Note: OECD (2020[9]), TALIS 2018 Results (Volume II): Teachers and School Leaders as Valued Professionals, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/19cf08df-en.

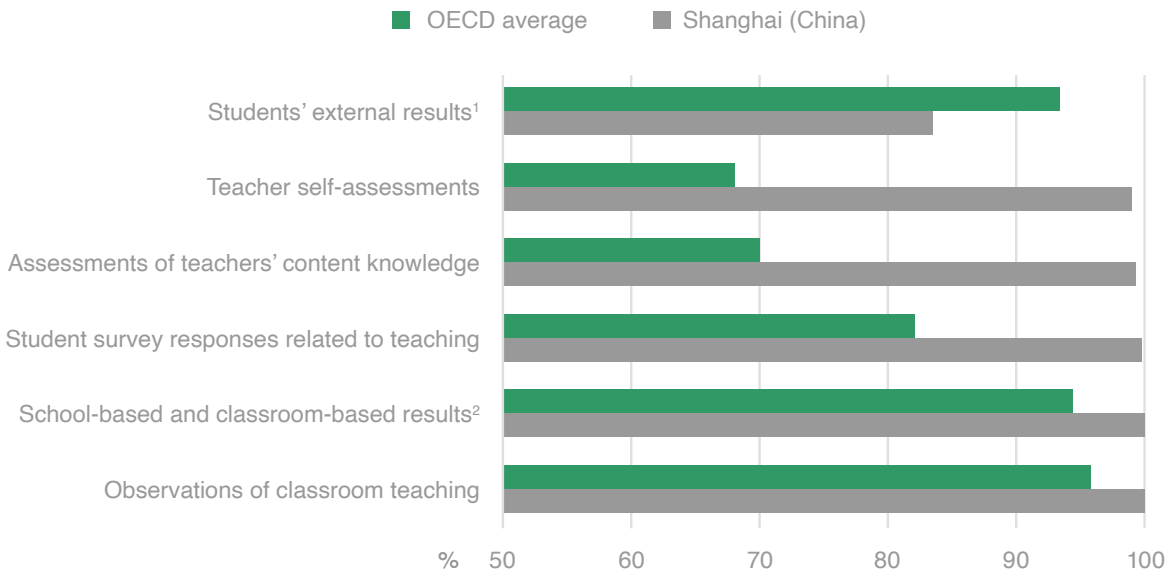
» Diverse methods used in teacher appraisal

To build successful teacher evaluation systems, teacher appraisals should not be limited to monotonous approaches, as such approaches hardly capture the broad range of teachers' professional skills, which can consequently harm teachers' enthusiasm. For instance, research shows that teachers and principals hold negative views of evaluations that rely on short class visits (Vaillant and Gonzalez-Vaillant, 2016[10]). Using multiple methods to appraise teachers helps schools and communities collect wider evidence associated with teacher competencies, thus enhancing the fairness of evaluation.

In contrast to some education systems that rely mainly on standard teacher appraisal methods, schools in Shanghai promote multiple teacher appraisal methods. The average number of methods used in teacher evaluation in Shanghai (5.8 out of 6) is the highest among countries and economies that participated in the OECD Teaching and Learning International Survey (see Figure 6.2). The methods include, among others, classroom observation, student response to teaching, student results and self-assessment (see Figure 6.4). Instead of relying on one method over another, each method is widely used and common to see in teacher appraisal in Shanghai.

Assessing teachers' content knowledge is also a more common approach used in teacher appraisal in Shanghai, compared to most OECD countries and economies (see Figure 6.4). Teachers' content knowledge (or knowledge of the subject matter) constitutes a fundamental part of teachers' professional knowledge base. Teachers' content knowledge directly shapes the knowledge they deliver to their students, which is critical for holding teachers accountable. Research shows that teachers with better content knowledge lead to better student achievement in mathematics (Metzler and Woessmann, 2012[11]).

Figure 6.4. Percentage of teachers whose school principals report that the following types of methods are used in formal teacher appraisal in Shanghai and OECD countries, 2018



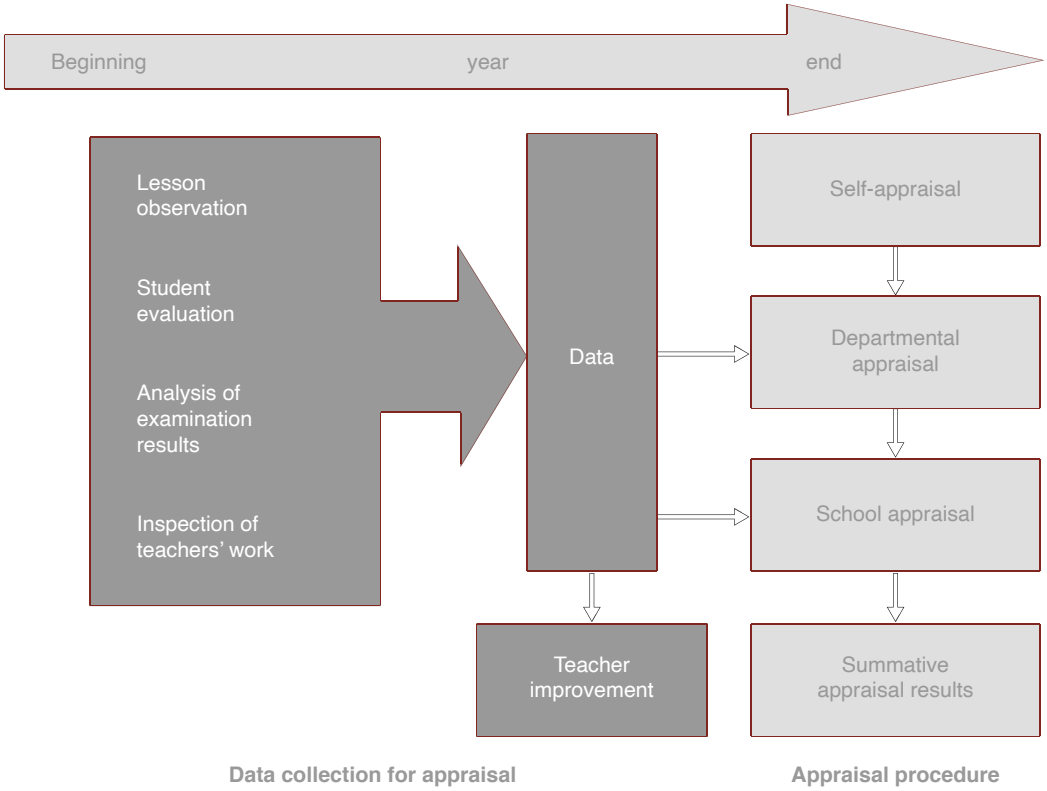
Note:
1. For instance, national test scores.
2. For instance, performance results, project results or test scores.
Source: OECD (2020[9]), *TALIS 2018 Results (Volume II): Teachers and School Leaders as Valued Professionals*, TALIS, OECD Publishing, Paris, https://doi.org/10.1787/19cf08df-en.

Teacher self-assessment is another teacher appraisal method that is widely used in Shanghai, but less so in most OECD countries and economies (see Figure 6.4). Engaging teachers in conducting self-assessments is a constructive strategy to facilitate their professional growth (Ross and Bruce, 2007[12]). Compared to other types of methods, teacher self-assessment is likely the most budget- and time-efficient method to allow teachers to quickly identify areas for further improvement. As teachers are important stakeholders in educational accountability, promoting teacher self-assessment can also contribute to teachers taking responsibility for their professional development, which, in turn, can cultivate a culture of accountability in the teaching profession.

» Some insights into formal teacher appraisal in Shanghai

Although using multiple sources and methods to inform teacher evaluation can enhance the validity and reliability of results, it can be challenging for schools to incorporate all of the sources and methods as a whole and to align each element to serve evaluation purposes. Shanghai is one of the few education systems that have achieved this. As shown in Figure 6.5, the teacher assessment process in Shanghai lasts one year, during which data are collected throughout the year. At the end of the year, three levels of appraisal are conducted, among which departmental appraisal and school appraisal are supported by the data collected through multiple methods. Through this process, teacher appraisal manages to serve both formative and summative purposes.

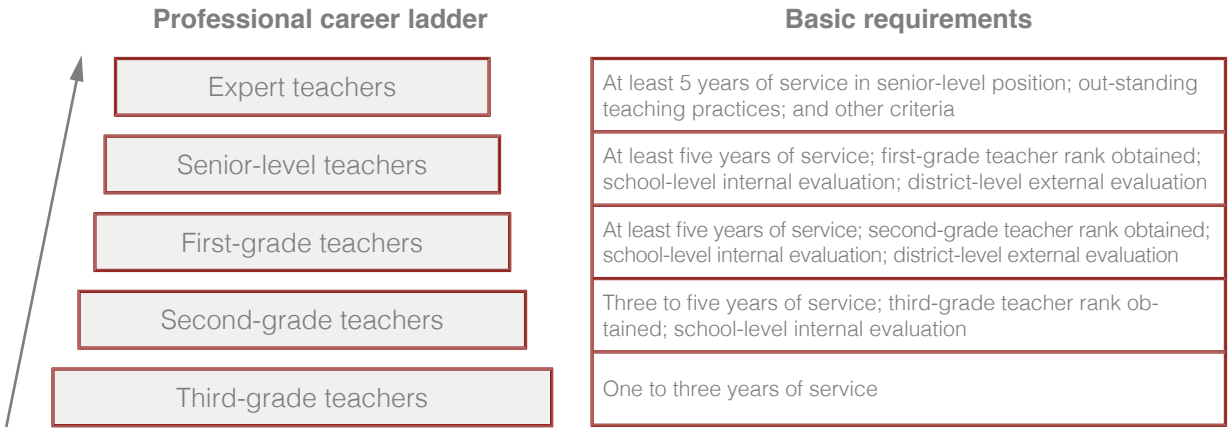
Figure 6.5. A model used for teacher appraisal in schools in Shanghai



Source: Zhang, X. and Ng, H. (2017[13]), "An effective model of teacher appraisal: Evidence from secondary schools in Shanghai, China", Educational Management Administration & Leadership, 45(2), pp. 196–218, https://doi.org/10.1177/1741143215597234.

The results of teacher appraisals are taken into account as a key criteria for teachers' professional promotion. The professional career ladder system in Shanghai is another powerful incentive to enhance the accountability of teaching professionals. Shanghai has a well-structured professional career ladder, which provides a clear professional pathway for the development of teaching careers. During their careers, teachers advance in the professional grades based on certain criteria (see Figure 6.6). Promotion is also accompanied by salary increases and other non-monetary benefits. Professional career ladders also extend teachers' career opportunities. In addition to pursuing a teaching or administrative position in schools, teachers with high professional grades may be selected into universities and work as teacher educators (Liang, Kidwai and Zhang, 2016[14]). The professional career ladder works together with the teacher evaluation system in Shanghai to motivate teachers to achieve excellence, and contributes thus to the high quality of teacher accountability.

Figure 6.6. Professional career ladder system for teachers in Shanghai



Source: adopted from Liang, X.,Kidwai, H. and Zhang,M. (2016[14]), *How Shanghai Does It: Insights and Lessons from the Highest-Ranking Education System in the World*, World Bank Group and Shanghai Municipal Education Commission (2020[15]), *上海市正高级教师评聘条件 [Criteria on the evaluation of primary and secondary level teachers for appointment and promotion in Shanghai]*

» Holding schools accountable

As the main provider of education services, schools are accountable to students and parents. With the increasing complexity of the 21st-century education system, developing successful approaches to ensuring effective school accountability becomes a pressing point on the policy agenda. Many education systems have realised that relying only on performance-based accountability is not enough to meet today's complex education demands, and may even cause unintended results (e.g. schools may become overly focused on student outcomes). Hence, many governments have adopted mixed mechanisms that encompasses multiple approaches to holding schools accountable. Specifically, there are three typical types of accountability approaches in today's mechanisms: regulatory, performance-based and market-based (OECD, 2011[16]) (Table 6.1). Regulatory approach and performance-based approach are more prevalent in China's accountability system.

Table 6.1. Holding schools accountable: Three types of accountability

Types of accountability	Features
Regulatory accountability	Laws or regulations establish formal evaluation.
Performance-based accountability	Authorities evaluate performance information in relation to processes, outputs or outcomes.
Market-based accountability	Parents and students evaluate publicly available, comparable information and choose the preferred education option.

» Regulatory accountability

The education system in China mainly relies on the regulatory approach to hold schools accountable. The Ministry of Education has published a set of school management standards for compulsory education (Ministry of Education, 2017[17]), which regulates six major goals that schools are expected to achieve:

- protect students' equal rights
- promote students' well-rounded development
- promote teachers' professional development
- improve the quality of teaching and learning
- build a harmonious environment
- build a modern school management system.

Although the management standards published by the central Ministry of Education seem to cover a broad number of regulations, a review of the regulation contents suggests that some important topics may not be covered sufficiently. For instance, a regulation on information and communication technology (ICT) resources is not mentioned explicitly among the 88 regulations outlined in the standard. Likewise, the maximum teacher-student ratio and the minimum number of students at schools are not included in the regulation contents. A review of 71 education systems conducted by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) revealed that the regulation of ICT resources and student-teacher ratios are under-emphasised in many education systems. Less than half of the education systems regulated its ICT resources, teacher-student ratios and number of students at schools (see Table 6.2) (UNESCO, 2017[18]).

Table 6.2. School regulations in global education systems at a glance

Category of school regulation	Exists in China's school regulations
Facilities and infrastructure	
ICT	..
Electricity	Yes
Playgrounds	Yes
Accommodation for students with disabilities	Yes
Health and safety	
Safe drinking water	Yes
Separate toilets for boys and girls	..
First aid and medical facilities	Yes
Toilets and sinks for disabled students	..
Governance	
School management committee	Yes
Students and teachers	
Teacher qualifications	..
Maximum student-teacher ratio	..
Minimum number of students at schools	..

Note:
Grey = 30-60% of the reviewed education systems regulate it
Green = 60-90% of the reviewed education systems regulate it
Red = Above 90% of the reviewed education systems regulate it
.. = Not available
The review of China's school regulations is based on its policy on "The Management Standard of Schools in Basic Education" (Ministry of Education, 2017[17]). "Not available" in some categories does not necessarily mean the regulations are missing. Information on the reviewed education systems is retrieved from UNESCO (2017[18]). In total, 71 education systems were reviewed.
Source: Authors' own work, based on UNESCO (2017[18]), Accountability in Education: Meeting our Commitments, Global Education Monitoring Report, UNESCO, Paris, https://unesdoc.unesco.org/ark:/48223/pf0000259338/PDF/259338eng.pdf.multi.

However, the lack of content on these topics in national school management standards does not necessarily mean that there are no relevant regulations in China's education systems. Regional and other contextual actors also play important roles in developing regulations that have the potential to complement national standards. Regional educational departments in China are required to consider the needs of local contexts in the development of school regulations for local practices, based on the national standard, for example. However, as the standards outlined by the Ministry of Education are mostly broad concepts and no measurable indicators are proposed, it can be hard to guide regional authorities in developing effective school regulations (Xin, 2016[19]).

Despite the regulatory approach, a number of non-regulatory school-based activities also contribute to the improvement of accountability culture in Chinese schools. These activities involve various forms, such as class observation, joint research activities and collaborative professional

development. In the case of Shanghai, the level of professional collaboration among teachers is high. Nearly half of teachers observe other teachers' classes and provide feedback at least once a month. The feedback provided by peers further generate meaningful impact on teachers' practices. Four out of five teachers consider that such feedback had a positive impact on their teaching practices (OECD, 2020[9]). The professional career ladder system, as mentioned earlier (see Figure 6.6), which enables teachers to progress their career and develop their leadership, also contributes to the strength of professional accountability in schools in Shanghai.

Furthermore, schools also hold themselves accountable through multi-componential school management teams. There is a relatively high percentage of schools where teachers, parents and students are represented on school management teams in Shanghai compared to the OECD average (OECD, 2020[9]). Diverse composition of school management boards allows voices from various stakeholders to be heard. Through this collaborative practice, schools in Shanghai establish an effective feedback loop where teachers and other stakeholders share information, learn from each other and further improve their practices.

» Performance-based accountability

Performance-based accountability is another common approach to enhancing school accountability. It is often combined with regulatory accountability in education systems. Performance-based accountability focuses on student performance and uses student outcomes (e.g. test scores) as important indicators to evaluate school performance. National examinations or national assessments, which collect comparable information on school-level and system-level performance, is a primary way to implement performance-based accountability. Although traditionally, many education systems have focused on regulatory accountability, in recent decades, with the development of international assessments such as PISA and TIMSS (Trends in International Mathematics and Science Study), a growing number of education systems are shifting more attention to performance-based accountability.

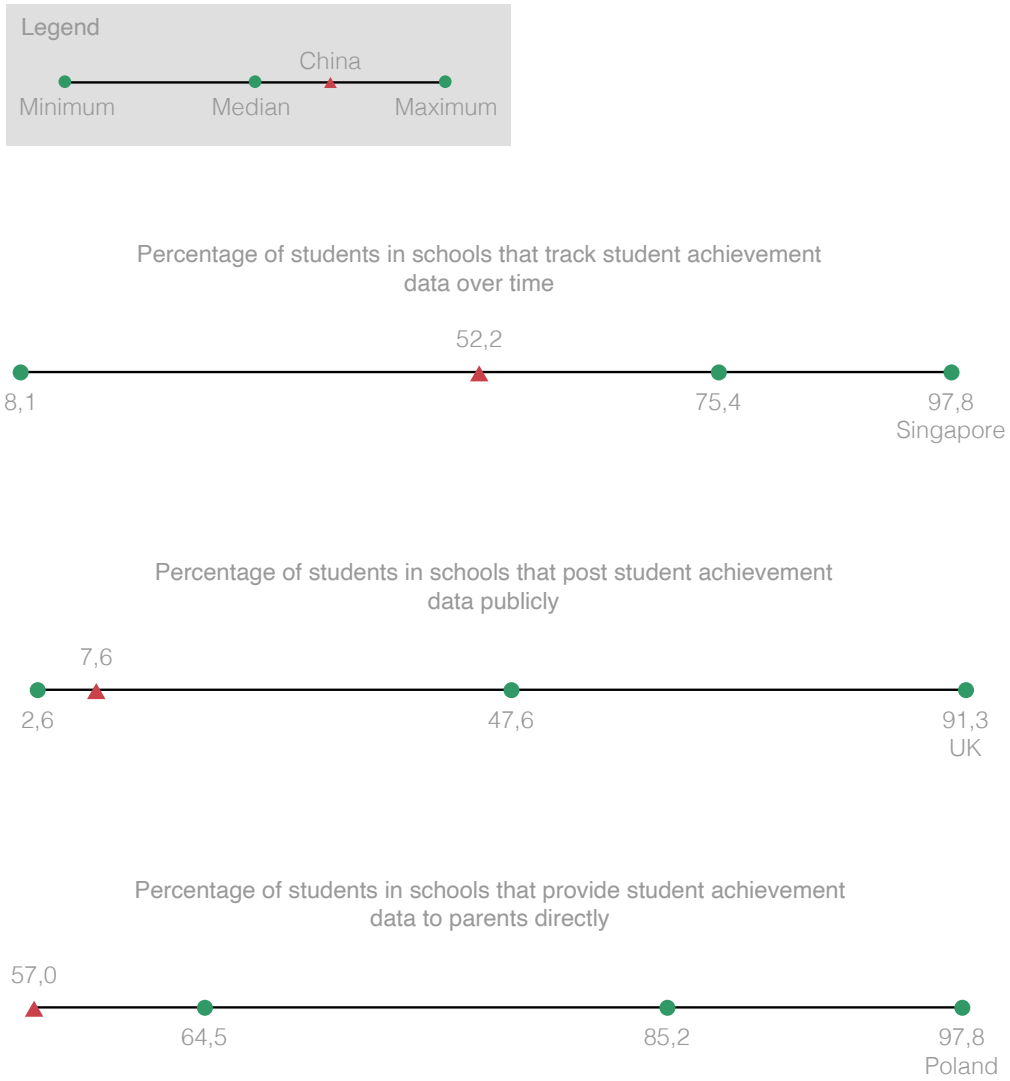
Similarly, in China's education systems, performance-based accountability is increasingly recognised as an effective type of accountability approach. However, compared to high-performing countries in PISA, the use of student achievement data for accountability purposes is less prevalent in China's schools (see Figure 6.7). However, not too long ago, Chinese education systems initiated a national assessment scheme to monitor its national education quality at the basic education level. This initiative also involves system-level monitoring infrastructure and is discussed in more detail in the section on Holding education systems accountable.

» School inspections

School inspections are one of the key practices of school evaluation that enhances accountability in education. School inspections are often conducted as an evaluation process that involves trained inspectors evaluating schools based on the standards or regulations set by relevant authorities. Inspectors then produce an evaluation report that identifies the extent to which schools comply with the set standards. In many education systems, school evaluation reports are often publicly available (OECD, 2011[20]).

In China, education inspections are mandated by the central government and are carried out by education inspection committees. These committees are scaled up systematically across four administrative levels, from central government to provinces, and from cities to counties. The governments at the four levels are responsible for building their own education inspection committees. The overarching goal of school inspections is to improve the quality of education in China. On the same note, there is a growing trend among many developed countries to use school inspections as a way to improve school quality. (UNESCO, 2017[18]).

Figure 6.7. Use of student achievement data for accountability in China, compared with the use of such data for accountability in selected high-performing education systems



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Guangdong.
Source: OECD (2016[6]), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264267510-en.

School inspections are organised into multiple types in China. The most common are regular school inspections, which are conducted by the inspectorates from local education inspection institutions. Regular school inspections are carried out at all schools in the administration zone at least twice per semester (see Figure 6.8). The main inspection areas in regular school inspections broadly focus on the quality of education inputs (financial resources, human resources, facilities, etc.); the teaching and learning quality; education equality; and compliance with rules and regulations (State Council, 2012[21]). In addition, there are also targeted inspections that focus on specific education priorities, such as school security, quality of school facilities and other priorities. This type of inspection is also usually used for particular types of schools.

Figure 6.8. Frequency and structure of school inspections at the primary and lower secondary levels in selected high-performing education systems, 2009

Once every three years | At least once every year | More than once a year

	Flemish Community (Belgium)	French Community (Belgium)	Canada	Denmark	England (UK)	Estonia	Finland	France	Germany	Ireland	Japan	Korea	New Zealand	Poland	Slovenia	Sweden	China
Frequency			..	X			X	No			X		..		..		
Structure			..	X			X				X		..		..		

Highly structured | Partially structured

Note: x = Not applicable; .. = Not available
"No" means there are no requirements for school inspections.
Belgium (Fl.) stands for Belgium (Flemish Community), and Belgium (Fr.) stands for Belgium (French Community).
"Highly structured" means similar activities are completed at each school, using a specific set of data collection tools.
"Partially structured" means there are some guidelines, but no specific sets of data collection tools.
Source: Adapted from (OECD, 2011[16]), *"How are schools held accountable?", in Education at a Glance 2011: Highlights*, OECD Publishing, Paris, https://doi.org/10.1787/eag_highlights-2011-33-en. *Data on China is based on the review of China's regulations on education inspection* (see the section above on Regulatory accountability).

However, it is not clear which means or instruments inspectorates use to collect information during school inspections. At the policy level, except for some broad guidelines, there is no governmental regulated inspection procedure that specifies the indicators or the data that should be examined or collected. School inspection procedures depend largely on the inspectorates. This less structured school inspection type is not a common case in other high-performing education systems. For instance, in Estonia, Germany and Korea, the school inspection process is highly structured (See Figure 3.7), meaning that similar activities are completed at each school using a specific set of data collection tools. School inspections are important in enhancing education accountability. Without a scientifically structured inspection procedure, the reliability and credibility of the results of school inspections may be at risk.

In light of the national regulation of school inspection, the lower level of educational administrations can further develop their own school evaluation system to adopt into local context. Box 6.1 provide some insights of how regional administrations integrate local contexts and needs into school evaluation, it presents a description of an innovative practice of developmental school evaluation in Shanghai.

Box 6.1. Developmental school evaluation in Shanghai

Shanghai is one of the Chinese cities that have carried out many initiatives to innovate its accountability system since the end of the 20th century. The developmental school evaluation system is one of the representative initiatives currently widely implemented in schools in Shanghai. Developmental school evaluation aims to support school development and foster school autonomy and innovation. This evaluation system proposes indictors for school evaluation from two broad categories. One is the basic indicators, which lays out the specific qualities that all schools are expected to achieve. The other is the school development guide. This guide outlines a broad orientation that concerns several key aspects of school development, based on which schools are encouraged to design their own evaluation indicators. Examples of some evaluation indicators are following:

(Basic evaluation indicators)

Level A: School management

Level B: Administrative management, teaching and learning management, moral education management, faculty management, management of general affairs.

Under each level B indicator, there are subsequent specific evaluation standards.

(School development guides)

Developmental area: School curriculum building

Evaluation criteria are proposed corresponding to each developmental area, which are broadly constructed rather than specific. In the area of school curriculum building, criteria are:

1. Curriculum arrangement should be in line with the reality of students and the principle of curriculum reform in Shanghai, the curriculum should provide space for students to choose and explore learning content.
2. Curriculum content should have a sense of contemporaneity, reflecting the nature of disciplinary integration and fostering students' creativity and practical ability.
3. In light of school and regional context, schools should actively develop school-based courses.

The above criteria provide an orientation for schools to explore the indicators that fit to the reality and developmental needs of each school. Based on the far-reaching developmental criteria, districts, counties, and schools are encouraged to add their own self-designed criteria that reflect their own developmental needs.

Developmental school evaluation on the one hand ensures that all schools fulfil the common regulations, and on another hand creates a flexible space that allows every school to explore their tailored goals of school development. In this process, schools enhance their competence in self-evaluation, self-monitoring and self-improvement.

Source: Shanghai Municipal Education Commission, (2005[22]), *上海市关于深化与完善中小学"学校发展性督导评价"工作的若干意见 [Advice on enhancing «school developmental evaluation» in primary and secondary schools in Shanghai].*

» Holding education systems accountable

Education systems cannot enhance their accountability without the support of system-level evaluations. Building system-level monitoring infrastructure allows countries to monitor and evaluate the overall performance of their education systems, thus allowing them to ensure that their education systems contribute to their overarching education goals.

To achieve fair and effective system-level monitoring, system-level infrastructure should be built to encompass a number of activities that contribute to evidence-based decision making. A well-designed monitoring infrastructure system often (Kitchen et al., 2017[23]):

- develops concrete and specific indicators
- uses scientifically informed tools and instruments to collect a wide range of information
- develops a wide network to engage various actors in the monitoring and evaluation process
- builds effective feedback loops so that monitoring feedback can lead to education improvement.

» Monitoring basic education quality

China's Ministry of Education initiated a national assessment plan to monitor basic education quality in 2015. The design of this assessment plan is closely aligned with China's long-standing goal of improving education quality. The plan outlines a detailed amount of information regarding the targeted population, subjects, assessment contents, timespan, assessment instruments and report types, which serves as the blueprint to guide the implementation of the national assessment to monitor basic education quality in China (see Table 6.3).

Table 6.3. Elements of China's national assessment plan to monitor basic education quality

Targeted population	All students at 4th grade and 8th grade
Sample strategy	Stratified sampling
Assessed subjects	Chinese, Mathematics, Science, Physical education, Arts, Moral education
Instruments	Paper and pencil test and questionnaire; fieldwork assessment
Scoring types	Performance grading (I, II, III, IV)
Timespan	Once every three years
Report types	National monitoring report; provincial monitoring report; basic data report

Source: State Council (2015[24]), *国家义务教育质量监测方案 (National plan for monitoring compulsory education quality)*.

» Designing the education monitoring infrastructure

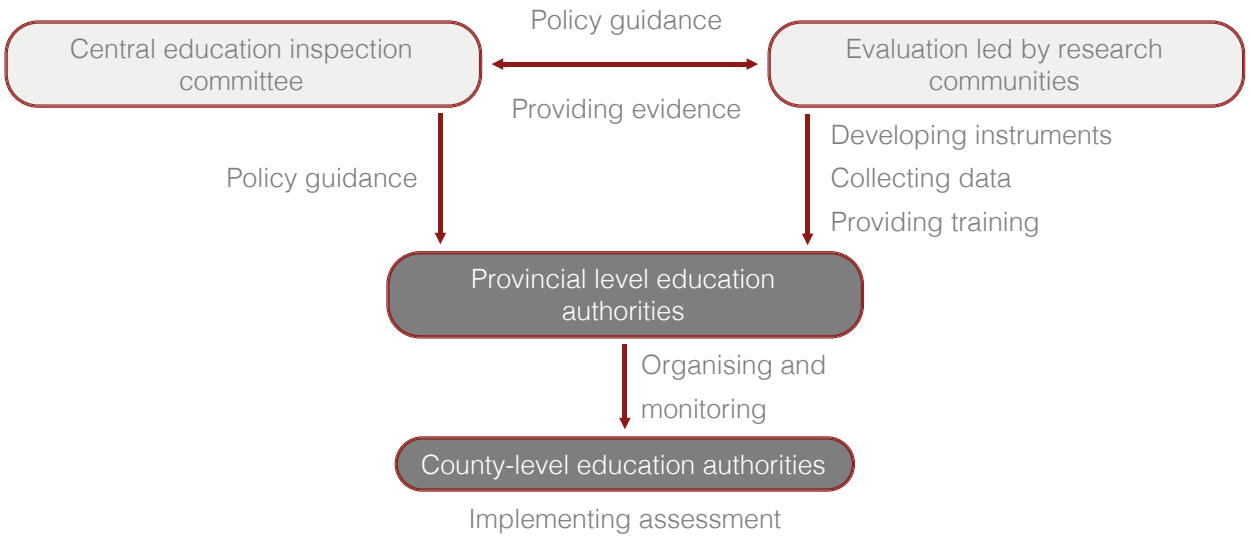
Implementing national assessments relies on capacity building both within and beyond governments. The approaches to enhance institutional capacity are also horizontal and vertical. While a central government may set up an education inspection steering committee to guide and co-ordinate the implementation of a national assessment policy, the education inspection departments at each level of government are engaged in an implementation process with separate responsibilities, which constitutes a vertical-level approach to capacity building. In addition, a central government may adopt a horizontal approach to engaging specialised assessment institutions supported by outside research communities to develop instruments, collect data, draft reports and conduct technical training to carry out a national assessment.

Involving the research community in the education monitoring process can help governments build research capacity in developing scientifically informed assessment methods and enhance evidence-based results interpretation for effective policy recommendations, which help to hold government accountable. To ensure accountability while engaging the research community in the monitoring process, it is vital to clarify each actor's responsibilities.

The central authorities in China have co-ordinated a range of research resources to set up a national assessment centre for education quality, in alliance with a national university. This research centre consists of researchers and experts in education evaluation and assessment, and is mandated to draft the

standards and develop the instruments for monitoring the quality of basic education; to implement national assessments; and provide technical support and guidance to regional assessments. To support the successful implementation of the national assessments, governments at multiple levels are assigned separate responsibilities (Figure 6.9), together forming a comprehensive monitoring infrastructure.

Figure 6.9. Horizontal and vertical co-operation in system-level evaluation of education in China

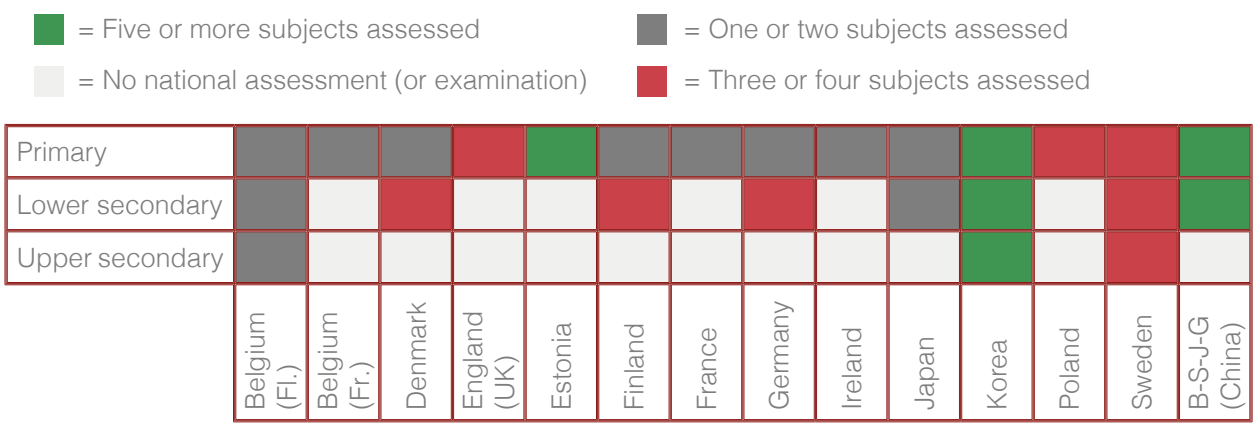


Source: Adapted from (State Council, 2015[24]), *国家义务教育质量监测方案 (National plan for monitoring compulsory education quality)*.

Many education systems use national assessments to provide performance-based accountability. As in China, the majority of OECD countries organise national assessments for students at primary and lower secondary levels. Maths, national language, science and modern foreign languages are the subjects most commonly included in the national assessment in many education systems (OECD, 2011[16]) (see Figure 6.10). In the case of China, foreign language is not included in the national assessment. In terms of scoring types, many systems adopt criterion-referenced tests, including China. Norm-referenced tests, which are designed to compare test takers with one another, is also a common scoring type found in assessments in some OECD countries.

The central-level authority usually devises and grades the national assessments in many education systems. In contrast, while central authorities devise the national assessment in China, a university research institution develops, administers and produces reports on it. The involvement of the research community in the assessment process is also seen in the Flemish community (Belgium). Furthermore, (sub) regional governments are also involved in the national assessment in China, taking two major responsibilities as regulated by the central authorities: monitor the process and organise the assessment. The horizontal involvement of authorities at different levels is also observed in the Russian Federation (OECD, 2011[16]).

Figure 6.10. Existence of national assessments in selected high-performing education systems, 2009



Note: Belgium (Fl.) stands for Belgium (Flemish Community) and Belgium (Fr.) stands for Belgium (French Community).
Source: Adapted from (OECD, 2011[16]), "How are schools held accountable?", in Education at a Glance 2011: Highlights, OECD Publishing, Paris, https://doi.org/10.1787/eag_highlights-2011-33-en.

Regarding the national assessment results in China, three types of assessment reports are produced: a national monitoring report, a provincial monitoring report and a basic data report. The national monitoring report, which presents overall student performance at the national level, is the only report shared with the public. The provincial monitoring report, which compares student performance across provinces, is only available for governments and education authorities. The basic data report summarises the original performance data by counties and is used internally by the assessment institution. However, while teachers, parents and students have access to the national monitoring report, the report does not report the results of individual student performance or student performance by different groups. In contrast, 14 out of 22 OECD countries share the results from national assessments directly with teachers, parents and students (OECD, 2011[16]).

School governance and school autonomy

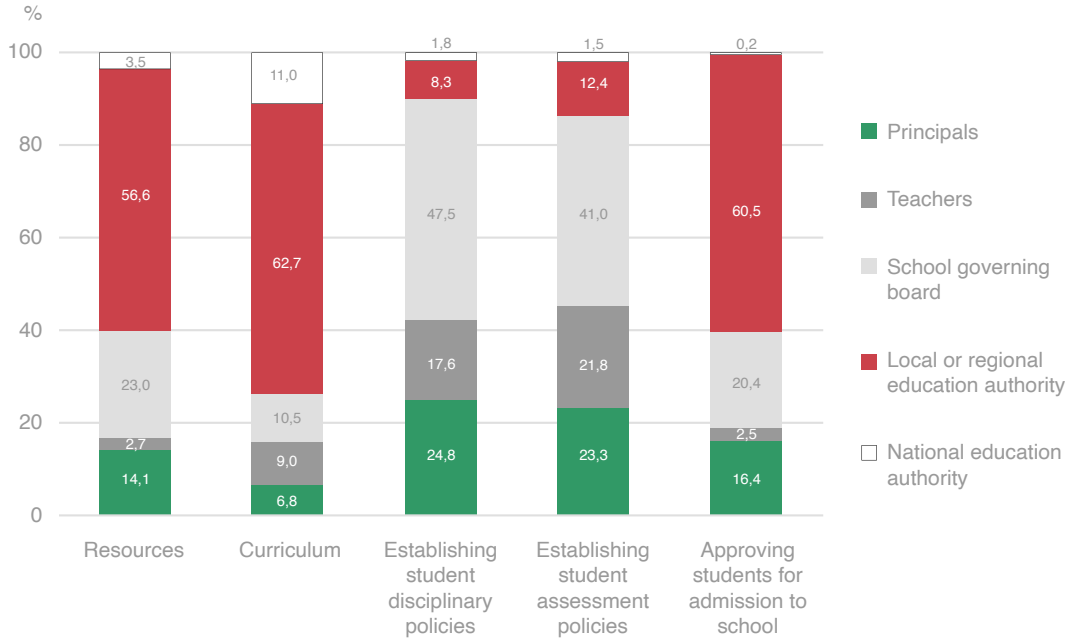
How school systems are governed determines how responsibilities are distributed to stakeholders within and outside schools, which directly shapes school environments and the quality of teaching and learning. In the past few decades, there is a growing trend calling for granting schools more autonomy in the governance process. One of the reasons is that principals and teachers, as qualified professionals in the delivery of education, can make the right judgements about which learning content, pedagogical approaches and school management styles are best for meeting their students' learning needs. If more autonomous, schools also can be more responsive to specific contexts and local needs.

However, school autonomy cannot be effective on its own. It needs to be considered from a whole-of-system perspective, taking a range of systematic conditions into account. An analysis based on empirical evidence of countries' practices on school autonomy (OECD, 2018[25]) has identified that a strong national framework, clear strategic goals, well-adapted training for school leaders and teachers, a robust accountability system and a collaborative environment together form a vital foundation for achieving successful school autonomy.

» School governance in China

Despite the decentralisation in education over the past decades, distribution of responsibilities to stakeholders at each level varies significantly in different education systems across the world. Evidence from Beijing, Shanghai, Jiangsu and Guangdong (China), has suggested that the local and regional authority holds much greater responsibility for school resources, curriculum provision, and approving students for admission to school, compared to school principals, teachers, school governing boards and national authorities (see Figure 6.11). When it comes to school policies, school governing boards in B-S-J-G (China) tend to hold the largest responsibilities in establishing disciplinary policies and student assessment policies than other stakeholders (see Figure 6.11).

Figure 6.11. Responsibilities for school governance, by actor, in B-S-J-G (China), 2015

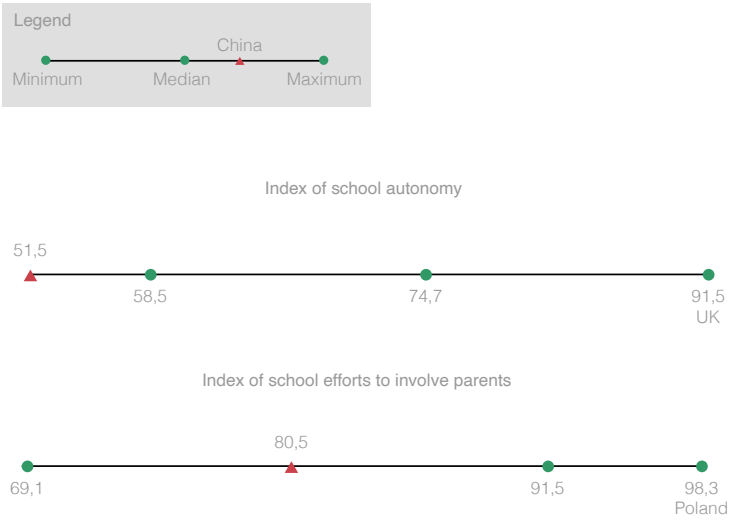


Note: Data are limited to four Chinese regions: Beijing, Shanghai, Jiangsu and Guangdong.
Source: OECD (2016[6]), PISA 2015 Results (Volume II): Policies and Practices for Successful Schools, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264267510-en.

A larger share of students in OECD countries, on average, than in B-S-J-G (China) attend schools where their principals are responsible for resource allocation (e.g. hiring and firing teachers, formulating school budgets), formulating school policies and determining which courses are offered. Relatively speaking, principals in B-S-J-G (China) have a limited role in fulfilling those responsibilities.

Teachers' responsibilities are also relatively limited in China. Around 82% of students in OECD countries, on average, attend schools where teachers can choose which textbooks are used in class; this figure is only 14% in B-S-J-G (China) (OECD, 2016[6]). From the perspective of the responsibilities shared by the principal, teacher and school governing board as a whole, the overall degree of school autonomy in B-S-J-G (China) is relatively lower than the degree of school autonomy in OECD countries on average (see Figure 6.12).

Figure 6.12. School autonomy and parental involvement in China, compared with school autonomy and parental involvement in selected high-performing education systems



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Guangdong. The index of school autonomy is calculated as the percentage of tasks for which the principal, the teachers or the school governing board have considerable responsibility. The index of school efforts to involve parents is calculated as the percentage of relevant statements applied to schools (also shown in Figure 5.13).
Source: adapted from OECD (2016[6]), PISA 2015 Results (Volume II): Policies and Practices for Successful Schools, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264267510-en.

When analysing the relationship between school autonomy and student performance on science, students in B-S-J-G (China) score higher in science when they attend schools with higher levels of autonomy. After taking students' socio-economic profiles into account, however, the association between school autonomy and student science performance is no longer valid (OECD, 2016[6]). This pattern is observed in many high-performing education systems as well, including Estonia, Finland, Germany, Korea, the Netherlands, New Zealand, Norway and Singapore.

» Involving parents and other stakeholders in the governance process

In many decentralised education systems, capacity in decision making in the policy process relies on co-constructed knowledge from various stakeholders. Parents and students are the primary stakeholders of education services, and their participation in education governance helps craft policies and practices that are more relevant to local contexts and student learning needs. Other stakeholders in wider contexts, such as schools, local communities, teachers' unions, research institutions and private agencies, can all serve as diverse sources of knowledge and information, and thus contribute to building capacity and accountability in education governance.

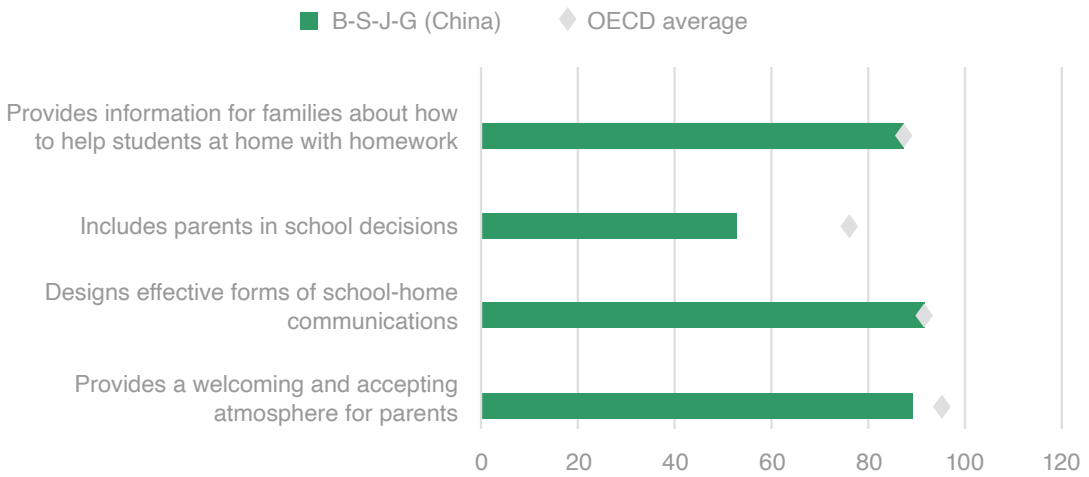
One of the most prevalent trends in developing education policy in many education systems in the past decade has been to engage a variety of stakeholders in decision making. Many strategies have been used in those education systems to achieve effective engagement with stakeholders. Such strategies include legitimising parents' participation in school activities, encouraging school networking and peer learning and engaging private actors in the school operation process (OECD, 2019[26]).

In China, parents' participation in school decisions has not been legalised in the national framework yet. However, the Ministry of Education has published a guideline and a school management standard that encourages schools to set up a parental committee (Ministry of Education, 2017[17]). The parental committee then becomes the catalyst to involve parents in the school governance process. Many other education systems around the world have carried out similar efforts. For instance, in Denmark and Korea, parents elect parent representatives who participate in school governing boards. In countries like Canada, parents have formed an essential part of school boards that are not only responsible for one school, but for an entire network of schools (OECD, 2016[6]).

Evidence from PISA 2015 sheds lights on parental engagement in the decision-making process in China. Around one-third students in B-S-J-G (China) attend schools for which there is national, state or district legislation on including parents in school activities. This figure is less than half as much as the OECD average (OECD, 2016[6]). Only around half of students attend schools that include parents in school decisions (see Figure 6.13).

A regression analysis further reveals that the likelihood of schools in B-S-J-G (China) to include parents in school decisions is largely determined by the existence of legislation on parental engagement (OECD, 2016[6]). Rather than making efforts to engage parents directly in decision making, schools in B-S-J-G (China) tend to make more effort to engage parents in informative activities (see Figure 6.12). These efforts include: creating welcoming atmospheres where parents can get involved; designing effective school-home communications; and providing information to families about how to help students at home (see Figure 6.13).

Figure 6.13. Percentage of students who attend schools where the following practices are implemented to raise parental engagement in China and OECD countries, 2015



Note: Data for China are limited to four regions: Beijing, Shanghai, Jiangsu and Guangdong.
Source: Adapted from OECD (2016[6]), PISA 2015 Results (Volume II): Policies and Practices for Successful Schools, PISA, OECD Publishing, Paris, https://doi.org/10.1787/9789264267510-en.

Engaging local employers and the private sector in the decision-making process has also become increasingly common in today's approaches to education governance. Through co operation with local employers and the private sector, educational policies can be more responsive to local needs and be implemented more effectively via joint efforts, and in alignment with specific goals.

For example, many vocational education and training (VET) programmes around the world promote engagement with local employers and the private sector, which allows schools to co-operate with local employers and the private sector to develop a "dual learning track" that combines school learning with work-based learning. In Denmark, nearly all the vocational programmes offer school-work integrated learning, where local employers and the private sector often work together with schools to construct curriculum frameworks (OECD, 2019[27]).

Similarly, engaging the private sector and employers is a policy priority in China. The Ministry of Education has published guidelines to encourage and promote vocational schools to build partnerships with local employers and the private sector (Kuczera and Field, 2010[28]). However, there is little data on how stakeholder engagement takes place on the ground. There is a lack of formal mechanisms to regulate the roles and responsibilities of stakeholders in the decision-making process, which risks reducing the effectiveness of partnerships and jeopardising the policy outcomes.

Education governance during an emergency

As the world experienced in 2020, unpredictable crises and disasters can hit education systems and cause devastating consequences on student learning. Building resilience in emergency situations is a vital skill that education systems in today's world must develop to better face future uncertainty. The coronavirus (COVID-19) crisis in 2020 brought school closures worldwide, which are predicted to cause disruptive consequences for over 90% of the world's student population (UNESCO, 2020[29]). It is one of the most severe disasters to hit global education systems. Many governments are currently struggling to minimise the damaging effects and protect student learning rights.

China was the first country to implement nationwide school closures during the COVID 19 crisis. It was also one of the earliest countries to develop school reopening plans once the virus outbreak was considered under control. As an "early responder" education system to the crisis, China provides some evidence, practices and insights into how education governance can adapt its long-term goals to the demands of a current emergency. This section presents a brief reflection on how a crisis governance system can be planned, organised and implemented to address abrupt and unexpected challenges.

» Practice 1. School closure: Balancing health needs and educational priorities

In the early stages of the COVID-19 outbreak in China, the Ministry of Education at the central level implemented a nationwide school lockdown, in conjunction with the lockdown of several cities in Hubei, the epicentre of the coronavirus. This happened at the end of January 2020. The school closure covered the entire education system at all levels, which is estimated to have affected 278 million enrolled learners in China.

The theoretical hypothesis supporting school closure is that school-aged children often have high human-to-human contact rates, which facilitates the spread of the novel coronavirus. In the face of the 2009 H1N1 pandemic, some researchers used computer simulations to test the effectiveness of school closure to curb H1N1, which showed that entire school system closures were not more effective than individual school closures (Lee et al., 2010[30]). Other evidence drawn on the previous epidemic yields similar results, suggesting that school closures may not be as effective as other policy restrictions (such as social distancing and domestic confinement) (Viner et al., 2020[31]).

However, the data on school closures curbing COVID-19 is limited to date. Unlike the previous epidemic, people infected with COVID-19 may not display any symptoms. One undetected infected case at school could transmit the virus to a larger group of students, again undetected, which could lead to an outbreak.

Countries that experienced the COVID-19 outbreak later in 2020 also adopted nationwide school closures, such as Italy, Spain and France. Others adopted localised approaches, which left local authorities to decide locally on school lockdowns,

such as Canada and the United States. Only a few countries kept schools open, including Turkmenistan and Belarus. The different approaches among education systems to managing schools during the COVID-19 crisis reflect the different strategies used in education governance to adapt to changing contexts and to strike a balance between short-term and long-term priorities.

Striking the balance between the need to respond to an urgent priority and long-term educational goals is key to achieving effective governance during an emergency. Decisions on school closures and reopenings reveal the difficult balance between student educational gains and student health and well-being (OECD, 2020[32]). Balancing health needs and education goals inevitably involves trade-offs. It becomes more crucial than ever to collect information and evidence from varied sources and stakeholders across all levels of education to be able to make the "right" and timely choices and trade-offs. Collecting such information enriches the knowledge base for emergency response and helps decision makers to inform, or adjust, their decision making more effectively.

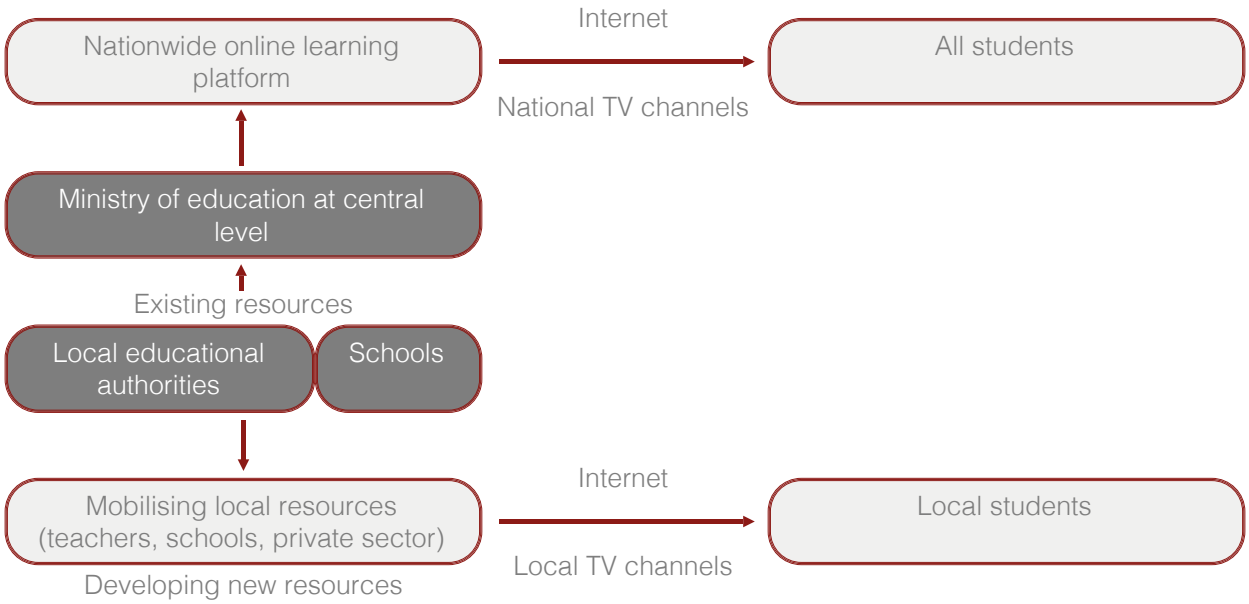
» Practice 2. Capacity building: Constructing an online educational platform at national scale

To minimise the disruptions caused by school closures on student learning, education systems need to act quickly to develop strategies to protect the continuity of curriculum provision and ensure that every student has access to learning opportunities, even in vulnerable or disadvantaged socio-economic conditions. But strategies are not enough. An urgent situation in which millions of students lose access to schools requires education systems to co-ordinate resources beyond schools and mobilise services and resources to maximise systematic capacity to implement the strategies.

Technology emerges as the bridge that connects learners with learning opportunities in a lockdown situation. Online learning environments have hence become more important than ever for students and educators. In the early stages of the COVID-19 crisis, education systems in China started co-ordinating online learning resources at national, regional and school levels, with the intention of bringing together all existing learning resources, and making them public on one integrated, nationwide, online learning platform. While the central education authority led the work to build a nationwide online platform, it also required local authorities to take responsibility for developing and providing new online learning classes adapted to local contexts (Ministry of Education, 2020[33]).

Internet access is one of the primary necessities for students to access online learning resources. However, some geographical areas may have limited Internet access, which can result in widening the education inequality gap and leaving students with disadvantaged socio-economic backgrounds even further behind. To address this issue, China's education system built horizontal capacity with TV broadcasts, where national TV channels, as well as local TV channels, are being used to broadcast learning resources, such as recorded lessons or live-streaming lessons (Figure 6.14).

Figure 6.14. How the education system in China developed its capacity to provide online learning during the COVID-19 pandemic



Note: Authors' own work, based on Ministry of Education (2020[33]), *利用网络平台，停课不停学 [Making use of online platform, suspending classes without stopping learning]*

Such capacity is not built in a day. Effective ICT resource coordination across central and local governance levels takes time and effort with planning, practice and optimisation. Starting in 2011, China put forward "the ten year development plan for ICT in education 2011-2020" (Ministry of Education, 2012[34]). In this plan, China set out tasks to achieve the following goals by 2020: 1) build an ICT learning environment that every student can benefit from; 2) build an ICT service system that supports the development of the learning community; 3) achieve full broadband network coverage; 4) improve ICT-enabled education governance; 5) improve ICT integration in the development of education. This ten-year development plan has laid a concrete foundation for the nation-wide development of ICT capacity in education, which contributes to the capacity building of China's education governance in the time of COVID-19.

» Practice 3. Change management: Engaging stakeholders and refining their responsibilities so they can adapt

School closures have shifted the learning environment from schools to homes, from face-to-face to virtual settings. This also implies shifts and changes in stakeholders' involvement in the governance process. While teachers can no longer regulate their students' behaviours like they could in their classrooms, parents have to assume the responsibility to monitor their children's participation and progression in the learning process. Likewise, as schools can no longer provide educational services to full capacity, the private enterprises and other stakeholders should be encouraged to step in and assume shared responsibility.

Education authorities in China took several initiatives to cope with the changing landscape of stakeholder engagement in education during the COVID-19 crisis. One initiative was to provide direct support to ensure that stakeholders could participate in the governance process. For instance, the Ministry of Education at both central and regional levels organised online training and collaborative learning among teachers to enhance teachers' knowledge of online teaching (Ministry of Education, 2020[35]). Developing teacher knowledge extended to fostering knowledge exchange and co-construction between teachers and parents, which was then prioritised explicitly in policies in several regions. Specifically, many regions in China required that teachers or schools needed to provide guidance on using online learning resources to parents, keep parents informed about the curriculum and instruction plan, and give parents advice on home tutoring. In return, parents were urged to provide feedback on their children to teachers, and help teachers implement learning activities, homework and home assessments (Fan, 2020[36]).

Offering teachers professional development opportunities has become a priority during COVID-19. Due to sudden impacts on student health, teachers not only need the capacity to support student academic development, but they need to cope with students' social and emotional well-being. In addition, teachers can facilitate parents and students engaging in the decision-making and governance process. However, according to a recent OECD survey, only 60% of the surveyed government representatives indicated that their teachers were offered professional development (OECD, 2020[32]).

Partnerships with technology companies play a notable role in providing education services during the pandemic lockdown in China. The partnerships between education and other social sectors have been nurtured over the past decade. The ten-year developmental plan (Ministry of Education, 2012[34]) aimed to build by 2020 an ICT-based service system that supports learning. China's new policy initiative "Modernising Chinese Education 2030" (State Council, 2019[37]) continues to put a high emphasis on innovating the education services market. With government support and market incentives, the technology sector has quickly become the leading industry supporting the education system, by providing online and digital services during the COVID-19 crisis. It also bridged information together and facilitated the feedback flows from various stakeholders, which significantly strengthened accountability in education emergence. For example, online teaching applications have allowed parents to observe or participate in the teaching and learning process, keeping parents informed and facilitating dialogues between teachers and parents. Some digital services such as online testing and grading have collected student performance data, and meanwhile reduced teachers' workloads.

» Conclusion

The above practices are only a few representative patterns observed in China's education governance in the first phase of the pandemic. While the spread of COVID-19 has steadily declined in China and schools reopen gradually, its education system still face a number of challenges in terms of sustaining its learning continuity in the aftermath of the pandemic and for the long-term future. Additional learning assessments and plans need to be developed to recover the learning loss of students who were unable to learn during the lockdown. Students who face delays in graduation and difficulties in entering the job market need to be offered support and services. Systematic changes are required to harness the innovative teaching and learning practices from the pandemic period and expand institutional capacities for learning provision. China needs to take stock of the lessons learned in this crisis, to continue strengthening the partnerships with other sectors of society and to develop clear and evidence-based policy strategies, integrating innovation as a core component to improve the sustainability of its education system.

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