Adapting Curriculum to Bridge Equity Gaps

TOWARDS AN INCLUSIVE CURRICULUM

OECD

Adapting Curriculum to Bridge Equity Gaps

TOWARDS AN INCLUSIVE CURRICULUM

Please cite this publication as:
OECD (2021), *Adapting Curriculum to Bridge Equity Gaps: Towards an Inclusive Curriculum*, OECD Publishing, Paris, https://doi.org/10.1787/6b49e118-en.

ISBN 978-92-64-35395-4 (print)
ISBN 978-92-64-80496-8 (pdf)
ISBN 978-92-64-54129-0 (HTML)
ISBN 978-92-64-83321-0 (epub)

Revised version, February 2023
Details of revisions available at: https://www.oecd.org/about/publishing/Corrigendum_Adapting-Curriculum-to-Bridge-Equity-Gaps.pdf

Photo credits: Cover © Shutterstock/wavebreakmedia.

Corrigenda to publications may be found on line at: www.oecd.org/about/publishing/corrigenda.htm.

Table of Contents

BOXES

FIGURES

TABLES

Executive Summary

Countries and schools around the world are increasingly using four types of curriculum innovations: digital curriculum, personalised curriculum, cross-content and competency-based curriculum, and flexible curriculum. In doing so, the reality they face to date has been that such innovations may enlarge equity gaps among different groups of students, instead of closing the gaps. Thus, this report focuses on how curriculum can be adapted to ensure that no learner is left behind, particularly the most vulnerable and provides the opportunity to think harder about 'equality, equity and inclusion in curriculum design and implementation'.

EQUALITY, EQUITY AND INCLUSION SHOULD BE MORE EXPLICITLY HIGHLIGHTED DURING CURRICULUM DESIGN AND IMPLEMENTATION PHASES.

21st century curricula should be truly inclusive, leaving no learners left behind. Some countries focus on **equality**, i.e. offering equal opportunities to all students (e.g. minimum curriculum standards or a core curriculum). Others take an **equity**-focused approach, providing differential support for students based on their individual needs (e.g. remedial learning for students with difficulties). Some others embrace diversity and embed **inclusion** as the principle of curriculum design and implementation (e.g. removing systemic barriers to learning so that students can learn just as they are without any differential support).

Making conscious efforts to listen to **student voice** and ensuring their **learning and well-being** should be embedded into the process of curriculum design and implementation; this is in line with the United Nations Convention on the Rights of the Child, for example, Article 12 (respect for the views of the child), 24 (health and health services) and 28 (right to education).

Policy makers, curriculum designers and teachers can consider practical approaches for adapting curricula to all types of learners (including the most vulnerable ones). For example, **Design Thinking** pushes curriculum designers to thoroughly understand the challenges students face by empathising and listening to students and exploring problem space with various data and analysis, iteratively. **Universal Design for Learning (UDL)** invites curriculum designers to systematically find ways how a curriculum works for all, not only some learners, by focusing on removing barriers around the what (content and concepts), the why (sense of purpose and motivation), and the how of learning (pedagogies and assessment).

DIGITAL CURRICULUM IS PROVIDING US WITH MYRIAD NEW OPPORTUNITIES FOR HUMAN ADVANCEMENT, WHILE AT THE SAME TIME ENLARGING EQUITY GAPS WITHOUT CONSCIOUS EFFORTS TO BRIDGE THEM.

> *Digital curriculum refers to digitalisation of curricula to support all students to achieve their educational goals. In addition to digital content, it can include organisational features and formats used to articulate curricular content, such as e textbooks, online materials and repositories, and technological tools to deliver the curriculum, including both hardware and applications such as YouTube, artificial intelligence (AI), and digital platforms. The definition varies across countries/jurisdictions, and is evolving as schools experiment with a greater number of digital applications.*

A digital curriculum can help reducing equity gaps by, e.g.:

- allowing students to continue learning outside school or in remote and rural areas (e.g. students being in hospital for their health reasons, dropout students learning from home, students in refugee camps) as long as access to devices and internet connection is ensured;
- supporting students to continue learning during natural disasters or pandemics (e.g. during school closures due to the Covid-19 pandemic in 2020/21);
- removing some barriers for students with physical disabilities with assistive technology;
- motivating students who seem disengaged in learning with the use of games and interactive tools;
- enabling immigrant students to benefit from more access to digital dictionaries and translated learning materials;
- supporting students who are struggling in learning by providing 'real-time' feedback through AI tutors alongside with their teachers, so that they can make progress at their own pace, based on their prior knowledge, ability levels and learning needs.

Despite many advantages, a digital curriculum entails potential risks.

- false dichotomy between the use of AI and the human intrinsic values, which should be the core values of curriculum design and implementation; students and teachers should benefit from using a digital curriculum, not being deprived of opportunities or space to exercise their own agency;
- trade-offs with other needs (e.g. sufficient face-to-face interactions with teachers and peers, protection from privacy threads, and health-related risks associated with excessive screen time, altered sleep cycles, reduced physical activity level and feelings of social isolation, depression and anxiety);
- disparities in the use of a digital curriculum (e.g. issues with access to software, hardware and internet connectivity as well as a basic level of digital literacy for teachers and students);
- growing inequalities in home learning and well-being environment, associated with increased discrepancies in students learning as well as wellbeing outcomes.

To face such challenges, countries invest in bridging gaps in various areas, e.g. supporting teachers and students to appreciate human values as well as new opportunities brought by digital transformation; ensuring equitable access to infrastructure (e.g. digital devices, use of e textbooks, print materials, online platforms); supporting parents to ensure good learning and well-being environment at home. As the pandemic Covid 19 crisis revealed, attention needs to be given not only to observable gaps (e.g. lack of computers or limited internet), but also to more silent and hard to observe gasps (e.g. gaps in motivation by students who may quietly disengage and drop out when receiving only online instruction).

Adopting a digital curriculum may also entail new opportunities and challenges for public-private partnerships. For example, some governments set standards for new education services such as EdTech, or relax regulations in the existing industries, where appropriate. The typical trends include, for example, publishers develop e textbooks and software companies develop new learning management systems and/or learning apps. The introduction of private partners into the curriculum delivery process may raise other dilemmas, such as the dependency on specific digital services providers or escalating costs after trial versions of services expire.

PERSONALISED CURRICULUM IS NOT NEW, BUT IT IS GAINING TRACTION, ACCELERATED BY DIGITAL CURRICULUM, ALLOWING MORE PERSONALISATION TO SUIT VARYING STUDENTS' NEEDS.

> *Personalised curriculum, also known as individualised curriculum, differentiated curriculum or tailored curriculum, refers to an approach that offers individualised instruction to students. Personalised learning has many definitions and connotations, but its main purpose is to contribute to equity and inclusion by tailoring instruction to students' individual needs, skills and interests. Although personalised curriculum is not necessarily technology-based, current approaches do make use of technology.*

Traditional curriculum is often designed for teachers to teach the same content to all students at the same time and through the same instruction. This approach has been challenging in particular for vulnerable learners, overlooking the differences in proficiency levels, prior knowledge and skills, as well as learning needs and strategies. A personalised curriculum, if implemented properly, has the potential to change the curriculum structure from a one-size-fits-all, linear learning-progression model to a differentiated, non linear learning-trajectory model, from

which all students can benefit. A personalised curriculum allows students some degree of choice in content, pace of learning, and learning activities, and assessment. For example, assessment can be tailored to support students to set their individual learning goals, to provide more frequent and substantive feedback on progress and to diagnose potential learning difficulties. This approach enables them to become aware of their personal interests and their talents, to make sense of why they learn, and to make connections between school life and their own social and cultural environment.

One of the challenges of this approach is retaining rigor and coherence so as to avoid stigmatisation that this curriculum is a second class (often associated with lower parental aspirations or teacher biases). Another example is ensuring accountability for national or regional standards with the alignment of personalised curriculum content, pedagogies and assessment adapted to diverse groups of students (special needs, immigrant students, students at risk of drop-out). Other examples include managing costs, including direct and indirect costs associated with implementation of personalised curriculum; opportunity costs of teachers to ensure teacher well-being; supporting teacher agency so that they can design and manage personalised curricula for all students to grow in their own way.

To counter such challenges, some actions from policy makers include: integrating personalised learning in legislation and/or curriculum; provide targetted funds and technical support to schools; publish the curriculum and learning materials in multiple languages; supporting teachers and school leaders to design individualised study plans and syllabi; and envolve additional stakeholders (e.g. parents, larger community), and make use of extracurriculum activites to support students at-risk.

CROSS-CURRICULAR CONTENT AND COMPETENCY-BASED CURRICULUM HOLD PROMISE FOR ENGAGING ALL STUDENTS NOT ONLY SOME, IF DESIGNED AND IMPLEMENTED PROPERLY.

> *It refers to curricula built across the boundaries of subject areas. Such a curriculum emphasises the importance of interdisciplinary knowledge and offers cross-curricular content to enable students to connect knowledge across different discipline. Some generic competencies, such as critical thinking and creativity, are thought to be best developed through a cross-curricular approach to meet students' interests and needs, by helping students become responsive citizens in a technology-driven globalised world.*

This type of curriculum can contribute to equity by offering more engaging, practical, and demanding learning experiences for all students and, thus, empower them. It can help prepare students for civic life, good health and for the workforce. Vulnerable students, especially low-income and minority students, are likely to benefit from integrated learning and enquiry-based learning, e.g. learning science together with literacy, with argumentation and with knowledge construction; learning science and mathematics together in real-life settings and through collaboration among students It is important to acknowledge that different pedagogies work for different students with different purposes; meta-analysis has shown that explicit teaching can be an effective instruction strategy when teaching critical thinking skills.

Cross-curricular content and competency-based curriculum should not imply a false dichotomy between content knowledge vs. competencies, but should instead value the development of competencies broadly speaking (knowledge, skills, attitudes and values) across learning areas. Similarly, it should not be seen as an equity measure targeting only certain groups of students, which invites stigmatisation. Unless it is designed properly, it can create more pressure to further curriculum overload. This curriculum type requires professional judgement and expertise of teachers to determine which type of teaching strategy works best for diverse students. Embedding equity-related values in curriculum as cross-curricular themes (e.g. inclusion, diversity, indigenous values) can also be a powerful tool for advancing the values of inclusion in schools and gives teachers and students opportunities to practice such values throughout their school day.

FLEXIBLE CURRICULUM CAN BE PARTICULARLY BENEFICIAL TO VULNERABLE STUDENTS WHILE COUNTERING THE RISKS OF DEEPENING LEARNING DIVIDES.

> *Flexible curriculum refers to the ability of schools and teachers to make local decisions about their curriculum. Flexible curricula allow schools and teachers a certain amount of freedom to make site-specific curricular choices on learning content and goals, pedagogy, assessment, and time and place of learning. For instance, when learning content intended in the curriculum, say sustainable development, teachers and students may choose to study in depth one environmental issue that deeply affects their local community (e.g. diversity of ocean life in coastal areas). A flexible curriculum welcomes such opportunities for contextualising learning.*

A flexible curriculum is similar to personalised curriculum in ways in which it allows students to learn differently, e.g. content, learning time, pedagogies, and assessment, in accordance with their needs. For example, flexibility in assessment (e.g. formative assessment) as well as time and place of learning (when coupled with a digital curriculum) hold promises for expanding access and improving the quality of learning for all, e.g. students learning from hospitals, remote areas, refugee camps, those abroad, etc.

Flexible curricula in content, however, may inadvertently have negative effects on students' performance and can even lead to increased equity gaps between groups of students. Other concerns include regional and local variations of how it is used as well as variations on investments in teaching and teachers, both of which may inadvertently increase equity gaps. To contain such risks some countries try to reserve flexible curriculum for specific groups of students, such as linguistic minorities and low-achieving students. Other countries encouraging schools to be flexible and proactive to support students from disadvantaged backgrounds, e.g. through the use of individual educational plans. Therefore, flexible curriculum is discussed in the context of curriculum autonomy, delegating responsibility for local entities to make informed decisions, being informed of the realities of the students.

ACROSS THE FOUR TYPES OF CURRICULUM INNOVATIONS, COUNTRIES HAVE GAINED INSIGHTS AND FIVE LESSONS LEARNED, DRAWING ON UNINTENDED CONSEQUENCES.

When experimenting with various curriculum design and implementation strategies, countries and jurisdictions experience varying levels of success. Below are some of the lessons learned that emerged from real attempts at putting in practice some of these curriculum innovations in an effort to make them more inclusive:

1. Use Universal Design for Learning as checklist.
2. Change the paradigm of "learning and assessment" to favour the whole child and person development.
3. Expect both untapped opportunities and new risks in public-private partnership.
4. Avoid stigmatising personalised and cross-curricular content and competency-based curricula.
5. Do not underestimate the resources required to close observable and non-observable equity gaps.

Key Messages

- **Digital curriculum, personalised curriculum, cross-curricular content and competency-based curriculum**, and flexible curriculum are four types of curriculum innovations, proving myriad new opportunities for bridging equity gaps, if carefully designed and implemented. Currently, countries and schools are facing dilemmas and trade-offs, while at the same time benefiting from curriculum innovations to bridge equity gaps.
- Curriculum designers, school leaders and teachers need to become more aware of diverse needs of students, in particular, those of vulnerable students. Attention should be paid to, e.g. **families' socio-economic backgrounds; family structures; migrant, ethnic or racial, minority, and indigenous background; language(s); geographic location; special education needs (SEN); low performance or under-preparation in prior learning; gifted and talented students with exceptional abilities in learning; gender and sexual orientation**. It is also important to recognise the intersectionality between these factors (a student may present any combination of such factors in reality).
- Despite all the diversity in students' needs, in particular, those of vulnerable students, a standardised "one size fits all" approach to curriculum design does not take into account their different learning needs, prior learning, or learning interests. One effective approach to better understand students' needs and ensure their learning and well-being in curriculum design and implementation is **Design Thinking**; it reinforces the important step of empathising by listening to students in the design process of a curriculum. This approach is in line with the United Nations Convention on the Rights of the Child, in particular, Article 12 (respect for the views of the child), 24 (health and health services) and 28 (right to education).
- Social and personal circumstances should not be obstacles to learners' success, but barriers still exist to make curriculum truly inclusive, e.g. a curriculum that exists only in written form (for teachers with visual and hearing impairments); dominance of written and standardised forms of student assessment. Thus, another approach is **Universal Design for Learning (UDL)**; it supports removing barriers and systematically focusing on the three components of what (content), the why (motivation), and the how of learning (pedagogies and assessment).
- **Digital curriculum** can remove some barriers to learning so students can learn from home, from refugee camps, from hospitals, from abroad, etc. It can support diverse learners by expanding the possibilities of assistive technology (e.g. screen readers, motion and voice recognition apps, Braille switchers, augmented reality, AI, wearable devices, etc.) and by blending the use of such applications so they can serve special needs students as well as learners. It can help unpack and personalise learning progressions through interactive tutoring systems that provide real-time and frequent feedback to students. It can also support teachers by gathering real data (learning analytics, Big Data) that helps them with early diagnosis of learning difficulties as well as adjusting learning goals to all learners. It can help with engaging unmotivated students or those at risk of drop-out (e.g. games and virtual reality applications). To make these opportunities a reality for all, a combination of public and private investment in enabling mechanisms is of critical importance, e.g. infrastructure (internet connectivity), devices (hard and software), school leaders and teacher training and support, etc.
- **Personalised curriculum** (especially when coupled with digital curriculum) can allow further adaptations for diverse learners, e.g. individualised learning goals or plans; relevant choice of content and learning activities in accordance with students' prior knowledge and experience as well as skills and interests. Challenges with this curriculum type include: pressure on students and teachers who still need to prepare for standardised forms of assessment for accountability; misalignment of parental and teachers' expectations and mindset (e.g. parents'

expectations of standard curriculum or teachers biases about what diverse learners can achieve); difficulty in designing teacher training; costs of implementation when maintaining and valuing human interactions; engaging stakeholders to design culturally responsive curricula etc.

- **Cross-curricular content and competency-based curriculum** have the potential to support equity goals by empowering all students, regardless of background, to engage in practical and demanding learning experiences. It supports some of the **twelve OECD Future of Education and Skills 2030 Design Principles,** such as **"Interdisciplinary", "Transferability"** and **"Authenticity"**. This curriculum type supports the development of interdisciplinary knowledge as well as important transferable competencies (such as critical thinking and problem solving) and provide space and links to the real world, in which the content is current, relevant and applicable to contemporary times. Equity-related challenges include, similar to those with personalised curriculum, false perceptions about a 'second class' curriculum when focusing on non-traditional pedagogies and assessment (e.g. inter-disciplinary learning and formative assessment); misalignment with standardised testing; possibility to result in curriculum overload, unless carefully designed; training and support for teachers to design and collaborate with other teachers and people outside school; regional and local variations in capacity to promote equity-related values as a cross-curricular theme; etc.
- **Flexible curriculum** aims at adapting it to the needs of diverse learners by allowing schools, teachers and students a certain amount of freedom to make specific curricular choices on learning content and goals, pedagogy, assessment, as well as time and place of learning. It supports some of the **twelve OECD Future of Education and Skills 2030 Design Principles**, such as "**Choice"**, **"Student agency"** and **"Teacher agency"**. School leaders and teachers are encouraged to find their own purpose of adapting curriculum especially to low-achieving, language and other minority and/or disadvantaged students and support, in particular, vulnerable students to feel a sense of purpose in learning, make informed choice and decision about their own learning, and own their own learning. One of the fundamental dilemmas includes, similar to personalised curriculum, how to reconcile discrepancies in learning (e.g. flexible content, learning time, assessment, etc.) and national/regional standards for accountability.
- **Five key lessons** learned from unintended consequences countries experienced when tackling time lag issues suggest:

  1. Use Universal Design for Learning as checklist.
  2. Change the paradigm of "learning and assessment" to favour the whole child and person development.
  3. Expect both untapped opportunities and new risks in public-private partnership.
  4. Avoid stigmatising personalised and cross-curricular content and competency-based curricula.
  5. Do not underestimate the resources required to close observable and non-observable equity gaps.

What does research and international data say?

Various OECD member and partner countries/jurisdictions, schools and teachers increasingly use the following types of curriculum innovations when attempting to renew, upgrade and/or transform curricula to make them more relevant and responsive to the demands of the 21st century, as reported in the latest OECD Future of Education and Skills 2030 thematic curriculum report (OECD, 2020[1]).

- digital curriculum;
- personalised curriculum;
- cross-curricular content and competency-based curriculum;
- flexible curriculum.

In advancing the use of such curriculum innovations, however, countries, jurisdictions, schools, teachers and students themselves reported that they often experience growing equity gaps. This publication aims to take a pragmatic approach to addressing the equity issues when introducing these curriculum innovations. Therefore, this report is not an in-depth study on equity in education in broad terms; it sets out the equity issues within the specific scope of the selected foci as curriculum innovations.

This section aims to clarify the definitions and interpretations about the concept of "equity" and similar concepts in the specific context of curriculum design and redesign; take stock of what is known in this evolving field from research, but also from international curriculum data and analysis as well as concrete case studies.

Unsurprisingly, such innovations are still evolving in many cases and, therefore, accompanying evidence to support their effectiveness, feasibility and accessibility is often limited, especially when it comes to achieving equity goals through curriculum innovations. That being said, this section highlights some promising tools, frameworks and concrete examples – such as Design Thinking and Universal Design for Learning (UDL) – that can inspire and help curriculum designers to leverage opportunities for creating more equitable and inclusive curricula.

DEFINING EQUALITY, EQUITY, AND INCLUSION IN THE CONTEXT OF CURRICULUM DESIGN

Aspirations for equity in curriculum redesign are often built around divergent assumptions. Before specifying what ensuring equity in curriculum design entails, it is important to understand the difference between the similar but distinct concepts "equality", "equity" and "inclusion". This said, the distinction gets often blurred as these concepts also overlap when we discuss them from different vantage points, e.g. opportunities to learn and learning outcomes.

A considerable amount of literature defines and interprets the differences between these, often with highly contested political and policy debates (Levin, 2003[2]). This report defines the terms pragmatically in the specific context of curriculum development. Figure 1 illustrates different possible approaches for ensuring that all learners benefit from learning. The image portrays four scenarios representing whether or not students' opportunity to watch a game (access) can be affected by individual (height) and/ or surrounding conditions, such as structural barriers (fence) or provided support (boxes).

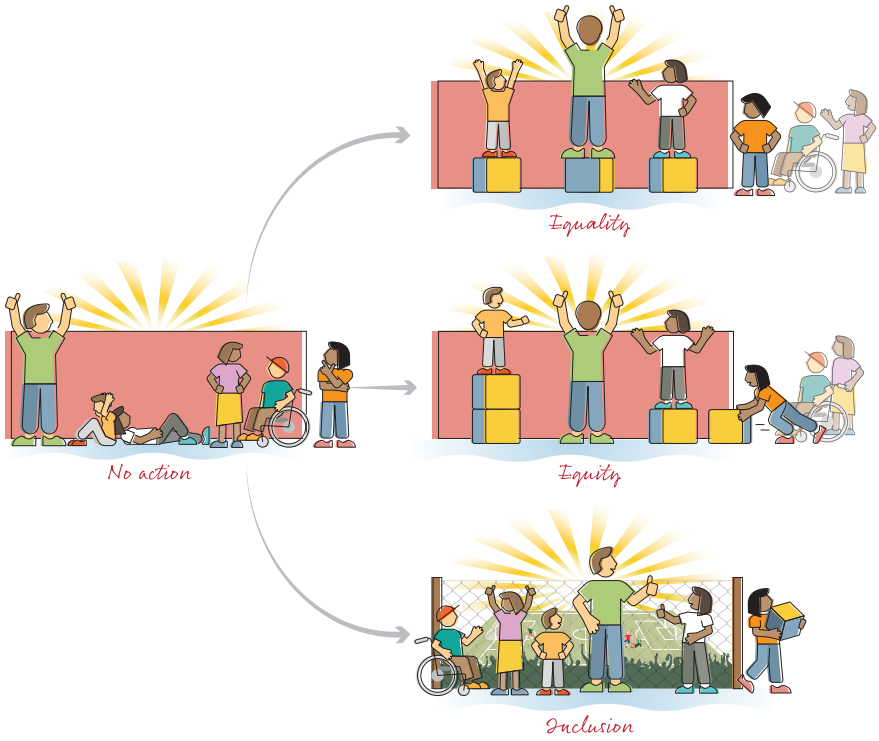
The baseline scenario on the left 'No action' presents a case where no intervention is made; only the tall student in green T-shirt is able to watch the game and the character in orange T-shirt (assuming the role of a policy maker)

is thinking of how others can get to see the game, too. There are at least three approaches the policy maker can consider in the context of curriculum design (scenarios on the right):

- **Equality** in curriculum: the policymaker provides the same box to all students, such as a minimum/common standards or core/essential learning in the curriculum design context. This way, all students have access to watching the game.
- **Equity** in curriculum: the policy maker provides the boxes in accordance with the needs of each student; the student with green T-shirt does not need any boxes to watch the game, while the shortest student in orange receives two boxes and the student in white receives one. This is similar to the case of preparing a mother language curriculum for migrant students, for example.
- **Inclusion** in curriculum: the policy maker can consider the fundamental barrier, i.e. fence being the obstacle to watch the game, and provides an alternative solution by replacing it with the net. This way, all students can watch the game without any subsidies or support (boxes). In this scenario, students in wheel chair can also watch the game without any additional support. This will, however, pose questions about political economy of reform related to the removal of the fence or the creation of a new net, etc.

All three approaches have their own reasoning as interventions. The complexity of curriculum design requires one or more of these approaches to benefit the individual student, depending on his/her specific context.

Figure 1 **Equality, equity and inclusion**



Note: In the "equality" and "equity" scenarios above, the students in faded colours indicate variations among countries on how to ensure equality and equity in curriculum design and implementation for students with special needs (SEN). It is important to highight that those special needs include not only students with physical disabilities, but also those with unobservable traits, such as learning disabilities and mental health disorders.

Source: OECD inspired by and adapted from City for All Women Initiative, 2015, https://www.cawi-ivtf.org/sites/default/files/publications/advancing-equity-inclusion-web_0.pdf.

Equality in curriculum design

> ***Equality in curriculum development*** *can be defined as giving all students equal treatment in curriculum, as represented in Figure 1. The same number of boxes with the same size and shape is given to all individuals depicted, independently of their height. The same treatment is assumed to give equal learning opportunities to all students.*

In curriculum design, equality means offering the same opportunities to all, such as the same curriculum content, same instruction time, same methods. This approach is taken, for example, when setting the minimum standards, common standards, or core/essential learning standards.

However, this does not mean that everyone will benefit from the same curriculum to the same extent since there are other factors that will influence the students' learning experiences and outcomes, such as socio-economic characteristics, gender and others.

For example, a recent OECD curriculum analysis report on physical/health education indicates that the design choice of activities in the curriculum matters for ensuring access and participation of all students. The study shows that girls are less likely to participate in certain types of activities due to the content suggested in physical education/health education curricula. Even though ball games are known to be associated with less participation among girls than boys, ball games are still the most prevalent content in physical education curricula in a number of countries. (OECD, 2019[3]).

Equity in curriculum design

> ***Equity in curriculum development*** *can be defined as giving all students opportunities to reach the core or essential knowledge and skills that allow them to participate in further education and society without lowering expectations due to their personal and social backgrounds (e.g. special learning needs, socio-economic background, gender, ethnic origin, location) (Voogt, Nieveen and Thijs, 2018[4]; OECD, 2020[5]). From an equity perspective, the focus is on ensuring that all students can achieve the intended outcomes (the view) by providing the most appropriate number and size of boxes to ensure that everyone sees the game.*

Accordingly, the equity scenario in Figure 1 implies preparing a separate, additional curriculum or other support measures to supplement the curriculum. This approach recognises that adaptations in the curriculum (e.g. content, instruction time) may be needed to ensure that diverse learners are offered the necessary opportunities to learn[1] so that all students can achieve the core/essential knowledge and skills needed for participation in society (OECD, 2020[5]).

Recognising diverse students' needs

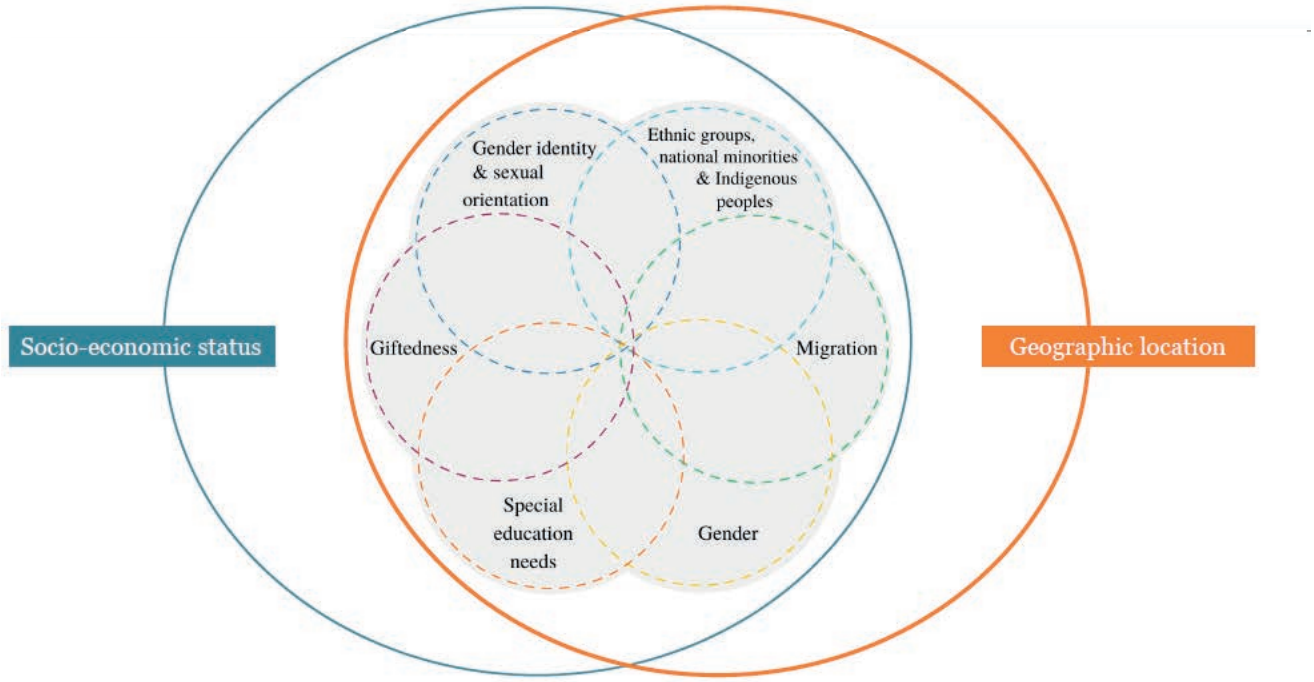
An equity approach to curriculum development will then start by acknowledging that certain individual and contextual differences among learners, such as socio-economic characteristics (e.g. parental education and occupation, educational resources available at home) are related to disparities in student performance (OECD, 2013[6]; OECD, 2014[7]). For example, research shows that students with low socio-economic backgrounds are likely to have far fewer opportunities to learn formal mathematical content (Schmidt, Zoido and Cogan, 2014[8]).

Research on individual differences, in particular the disparities in learning and access related to students with special education needs (SEN) and students of lower socio-economic backgrounds, suggests that curriculum design approaches can be leveraged to respond to the needs of diverse students (Darling-Hammond et al., 2020[9]).

Literature further suggests that social and/or individual differences in students' backgrounds may be associated with unfair limitations to their learning achievement, educational attainment and broader development outcomes. It is important to consider these when designing and redesigning curriculum as they can serve as potential identifiers of vulnerable students. For example:

- students' socio-economic status (OECD, 2017[10]);
- family structures (Santín and Sicilia, 2016[11]; Dronkers, Veerman and Pong, 2017[12]);
- migrant, ethnic or racial, minority background, such as indigenous background (Chetty et al., 2018[13]; Sørensen et al., 2015[14]; UNESCO, 2018[15]; Nusche, 2009[16]; OECD, 2017[17]; Rutigliano, 2020[18]);
- language(s) (Bredtmann, Otten and Vonnahme, 2018[19]);
- geographic location (Cresswell and Underwood, 2004[20]; Pegg and Panizzon, 2007[21]);
- special education needs (SEN), i.e. learning disabilities, physical impairments and mental health conditions. (WHO, 2011[22]; Brussino, 2020[23]);
- low performance or under-preparation in prior learning (OECD, 2017[10]);
- gifted and talented students with exceptional abilities in learning (Jarvis, 2018[24]);
- gender and sexual orientation (UNESCO, 2019[25]; Kosciw, Palmer and Kull, 2014[26]; Vecellio, 2012[27]; Reygan, 2009[28]; Kosciw et al., 2020[29]; Martino, Kassen and Omercajic, 2020[30]; Case, Stewart and Tittsworth, 2009[31]; Rubén, 2018[32]; Barrientos and Lovera, 2020[33]; Kosciw and Zongrone, 2019[34]).

Figure 2 **Intersectionality associated with dimensions of diversity**



Note: OECD, Strength Through Diversity Project, Education for Inclusive Societies, Phase II.

Source: (OECD, 2020[5]), "Strength through Diversity: Education for Inclusive Societies. Design and Implementation Plan", https://one.oecd.org/document/EDU/EDPC(2019)11/REV2/en/pdf

The list suggested is not exhaustive. The OECD's Strength through Diversity project highlights the intersectionality among these various dimensions of diversity as well as implications for policy making (Figure 2).

Defining who the vulnerable students are may depend on local contexts and transitory conditions (e.g. students with limited access to Internet in times of school closures, brought by unpredictable factors such as natural disasters and pandemics).

Personal and social circumstances, such as gender, socio-economic status or ethnic origin, should not be obstacles to their success. Examples of barriers to an equitable curriculum include:

- a curriculum that exists only in written form (for teachers with visual and hearing impairments);
- dominance of written and standardised forms of student assessment;
- a "one size fits all" approach that does not take into account students' cultural and linguistic differences.

Adapting curriculum to the students' needs

To accommodate different students' needs, policy makers often design a system with an unequal distribution of resources. An equitable curriculum should be able to provide all students with a school experience that enables them to be socially mobile and have the opportunity to succeed in life, regardless of their personal and social backgrounds (Muller and Young, 2019[35]). Therefore, the equity approach suggested in Figure 1 would result in some type of curriculum adaptations (e.g. extracurricular remedial learning) to ensure that such students would receive additional support to eventually benefit from a rich mathematics curriculum that includes formal mathematics content. Other examples include offering mother language learning for migrant students or specific curriculum adaptations to support gifted and talented students in reaching their full potential.

A recent international curriculum analysis by the OECD Future of Education of Skills 2030 project also reveals the types of curriculum adaptations countries/jurisdictions have in place to achieve greater equity. The analysis builds on data collected through the OECD Future of Education and Skills 2030 Policy Questionnaire on Curriculum Redesign (E2030 PQC). In general, a number of OECD and partner countries already make special curriculum provisions for certain groups of students that they have identified as vulnerable (Table 1).

- **SEN students** are highlighted by most countries/jurisdictions (92%). For example, in Australia, teachers can adapt content and pedagogies for students with disabilities (including learning disabilities). Teachers are able to draw on the curriculum, particularly as the learning areas can be enhanced by the use of the general capabilities and the cross curriculum priorities, to take account of the learning needs of individual students.
- Reflecting on cultural and linguistic diversity, 72% of participating countries/jurisdictions reported that they provide special curriculum provision for **language learners, non-native speakers and/or immigrants**. Also reflecting on historical legacy, 56% reported that curriculum provision considers the specific needs of **indigenous or minority students**. Some countries/jurisdictions design a needs-based language curriculum specifically for migrant students, to give them access to instruction in their mother language or to training in the language of instruction of the host country. In **Finland** students from multilingual families (foreign background) are offered optional lessons in their family's language. For instance the city of Helsinki offered optional lessons in 40 different languages in 2015. Students with an immigrant background are also entitled to take part in instruction preparing them for basic education. This preparation lasts usually one school year and it is provided in public basic education schools. **Mexico** put in place multi-grade schools for children of migrant agricultural day-labourers. **Korea** and **Japan** support the reverse situation, i.e. support students who return to the country from abroad.
- Another aspect to consider includes individual differences in students' curriculum experiences. Well over one-third of countries/jurisdictions include provisions for **gifted or talented students** (42%). Around one third of countries include provisions for **early school leavers or potential dropouts** (31%). **Hungary** makes efforts to identify potential dropouts and keep them in school. **Japan** supports students who are often absent from school.
- Family backgrounds are another factor: 28% address **socio-economic disadvantages** and 14% address **geographic disadvantages**. Ireland has an Action Plan for Educational Inclusion (Delivering Equality of Opportunity in Schools [DEIS]), which focuses on addressing and prioritising the educational needs of children and young people from disadvantaged communities, from pre-school through second-level education (3 to 18 years). In **Hong Kong** (China), the Education Bureau (EDB) established in 2002 jointly with the Hong Kong Jockey Club Charities Trust a Life-wide Learning Fund, which subsidised the participation of disadvantaged students in life-wide learning activities organised or recognised by schools for well-rounded development. From 2019 onwards, the Fund has been replaced by the new and recurrent Student Activities Support Grant, which is provided by the Education Bureau to continue subsidising financially students in need to participate in life-wide learning activities.

Inclusion in curriculum design

> ***Inclusion in curriculum development*** *can be defined as offering all learners a high quality curriculum that allows them to reach their full potential just as they are, by respecting their diverse characteristics, needs, abilities and expectations and by removing structural and cultural barriers, including biases and discrimination.*

> ***Inclusive curriculum*** *refers, therefore, to a curriculum that acknowledges and values students' differences and embraces diversity so that all students can experience an enriching school life.*

The inclusion scenario in Figure 1 illustrates an inclusive approach to curriculum design as it suggests that all students can benefit from the learning opportunities as they are. The notions of inclusion and equity are inevitably related as both acknowledge learners' diverse profiles and needs. In fact, some literature treats inclusion as one aspect of equity (OECD, 2004[36]; Field, Kuczera and Pont, 2007[37]; OECD, 2020[5]). That being said, some fine distinctions can be made between an equitable and an inclusive curriculum.

In an inclusive curriculum, every student is appreciated and valued for who they are: "it is about changing the system to fit the student, not changing the student to fit the system" (UNICEF, 2014[38]; OECD, 2020[5]). Unlike the equitable approach to curriculum development, an inclusive curriculum does not assume the same standards for all learners, but respects and values their unique needs, talents, aspirations and expectations. In doing so, it strives to create learning environments where broader societal and education goals of inclusion are celebrated and to remove barriers to participation by certain groups of students, including those created by unstated school norms, values and beliefs referred to as "hidden curriculum " (Jackson, 1968[39]; Bernstein, 1971[40]; Snyder, 1971[41]; Sally Power, 2018[42]; Apple, 2019[43]).

Authentic inclusion takes place when the boundaries between mainstream and minority students cease to exist, all students learn with and from one another and can achieve their full learning potential. While the equity approach (e.g. preparing additional or different curriculum for those in need) may inadvertently invite stigmatisation

(e.g. students in "remedial classes" may be regarded as weak learners), an inclusive curriculum aims at instilling in learners a positive sense of self-esteem and self-worth as well as a sense of belonging in the school and in society (OECD, 2020[5]). For this reason, an inclusive curriculum have the potential to more explicitly support not only the learning but also the well-being of all learners, while supporting societal values of diversity.

Table 1 **Groups receiving special provisions within the curriculum**

		Special education needs	Language learners/ non-native speakers/ immigrants	Indigenous or minority	Gifted/ talented	Socio-economically disadvantaged	Early school leavers or potential dropouts	Geographically disadvantaged
OECD	Australia	✓	✓	✓	✓			
	British Columbia (Canada)	✓	✓	✓				
	Chile	✓	✓	✓	✓		✓	
	Czech Republic	✓				✓		
	Denmark	✓	✓					
	Estonia	✓	✓				✓	
	Finland	✓	✓	✓		✓		
	Hungary	✓			✓		✓	
	Ireland	✓	✓			✓	✓	
	Japan	✓	✓	✓	✓	✓	✓	✓
	Korea	✓	✓	✓	✓			✓
	Mexico	✓	✓	✓	✓		✓	
	Netherlands	✓	✓	✓	✓			
	New Zealand	✓	✓	✓	✓		✓	✓
	Northern Ireland (UK)[1]							
	Norway	✓	✓	✓				
	Ontario (Canada)	✓	✓	✓	✓	✓		✓
	Poland	✓	✓					
	Portugal	✓	✓	✓	✓	✓	✓	✓
	Québec (Canada)	✓	✓	✓			✓	
	Scotland (UK)	✓						
	Sweden	✓	✓	✓				
	Turkey	✓	✓				✓	
	United States[1,2]	✓	✓	✓	✓	✓	✓	
	Wales (UK)							
Partners	Argentina	✓	✓	✓				
	Brazil[1]	✓		✓				
	China (People's Republic of)	✓			✓	✓		
	Hong Kong (China)	✓	✓		✓	✓		
	Costa Rica	✓						
	India[1,2]	✓	✓	✓		✓		
	Kazakhstan	✓	✓	✓	✓			
	Russian Federation	✓			✓			
	Singapore	✓	✓					
	South Africa	✓	✓	✓				
	Viet Nam							

Notes: Based on available data from 36 countries/jurisdictions. Countries with missing or not applicable values in all categories of the table were not included in the analysis. They were included if data was available for at least one of the categories in the table and could be clearly coded as "yes" or "no".

1. Responses for these countries/jurisdictions were submitted by independent researchers, not government officials.

2. Provisions may vary from state to state.

Source: Data from E2030 PQC, item 0.6.

Examples of barriers to an inclusive curriculum include:

- lack of recognition of students' prior knowledge and life experiences in designing learning progression in curriculum;
- a disconnect between curriculum content and textbooks and the social and cultural background of learners;
- any form of discrimination, systematic and cultural biases in curriculum content, instruction materials, learning activities, forms of assessment and learning environment.

To help remove such barriers for inclusion, curriculum designers may draw on design principles, such as flexibility, student choice, engagement, teacher agency and student agency (see OECD (2020[44])). To embed such principles in curriculum while also encouraging the emergence of innovative solutions, curriculum designers can also consider the use of an interdisciplinary design methodology for concrete problem-solving called Design Thinking. Another practical tool for curriculum designers is the Universal Design for Learning (UDL), a well-developed research-based framework created specifically for helping design inclusive curricula and learning environments. These tools are discussed in the sequence.

DESIGN THINKING AND UNIVERSAL DESIGN FOR LEARNING (UDL)

Design thinking

When considering ways to design and redesign curriculum with equity and inclusion in mind, a design thinking approach can be helpful. **Design thinking** is a human-centred approach to solving problems with a drive towards innovation. It includes a process, skills, and mindsets.

The process, adapted for curriculum analysis, includes four phases (Goldman and Kabayadondo, 2017[45]):

1. exploring the problem space;
2. empathising;
3. brainstorming;
4. prototype cycles.[2]

The problem space is the initial exploration of what the focus and scope of the problem is. Understanding and delineating clearly what the problem is and why it is considered a problem starts with examination of research and some stock-taking of current and past solutions.

Once the problem space is defined, the empathising phase takes place. Here, designers strive to develop a deeper understanding of end-users and their needs beyond initial assumptions. This requires carefully listening to the users and trying to understand their expectations, needs and experiences as the central parameter for finding appropriate solutions to problems affecting the users. Thus, during this stage, curriculum designers place students' interests and needs at the centre, which offers opportunities for special attention to hidden factors, the needs of vulnerable students, or unheard student voices. This responds to international recognition of the fundamental rights of children stated in the United Nations' Convention on the Rights of the Child, particularly with respect to Article 12, under which State Parties should ensure children's freedom to express their own views on all matters that have direct implications for them as soon as they are able to form their own views and in accordance with their age and maturity.[3]

Designers then go from a wide range of brainstormed options to a narrow selection of potential solutions to develop as prototypes, test, and refine. During this stage, curriculum designers can reflect on policy questions, e.g. what their needs are, to what extent differentiated provision is appropriate to serve such needs, whether or not universal approach can capture such needs most effectively, what would be the costs associated with each of these approaches, etc. These steps often follow an iterative process, which is well-suited for ill-defined or unknown problems (Brown, 2009[46]).

Design thinking developed greatly since its first mention by cognitive scientist Herbert Simon in 1969[4] (Simon, 1996[47]). It amalgamated different approaches and is now applied to many fields – architecture, business, engineering, technology, etc. – as an umbrella term for multi-disciplinary, human-centred methods to find creative solutions to problems, involving research and rapid idea generation, engaging diverse stakeholders.

Universal Design for Learning (UDL)

Universal Design for Learning (UDL) allows curricula to be inclusive by removing barriers for all types of learners. UDL is a research-based framework for designing curricula, learning environments, and tools. It was originally adapted from the movement that sought to design buildings accessible to people with physical disabilities. Deliberately designing buildings for inclusion of such groups benefits everyone. For example, ramps are used by people in wheelchairs, those with strollers, and those with bicycles.[5]

By removing barriers that may be experienced by diverse students, the UDL approach to curriculum aims to foster motivated, self-directed, and life-long learners (Meyer and Rose, 2014[48]; Meyer and Rose, 2000[49]; Schreiber, 2017[50]; Hall et al., 2014[51]). These goals align with those of student agency and well-being in the OECD Learning Compass.

UDL was successfully adopted into teaching and learning for students with special needs, but it can be adapted for all types of learners. A greater understanding of how we learn, combined with new technological advancements, demonstrates novel ways to engage students and provide tools to help teachers facilitate effective learning (Dehaene, 2020[52]). In the UDL framework, designers are called to remove barriers around:

- The **Why of Learning** (motivation), by providing multiple means of engagement. This is the **engagement principle**. Curriculum designers can make learning more engaging by adapting to learners' interests, by valuing learners' curiosity, by building in a sufficient level of challenge, by making learning interactive and dynamic, and by making visible the usefulness of learning for a given purpose.
- The **What of Learning** (content), by providing various means of representation (e.g. text, visuals, multi-media, the language of the learner, adaptive digital materials and tools). This is the **representation principle**. It targets physical, perceptual, and cognitive barriers that get in the way of learning for students with diverse needs and talents.
- The **How of Learning** (goal-setting, strategies, and skills), by allowing multiple ways for students to demonstrate what they know. This is the **action and expression principle**. It has direct implications for how to design assessment and examinations (e.g. beyond written text or standardised formats).

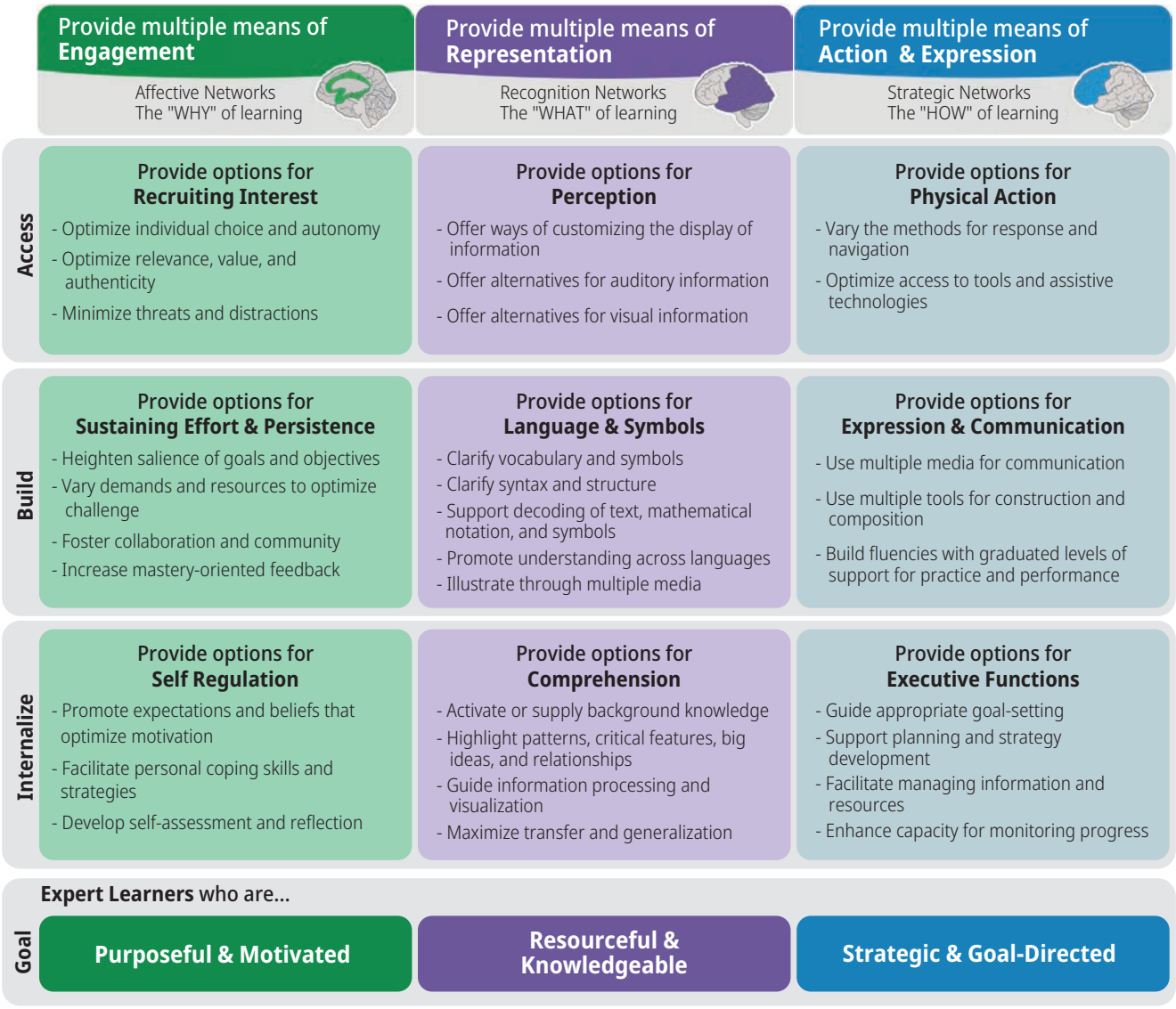
These dimensions of learning correspond closely to the key competencies of the OECD Learning Compass 2030. The **What of Learning** can be mapped to disciplinary content knowledge and also to certain types of skills (e.g. knowing how to perform certain tasks). The **How of Learning** relates to self-regulation skills. The **Why of Learning** relates to student agency (sense of purpose), epistemic knowledge (why learn mathematics or science? how do mathematicians and scientists think?), as well as to attitudes and values, such as resilience and a growth mindset that sustains and improves learning.

Figure 3 summarises the UDL guidelines for designing inclusive curricula, learning environments and tools. By deliberately striving to remove barriers to learning, the UDL framework is well aligned with the societal goals of justice and fairness in designing curricula that work for all learners, including those in vulnerable situations.

Combining different approaches

For vulnerable students to be well supported and better served, E2030 PQC participating countries/jurisdictions provide different types of general provisions to ensure equality, equity, inclusion (Table 2).

Figure 3 **Universal Design for Learning Guidelines**



Source: CAST (Centre for Applied Special Technology) (2018), Universal Design for Learning Guidelines, Version 2.2 [graphic organiser], Wakefield, MA.

Table 2 **General approaches to ensuring equality, equity and inclusion in curricula**

		Inclusion/ anti-discrimination policies	Centralised national (core) curriculum	Support programmes/ services	Local flexibility in content, pedagogies or assessment	Specific teacher training
OECD	Australia	✓	✓	✓	✓	✓
	British Columbia (Canada)	✓			✓	
	Chile	✓	✓	✓	✓	
	Czech Republic	✓	✓	✓		✓
	Denmark	✓	✓	✓	✓	
	Estonia	✓	✓	✓	✓	
	Finland	✓	✓	✓	✓	
	Hungary		✓	✓		
	Ireland	✓	✓	✓		✓
	Japan	✓	✓	✓	✓	✓
	Korea	✓	✓	✓		
	Mexico	✓	✓	✓		
	Netherlands	✓	✓		✓	
	New Zealand	✓	✓			
	Norway	✓	✓	✓	✓	
	Ontario (Canada)	✓		✓	✓	✓
	Poland	✓	✓		✓	
	Portugal	✓	✓	✓	✓	
	Québec (Canada)	✓		✓	✓	
	Scotland (UK)	✓		✓		
	Sweden	✓	✓	✓		
	Turkey	✓	✓			
	United States[1,2]	✓		✓	✓	✓
Partners	Argentina	✓	✓	✓	✓	✓
	Brazil[1]	✓	✓		✓	
	China (People's Republic of)		✓	✓	✓	✓
	Hong Kong (China)	✓	✓	✓	✓	
	Costa Rica	✓	✓		✓	
	India[1,2]	✓	✓	✓	✓	
	Kazakhstan	✓	✓			
	Russian Federation		✓			
	Singapore	✓	✓	✓		✓
	South Africa	✓	✓			

Notes: Based on available data from 33 countries/jurisdictions. Countries with missing or not applicable values in all categories of the table were not included in the analysis. They were included if data was available for at least one of the categories in the table and could be clearly coded as "yes" or "no".

1. Responses for these countries/jurisdictions were submitted by independent researchers, not government officials.

2. Provisions vary from state to state.

Centralised national (core) curriculum: National curriculum in place to define minimum contents to be covered by all students across the country.

Local flexibility in content, pedagogies or assessment: At least minimal local flexibility in content, pedagogies or assessment to allow for a most relevant curriculum to local circumstances.

Specific teacher training: Provision of specific teacher training to support the implementation of personalised learning in school allowing diverse students to excel.

Support programmes/services: General support programmes or services accessible to all students including guidance, counselling and/or career advice.

Inclusion/anti-discrimination policies: Inclusion/anti-discrimination policies implemented on national or jurisdictional level to ensure unbiased and equal treatment of all students.

Source: Data from E2030 PQC, item 0.6.

- A majority of countries **explicitly include references to inclusion/anti-discrimination policies in their curriculum** (91%). In **Portugal**, teachers make the necessary adaptations to the curriculum for students with specific needs within the framework set by the law on inclusive education. UDL is a methodological option underlying the law. Moreover, inclusion has gained a wider reach through a process that aims to respond to the diversity of the needs and potential of each student, by increasing their participation in the processes of learning and educational community life.
- In most countries/jurisdictions at least a part of the curriculum is **centralised at the national level** to ensure a common core that will provide equal learning opportunities to all students (85%). Besides the core curriculum, flexibility is often granted to schools and teachers to adapt curriculum content, pedagogies or assessment to the local context and students' needs. **Japan** reports that the National Curriculum Standards intend to provide students with a uniform level of education wherever they live in Japan, while at the same time recognising different learning needs, interests and difficulties of students. In **Argentina**, the curriculum standards approved at the federal level identify the key content that all students should have the opportunity to acquire from kindergarten to higher secondary education. The curriculum standards are thus conceived as a way to ensure a degree of homogeneity across provincial curricula, which further develop the curriculum building on the core contents set by the federal standards. In **Singapore**, the national curriculum is designed so that there is quality learning in every classroom, in accordance with the "Every learner, an engaged student" vision (Heng, 2011[53]).
- Over two-thirds of countries/jurisdictions provide **general support programmes or services** accessible to all students including guidance, counselling and/or career advice (70%). In **Québec (Canada),** the Basic School Regulation for Preschool, Elementary and Secondary Education requires school boards to establish several programs for student services to help students to progress in their various types of learning. These services include, among others, academic and career counselling and information, psychological services, psychoeducational services and health and social services. In **Scotland (United Kingdom),** the Education (Additional Support for Learning) Act provides the legal framework for the provision of additional support for learning for all children regardless of background, needs and whether education is provided in a "mainstream" school or in a "special school". The Act states that all children are entitled to support being needed for any reason, and for short or long term periods determined by the individual learning needs of the child or young person.
- 61% allow **local flexibility on curriculum content, pedagogies or assessment**. These provisions can translate into students exceptionally being given instruction at a lower grade or even being relieved of a subject by the principal in agreement with the parents (**Denmark**); and special measures or exceptions applied to pupils with special educational needs, non-native speakers or those with behavioural difficulties (**Estonia**). In **Portugal**, schools' autonomy allows a flexible management of the curriculum and of the learning spaces and schedules, so that the methods, timing, instruments and activities can respond to the singularities of each student.
- A little more than one quarter (27%) provide dedicated teacher training to ensure equal access to learning opportunities. For example, in **Ireland** a number of guidelines have been prepared to help teachers ensure quality access to the curriculum for students with general learning disabilities and with special education needs. Teacher training is available in relation to some of these areas. In **New Zealand**, teachers are provided with an extensive range of (non-mandatory) support and guidance for particular focus areas, including special education and gifted education.

In addition to the general provisions shown above, some countries/jurisdictions try to remove barriers to learning by the provision of free textbooks. Digitalisation can potentially improve access to textbooks and other learning materials, but their cost may remain too high for some households. Textbooks, digital or paper-based, can indeed be costly, and it can be unrealistic for some families to purchase them. That makes the accessibility and affordability of quality textbooks for all students a concern for policy makers, school leaders and teachers.

Furthermore, the diversity of students within countries, whether low-income, SEN, or language minorities, may make accessing these resources even more challenging. Overall, there are differences across E2030 PQC participating countries/jurisdictions in the student groups to whom textbooks are provided. The majority of countries/jurisdictions provide textbooks free of charge either to all students or only to a targeted group of students, i.e. to public school students or students in need (Table 3). Of those, 62% of countries/jurisdictions provide them to all students and 26% only to public school students, while also 26% provide them to students in need only. Providing free textbooks to all students, often explicitly covers the entire cycle of basic or compulsory education, as in the **Czech Republic, Finland, Hungary, Korea and Portugal.**

The ways in which assistance for textbooks is provided to students in need also differ across countries/jurisdictions. DEIS (Delivering Equality of Opportunity in School) is the main policy initiative in Ireland to address educational disadvantage at school level. Although **Ireland** does not have a national free textbook programme, individual state primary and post primary schools can benefit from a school book grant, with schools participating in the DEIS Programme receiving an enhanced rate. Schools are encouraged to use these funds to set up book rental schemes. **Singapore** has similar programmes, where students on the Ministry of Education Financial Scheme are given free textbooks. In **Hong Kong (China)** textbooks published by private publishers are not provided free of charge to students, but the government offers financial assistance to families in need.

Table 3 **Provision of free textbooks to student groups**

		All students	Public school students only	Students in need only
OECD	Australia[3]	✓	✓	✓
	British Columbia (Canada)	✓		
	Chile	✓		
	Czech Republic[2]	✓		✓
	Denmark	✓		
	Estonia	✓		
	Finland[2]	✓		
	Hungary[2]	✓		✓
	Ireland			✓
	Japan	✓		
	Korea	✓		
	Lithuania	✓		
	Mexico	✓		
	Netherlands	✓		
	New Zealand	✓		
	Northern Ireland (UK)[1]	✓		
	Norway		✓	
	Ontario (Canada)		✓	
	Poland		✓	
	Portugal	✓		
	Québec (Canada)	✓		
	Sweden	✓		
	Turkey	✓		
	United States[1,3]	✓	✓	✓
Partners	Brazil[1]		✓	
	China (People's Republic of)			
	Hong Kong (China)			✓
	Costa Rica			
	India[1]		✓	
	Kazakhstan		✓	✓
	Russian Federation[4]			
	Singapore			✓
	South Africa	✓	✓	
	Viet Nam			✓

Notes: Notes: Based on available data from 34 countries/jurisdictions. Countries with missing or not applicable values in all categories of the table were not included in the analysis. They were included if data was available for at least one of the categories in the table and could be clearly coded as "yes" or "no".

1. Responses for these countries/jurisdictions were submitted by independent researchers, not government officials.

2. Textbooks provided only for basic/compulsory education.

3. Varies by state/jurisdiction in Australia or school district in the United States.

4. Free textbooks are provided but detailed information on student groups receiving them was not available.

Source: Data from E2030 PQC, item 1.7.5.

Making equality, equity, and inclusion a priority

In spite of the various nuances involved in the definitions of equality, equity and inclusion as seen earlier, in practice, actual curricula set out one of these goals or a combination of them as the societal goals.

Many OECD and partner countries/jurisdictions explicitly include cultural diversity, equality, equity, justice and fairness as societal values in their curricula[6] (Table 4). E2030 PQC data reveal that diversity figures prominently in the curricula of participating countries/jurisdictions (73% of countries/jurisdictions explicitly mention cultural diversity in their curriculum). This is followed by equality (62%), justice (57%), inclusion (46%), equity (41%) and fairness (35%).

Table 4 **Equity-related values explicitly mentioned in curricula**

		Cultural diversity	Equality	Justice	Inclusion	Equity	Fairness
OECD	Australia	✓	✓	✓	✓	✓	✓
	British Columbia (Canada)	✓	✓		✓		✓
	Chile	✓	✓	✓	✓	✓	
	Czech Republic	✓	✓			✓	
	Denmark		✓	✓			
	Estonia	✓	✓	✓	✓	✓	
	Finland	✓	✓				
	Hungary	✓		✓			
	Ireland	✓			✓		
	Japan	✓	✓	✓	✓	✓	✓
	Korea	✓	✓	✓	✓	✓	✓
	Lithuania				✓		
	Mexico	✓	✓	✓	✓	✓	✓
	Netherlands	✓			✓		
	New Zealand	✓	✓			✓	
	Northern Ireland (UK)[1]	✓	✓	✓	✓		
	Norway	✓	✓	✓	✓	✓	✓
	Ontario (Canada)	✓	✓	✓	✓	✓	✓
	Poland	✓					
	Portugal	✓	✓	✓	✓	✓	✓
	Québec (Canada)		✓	✓		✓	
	Scotland (UK)			✓			
	Sweden	✓	✓	✓			✓
	Turkey			✓			
	United States[1]						
	Wales (UK)	✓					
Partners	Argentina						
	Brazil[1]	✓	✓	✓			
	China (People's Republic of)	✓	✓	✓	✓	✓	✓
	Hong Kong (China)	✓	✓	✓	✓	✓	✓
	Costa Rica	✓	✓			✓	
	India[1]	✓	✓	✓			
	Kazakhstan						
	Russian Federation	✓					
	Singapore						
	South Africa	✓		✓	✓		✓
	Viet Nam		✓				✓

Notes: Based on available data from 37 countries/jurisdictions. Countries with missing or not applicable values in all categories of the table were not included in the analysis. They were included if data was available for at least one of the categories in the table and could be clearly coded as "yes" or "no".

1. Responses for these countries/jurisdictions were submitted by independent researchers, not government officials.

Source: Data from E2030 PQC, item 1.2.1.1.

Some countries/jurisdictions include a combination of these values in their curricula while others make a clear choice for one of them. **Australia, Japan, Korea, Mexico, Norway, Ontario (Canada)** and **China** explicitly mention all six values (Table 4). Others only mention one: **Lithuania** (inclusion), **Poland** (cultural diversity), **the Russian Federation** (cultural diversity), **Scotland (United Kingdom)** (justice), **Turkey** (justice) and **Wales (United Kingdom)** (cultural diversity).

That some countries do not explicitly include these values in their curriculum may not mean that they do not build their curricula on these principles. It may indicate that some values are tacitly understood and thus do not need to be highlighted in the curriculum, or they are highlighted elsewhere in education policy. When a particular value is highlighted in a curriculum, it may also signal specific national priorities, while needing to recognise that the actual implementation requires careful monitoring of actions and practices in reality.

For the scope of this report, the focus is on the equity and equity-related values, as defined in the earlier section. Specifically, what are the potentials and constraints of ensuring equity and inclusion through curriculum innovations, in particular four main trends in curriculum change: digital curriculum, personalised curriculum, cross-curricular content and competency-based curriculum and flexible curriculum (Box 1; for more details, see (OECD, 2020[1])).

Box 1 Four types of curriculum innovation to be leveraged towards equity

1. **Digital curriculum** refers to digitalisation of curricula to support all students to achieve their educational goals. In addition to digital content, it can include organisational features and formats used to articulate curricular content, such as e-textbooks, online materials and repositories, and technological tools to deliver the curriculum, including both hardware and applications such as YouTube, artificial intelligence (AI), and digital platforms. The definition varies across countries/jurisdictions, and is evolving as schools experiment with a greater number of digital applications (Pepin et al., 2015[54]; Graesser, McNamara and VanLehn, 2005[55]; Papadakis, 2016[56]).
2. **Personalised curriculum**, also known as individualised curriculum, differentiated curriculum or tailored curriculum, refers to an approach that offers individualised instruction to students. Personalised learning has many definitions and connotations (Maguire, Ball and Braun, 2013[57]), but its main purpose is to contribute to equity and inclusion by tailoring instruction to students' individual needs, skills and interests (Pane et al., 2017[58]). Although personalised curriculum is not necessarily technology-based, current approaches do make use of technology.
3. **Cross-curricular content and competency-based curriculum r**efers to curricula built across the boundaries of subject areas. Such a curriculum emphasises the importance of interdisciplinary knowledge and offers cross-curricular content to enable students to connect knowledge across different disciplines (OECD, 2018[59]). Some generic competencies, such as critical thinking and creativity, are thought to be best developed through a cross-curricular approach to meet students' interests and needs, by helping students become responsive citizens in a technology-driven globalised world (McPhail and Rata, 2015[60]).
4. **Flexible curriculum** refers to the ability of schools and teachers to make local decisions about their curriculum. Flexible curricula allow schools and teachers a certain amount of freedom to make site-specific curricular choices on learning content and goals, pedagogy, assessment, and time and place of learning (Jonker, März and Voogt, 2020[61]; Nikolov et al., 2018[62]). For instance, when learning content intended in the curriculum, say sustainable development, teachers and students may choose to study in depth one environmental issue that deeply affects their local community (e.g. diversity of ocean life in coastal areas). A flexible curriculum welcomes such opportunities for contextualising learning.

Source: (OECD, 2020[1]), *What Students Learn Matters: Towards a 21st Century Curriculum*, OECD Publishing, Paris, https://doi.org/10.1787/d86d4d9a-en.

1. DIGITAL CURRICULA

Digital curricula that work for all students

The promises of a digital curriculum are attractive: as technology allows for greater adaptation and integration of content, materials and activities, it can help students be motivated to learn, progress at their own pace, and continue learning beyond the classroom – anytime, anywhere. A recent OECD report describes in more detail the growing trend towards using technology to expand learning opportunities, improve teachers' practices and create more adaptive education systems, despite different paces of digitalisation across countries/jurisdictions[7] (OECD, 2020[1]). For example, the use of learning analytics and AI seem promising not only for teaching and learning, but also assisting in classroom management.[8]

Since the use of digital curriculum and tools has the potential to transform teaching and learning, many countries are making deliberate efforts to adopt technology, including changes towards a digital curriculum. Table 5 shows a variety of ways in which technology is used in E2030 PQC participating countries/jurisdictions to facilitate curriculum delivery, pedagogy, assessment and even school administrative processes in OECD and partner countries and jurisdictions:

- **Use of teaching and learning technologies:** Countries/jurisdictions report a wide variety of technologies used to support different aspects of teaching and learning. Several countries/jurisdictions refer to the availability of computers and internet access. In **Japan**, the National Curriculum Standard states that schools should ensure an appropriate learning environment for using computers and information and communication networks, as well as provide learning activities in which students appropriately utilise technological aides. In some cases, the requirements in the curriculum to use technological devices concern only specific subjects. For example, in **Denmark** there is a requirement to use digital dictionaries for Danish and foreign languages, GPS for physical education and digital resources and databases for sciences.
- **Use of assessment technologies:** The use of technologies to support assessment is also reported by several countries. In **Finland**, ICT technology is used at different levels of curriculum implementation in different subjects, including to support assessment methods and cooperation with parents. In **Scotland (United Kingdom)** assessment arrangements such as the use of a computer with text-reading software are designed to remove barriers to candidates, for example when a candidate may have a difficulty with reading the questions in a question paper in the external examination.
- **Use of technologies to support parental involvement:** Digital technologies provide opportunities to strengthen communication channels between schools and parents, and to facilitate parents' involvement in their children's education. **Ontario (Canada)** is developing an interactive digital curriculum and resource platform that will help not only educators, but also parents and students access curriculum and learning resources in a user- and mobile-friendly manner. Over time the site will become increasingly interactive with more content and features based on user feedback. **Finland** reported that information and communication technology (ICT) is pervasive in the curriculum and used to support cooperation with parents.
- **Use of assistive technologies:** With a broad variety of assistive technology tools nowadays available (e.g. speech synthesizer/voice recognition apps, screen readers, etc.), countries/jurisdictions are removing barriers and thus enhancing the learning of students with cognitive disabilities or physical impairments. For example, **New Zealand, Portugal** and **Scotland (United Kingdom)** report the use of assistive technologies to support SEN students.
- **Guidance to teachers on appropriate use of technological aides:** In **Scotland (United Kingdom)**, there is no specific reference to the use of technology in the curriculum. The decision on its use depends on the teacher. Education Scotland's National Improvement Hub provides a number of self-evaluation questions to practitioners to help them reflect on their approach to the use of technology.
- **Additions to curriculum content:** Many countries have introduced new digital and/or ICT-related content in the curriculum (Table 2 in (OECD, 2020[1])). But supporting students to acquire the technical knowledge they need to be able to use digital technologies is not the only concern countries/jurisdictions have. Ensuring that students can use technology safely and without putting their well-being at risk (e.g. online privacy risks, avoiding sleep deprivation), has also become a priority. **British Columbia (Canada), Finland, Ireland, Québec (Canada)** and **Costa Rica** report the inclusion of curriculum content on safe and responsible use.

Table 5 [1/2] **Reported applications of technologies for teaching and learning**

		Reported uses of technological aides
OECD	**Australia**	No specific aides or devices mentioned in the curriculum
	British Columbia (Canada)[3]	On-line delivery of provincial exams. Curriculum content on responsible use
	Chile	The Enlaces program (1992, by the Center of Education and Technology of the Ministry of Education) promotes ICT Skills for Learning: "The ability to solve problems of information, communication and knowledge as well as legal, social and ethical dilemmas in a digital environment"
	Denmark	Requirements to use technological aides only for certain subjects (digital dictionaries for Danish and foreign languages, GPS for PE and digital reference works and databases for sciences)
	Estonia	Several aids used in teaching and learning: social media services, tools used in presentations, personal devices like mobile phones, mobile data interfaces (Pasco and Vernier different sensors and interfaces)
	Finland	Teaching, learning and assessment aids, and support of communication with parents Curriculum content on safe and responsible use
	Ireland	High speed broadband, and annual grants to update school digital equipment provided by government to schools Curriculum content on safe and responsible use Technological aides used across subjects to support SEN
	Japan	The National Curriculum Standard states that schools should ensure an appropriate learning environment for using computers, and information and communication networks, as well as provide learning activities in which students appropriately utilise technological aides
	Korea	Some subjects include statements about students' use of technological aides mainly in the Teaching Learning Methods' section
	Lithuania	Aides to support: Teaching, learning assessment, and reporting Statements about students' use of technological aides are included in the description of communication competence
	Mexico	Internet, internal network, computer equipment or other electronic devices in media classroom or mobile media room, or media corner in the classroom or in the school library
	Netherlands	Use of calculators in mathematics
	New Zealand	The national curriculum does not specify use of technological aides but provides an introduction to e-learning and pedagogy in the 'Effective Pedagogy' section Use of assistive technologies to address SEN
	Northern Ireland (UK)[1]	ICT skills are specified
	Norway	Teaching aides, and content and examination aides Digital tools and resources, media and information, spreadsheets, dynamic graphing tools, programming, word processors, dictionaries, and complex digital texts
	Ontario (Canada)	Interactive digital curriculum under development, to access curriculum and learning resources in an interactive and mobile-friendly manner Other aides: multimedia resources, databases, websites, digital cameras, and word-processing programs, mobile applications and devices, the Internet, wearable devices, interactive software
	Poland	Computers at students' disposal and links to digital sources for IT teachers Computers or other digital devices and software depending on the needs arising from the nature of the activities, objectives and themes being pursued, such as programming languages (visual languages [Scratch, Blockly, Logo], C++, Python, Java)
	Portugal	Examination aides Schools have technologies that may be used in the classroom with and for all students The Ministry of Education finances technological facilities that schools acquire and provide to students for their personal use, either at school and/or at home Assistive and inclusive technologies to address SEN (computers, tablets, graphic calculators, Braille switches, Augmentative and Alternative Communication devices and software, tactile/sensory materials, speech synthesizer/voice recognition apps, screen readers, magnification devices and software, etc.)
	Québec (Canada)	The *Direction de la sanction des études* (Certification of Studies Branch - DSE) provides schools with core principles governing the controlled use of technological tools, in particular related to administering Ministerial examinations at elementary and secondary levels. Curriculum content on safe and responsible use Use of technological aides to address SEN

Note: Based on available data available from 32 countries/jurisdictions. Countries with missing or not applicable values were not included in the analysis.

1. Responses for these countries/jurisdictions were submitted by independent researchers not government officials.

Source: Data from E2030 PQC, item 2.5.4.

Table 5 [2/2] **Reported applications of technologies for teaching and learning**

		Reported uses of technological aides
OECD	**Scotland (United Kingdom)**	No reference to technological aides in core curriculum guidance but as teachers have autonomy in how they deliver learning they may allow digital technology to be used Education Scotland's National Improvement Hub provides a number of self-evaluation questions to practitioners to help them consider their own approach to the use of technology Assistive technologies to address SEN
	Sweden	Some subject syllabi include statements about students' use of technological aides Mandatory national tests include use of technological aides, e.g. national tests in Swedish include writing essays on computers
	Turkey	Some subjects and information technology aims contain statements on digital devices Some aides mentioned include internet-based services, algorithm design and verbal visual expression, programming languages
Partners	**Argentina**	ICT and calculators as learning aides to develop competences needed for the use of ICT
	Brazil[1]	Technology as learning aides to better understand reality and treat/visualise data in a new way, e.g. computers, cell phones, tablets and the like, social networks, research institutions' websites and datasets, tabulation tools/spreadsheets
	Hong Kong (China)	Statement about use of mobile computing devices under the Fourth Strategy for IT in Education The Education Bureau supports schools to formulate effective strategies on adopting bring your own device (BYOD), e.g. support of coordination with parents, student discipline and responsibilities in using mobile devices, classroom management
	Costa Rica	Curriculum content on safe and responsible use Development of a set of practices aimed at reducing the social and digital divide through the use and development of digital technologies
	India[1]	National Council of Educational Research and Training (NCERT) organises yearly programs and activities Online e-learning web portal (geo-spatial skills and integration of learning and technology)
	Kazakhstan	The State Compulsory Educational Standards (SCES) state that educational organisations must provide learners with material and technical equipment necessary for teaching and learning Subject programs and plans include learning objectives/statements that suggest student's use of technological aides During paper-based tests or examinations, students are not allowed to use technological aides unless the assignment/test/examination allows using such equipment Online platforms are available for teachers and students
	Russian Federation	School children are usually allowed to use electronic devices
	Singapore	MOE's ICT Masterplans, first introduced in 1997, guide schools in developing an ICT-enriched environment for learning and teaching that transforms the learning experiences of students MOE launched its own online learning platform, the Singapore Student Learning Space (SLS) in 2018 Schools are given autonomy to adopt and adapt a variety of approaches that best meet the learning needs of their students The affordances of ICT are carefully considered in designing both the learning experiences and environments of the students MOE will progressively roll out the use of personal learning devices (PLDs) to all secondary schools Every secondary school student will have a school-issued PLD by end-2021
	South Africa	White paper on e-Education seeks to enable the education sector and all social partners to ensure optimal availability and use of ICTs in education Use of technological aides is specified in the Curriculum and Assessment Policy Statements for each subject and in textbooks Teachers are encouraged to integrate ICT into teaching and learning
	Viet Nam	Statements on devices in the draft general education curriculum

Note: Based on available data available from 32 countries/jurisdictions. Countries with missing or not applicable values were not included in the analysis.

1. Responses for these countries/jurisdictions were submitted by independent researchers not government officials.

Source: Data from E2030 PQC, item 2.5.4.

E2030 participating countries/jurisdictions have adopted a number of different approaches to bridge the digital divide by making changes in infrastructure, adapting and developing digital tools, making connections to student assessment, and providing training and professional development (Table 6).

- Most countries/jurisdictions (71%) are **adopting or developing digital tools,** such as virtual learning environments or integrated learning and teaching platforms to increase opportunities for flexible learning. **Scotland (United Kingdom)** makes extensive efforts to promote digital learning and teaching, as outlined in its Digital Learning and Teaching Strategy. For example, Glow, Scotland's national intranet for learning and teaching provides all learners and practitioners with industry-standard productivity and collaboration tools at

no cost. It also provides professional learning communities and practitioners resource-sharing features, such as the National Numeracy and Mathematics hub. Learning apps are also likely to supplement digital textbooks and other educational resources. They will be particularly relevant when physical access to school is difficult (e.g. due to weather conditions or during the COVID-19 crisis of 2020), but also when students need tailored learning experiences in a particular domain to optimise their learning. In **Estonia,** digital or e-learning materials include e-textbooks, e-workbooks, educational videos and e-tests. In an interactive web environment, e-Koolikott (E-School Bag),[9] students can access digital study materials, and teachers can create collections of e-materials. This environment offers preschool, basic, general, and vocational education study materials, with open access to everybody. The open platform and learning management environment, Opiq[10] includes textbooks, study kits, a diary and a self-assessment system that are widely used. In addition, a large number of e-tasks and diagnostic tests for learning are compiled. A collection of 88 e-tasks and 69 diagnostic tests in five areas (mother tongue, natural sciences, mathematics, foreign languages and social sciences) were published. Based on test feedback, teachers can plan further learning activities and determine what should be retaught, what should be reinforced, and who should be offered individual activities. Students also receive feedback on their learning. In **Hong Kong (China)**, the Education Bureau operates a one-stop education portal with information, resources, interactive communities and online services. It promotes the use of information technology to enhance learning and teaching, facilitating exchanges among schools and teachers, encouraging students to make effective use of e-learning, and providing web-based learning, teaching and assessment tools for students.

- Quite a few countries also make connections between the platforms mentioned above and student assessment (58%) by conducting computer-based standardised assessment, providing self-assessment tools or teacher access to longitudinal student performance data. In **Scotland (United Kingdom)**, the Glow platform enables the creation of e-portfolios where learners can review their achievements and track their progress. In 2016, **Estonia** created an electronic environment system to prepare tasks and conduct tests, including state exams to monitor the development of key competencies that ensure the ability to live creatively, entrepreneurially and flexibly in life.[11] In **New Zealand**, the government funded two digital tools to enable teachers and learners to build shared curriculum and monitor learning progress.
- In a number of cases (55%), countries/jurisdictions also provide professional development opportunities to teachers through dedicated training, support services, or encouragement of peer-learning through communities of practice. **Hungary, the Netherlands, Scotland (United Kingdom)** and **India** offer (or plan to offer) dedicated teacher training. In **Scotland (United Kingdom),** a national team of digital officers have been delivering virtual professional learning at national, regional and local levels. **Hungary, New Zealand, Scotland (United Kingdom), Hong Kong (China)** and **Kazakhstan**, encourage or provide the means to build communities of practice between teachers, online or offline. **Portugal** is running a Digitalisation Programme for Schools at the national level where professional development figures prominently. The dimensions of the programme are: i) equipment loan and free connectivity for every student and teacher; ii) teacher training according to their digital proficiency level and focused on the use of digital technologies for teaching and learning in all subjects/areas of the curriculum; iii) design, in each educational context, of an action plan for the digital development of the school, based on schools leadership training sessions organised by Digital Ambassadors allocated to the school associations training centres; iv) development of communities of practice for teacher trainers and Digital Ambassadors so that peer-learning is promoted and encouraged.
- However, countries/jurisdictions still struggle with concerns related to equal access to devices and the Internet, either through a lack of access in schools or a lack of well-prepared teaching personnel. Nearly half of countries and jurisdictions (45%) are thus also **making changes to basic infrastructure** (e.g. by ensuring basic IT infrastructure/minimum internet connectivity in schools, providing additional ICT devices in school, etc.) and **providing training and professional development opportunities for teachers**. For example, several countries/jurisdictions made (or are planning to make) changes in their ICT infrastructures to increase the inclusiveness of learning, and equity in access to digital learning opportunities. This includes providing basic IT infrastructure and minimum Internet connectivity in schools, additional ICT devices in schools, and putting in place measures for greater inclusion of disadvantaged groups, both in schools and out of schools (such as student populations in the periphery, in hospitals or in prisons). **New Zealand, Poland, Scotland (United Kingdom), Hong Kong (China)** and **India**, are investing in stable Internet or Wi-Fi connections in schools. **Argentina** and the **Russian Federation** are proposing measures particularly targeted to vulnerable populations (such as student populations in hospitals or prisons or in rural and remote areas). **Portugal** provides equipment and free connectivity for all students and teachers at national level, allowing the access to digital textbooks/other educational resources, the use of collaborative tools that promote innovation and creativity, as well as the use of digital tools for external assessment purposes.

Table 6 **Strategies to facilitate access to digital tools and infrastructure**

		Adopting/ developing digital tools	Making connections to student assessment	Providing training/ professional development	Making changes in infrastructure
OECD	Australia	✓	✓	✓	
	British Columbia (Canada)	✓	✓		
	Denmark	✓	✓		
	Estonia	✓	✓	✓	✓
	Finland				
	Hungary	✓	✓	✓	
	Ireland		✓		
	Japan	✓	✓	✓	✓
	Korea				
	Lithuania	✓	✓	✓	✓
	Mexico			✓	
	Netherland				
	New Zealand	✓	✓	✓	✓
	Northern Ireland (UK)[1]	✓	✓	✓	
	Ontario (Canada)	✓	✓		
	Poland	✓	✓	✓	✓
	Portugal	✓	✓	✓	✓
	Québec (Canada)	✓	✓		✓
	Scotland (UK)	✓	✓	✓	✓
	Sweden				
	Turkey				
Partners	Argentina	✓	✓		✓
	Brazil[1]				
	Hong Kong (China)	✓		✓	✓
	Costa Rica	✓	✓	✓	✓
	India[1]	✓		✓	✓
	Kazakhstan	✓	✓	✓	
	Russian Federation				✓
	Singapore	✓			
	South Africa	✓		✓	✓
	Viet Nam	✓		✓	

Note: Based on available data from 31 countries/jurisdictions. Countries with missing or not applicable values in all categories of the table were not included in the analysis. They were included if data was available for at least one of the categories in the table and could be clearly coded as "yes" or "no".
1. Responses for these countries/jurisdictions were submitted by independent researchers, not government officials.
Source: : Data from E2030 PQC, item 2.5.2.

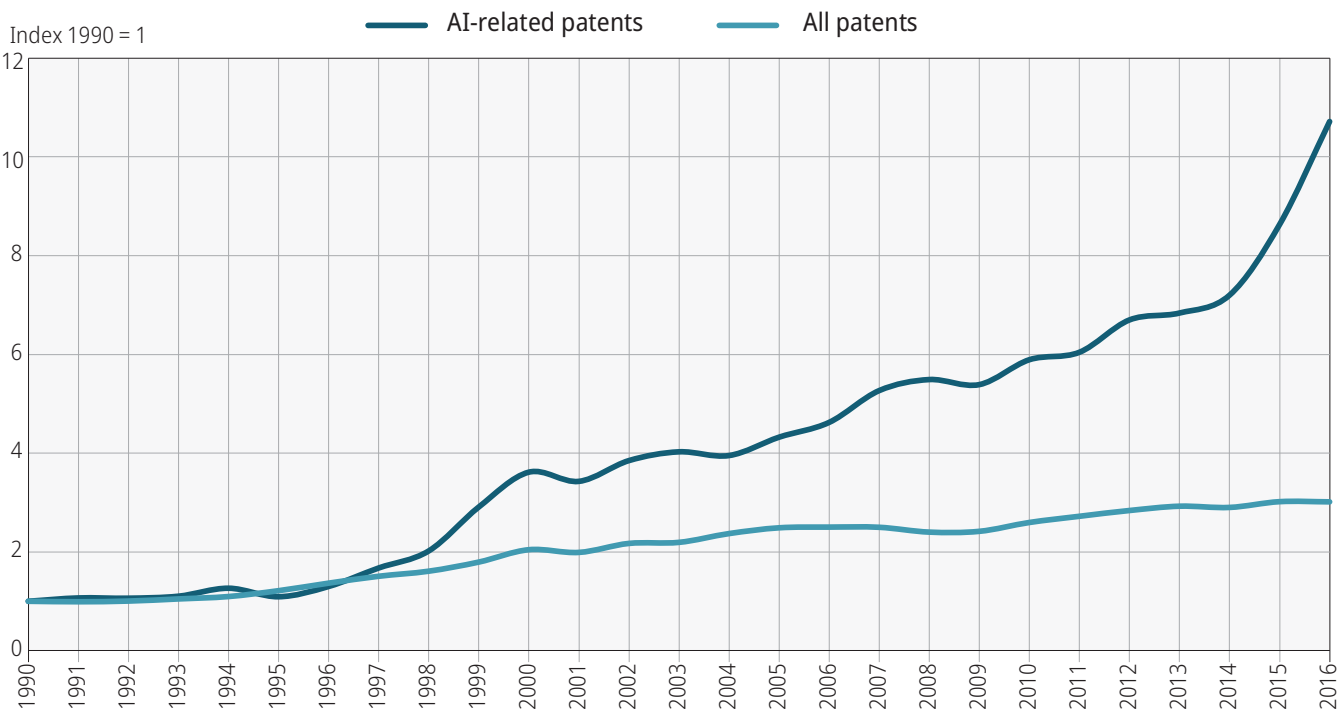
Digital literacy to prepare students for the real world

In our rapidly changing world, which relies so heavily on technology, digital literacy is a cornerstone for students to successfully navigate the social, civil, economic, and occupational roles of adulthood (OECD, 2019[63]). Such digital tools also help develop future competencies for the future that can only be obtained through the use of such technology. This can lead to a path of lifelong learning and help prepare youth for their adult life. These tools can also help students to personalise their learning experience.

The growth of new technologies, such as AI (Figure 4) signals unprecedented demand for competencies in technology-rich environments, particularly information-processing skills.

Figure 4 **Growth of AI technologies**

Index 1990=1 based on the number of IP5 patent families



Source: (OECD, 2019[64]), *Measuring the Digital Transformation: A Roadmap for the Future*, OECD Publishing, Paris, https://doi.org/10.1787/888933928331.

While work and life in the future will require knowledge of and comfort with diverse forms of technology, a recent OECD Survey of Adult Skills reveals that, on average, only about one in three adults in participating countries are very proficient in problem solving in technology-rich environments (31.1%) (Figure 5). The country-level comparison shows significant discrepancies between countries with a large proportion of adults who demonstrated good levels of proficiency in such skills (**New Zealand** and **Sweden**) and those where only a minority of adults scored at the same level (e.g. **Poland, Lithuania, Chile, Greece, Turkey**).

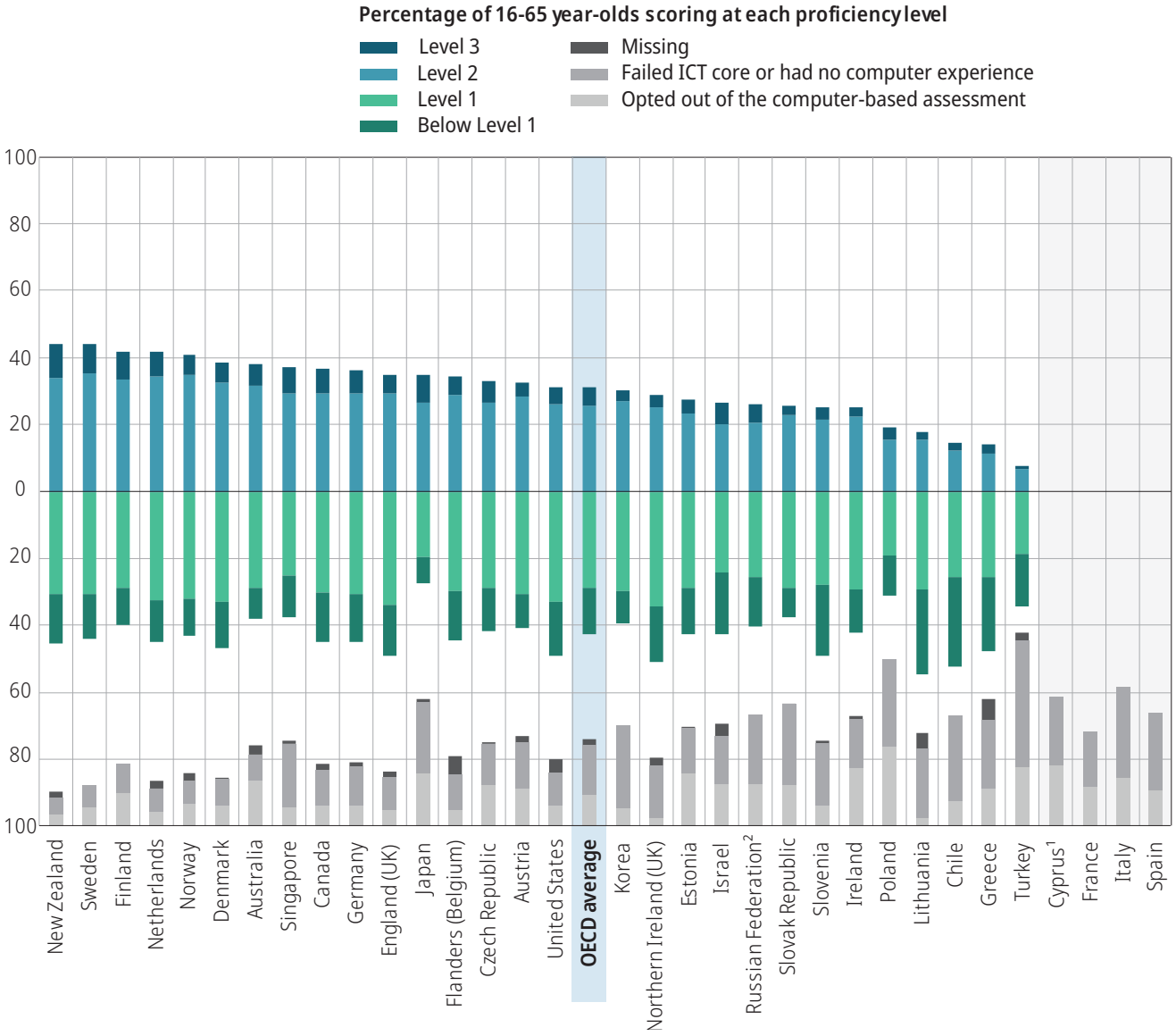
Closing gaps in digital competencies, therefore, remains a policy priority for eliminating digital divides now and in the future. Some of the digital tools may help teachers and students interact with other technologies. Using a digital curriculum makes technology in the classroom part of the normal school experience, reflecting the world outside school. It allows students to naturally gain skills and experience working with digital tools that they will need to master as adults. The more students are exposed to these tools, the more they may be able to effectively transition to the workforce and a more digitalised civic life.

However, it takes time for students and teachers to adapt to the use of digital curriculum resources (Rosen and Manny-Ikan, 2011[65]). A quality curriculum considers broader contextual opportunities and the needs of both students and the community (OECD, 2020[1]; Darling-Hammond et al., 2020[9]). Teachers may be supported to develop their digital skills or other pedagogical knowledge through various measures, such as training by professional organisations or local governments, or through peer-learning and online workshops. The Future Classroom Lab (FCL) in Brussels (Belgium) and the European Schoolnet Academy are a few examples in the European context. Box 2 explains how a school network in Korea swiftly incorporated digital tools to support teachers in response to school closures due to the pandemic in 2020.

Efficient and effective use of technology may facilitate additional learning potential in a more equitable manner. For example, digitised textbooks can be accessed and shared by a larger number of students, depending on the licenses obtained from textbook publishers.[12] They may be more rapidly updated and aligned with changes in the curriculum, and interactive resources can be accessed directly from these books. Parts can be printed and distributed by teachers for non-commercial purposes, and students do not need to go to the library to check out physical copies or carry them around, which could be physically challenging.

Figure 5 **Proficiency in problem solving in technology-rich environments among adults**

Percentage of 16-65 year-olds scoring at each proficiency level



Notes: Adults included in the missing category were not able to provide enough background information to impute proficiency scores because of language difficulties or learning or mental disabilities (referred to as literacy-related non-response). The missing category also includes adults who could not complete the assessment of problem solving in technology-rich environments because of technical problems with the computer used for the survey.

Cyprus, France, Italy, Jakarta (Indonesia), and Spain did not participate in the problem-solving in technology rich environments assessment. Results for Jakarta (Indonesia) are not shown, since the assessment was administered exclusively in paper and pencil format.

1. Note by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

2. The sample for the Russian Federation does not include the population of the Moscow municipal area.

Countries and economies are ranked in descending order of the combined percentages of adults scoring at Level 2 and at Level 3.

Source: Survey of Adult Skills (PIAAC) (2012, 2015), Table A2.6, http://dx.doi.org/10.1787/888933365903.

Box 2 **Preparing teachers for interactive online teaching during COVID-19**

As a response to the COVID-19 pandemic, many countries/jurisdictions pivoted to digital and online approaches to learning. With no roadmap on how to proceed, schools and stakeholders were left with no choice, but to innovate themselves and adapt to this uncertainty.

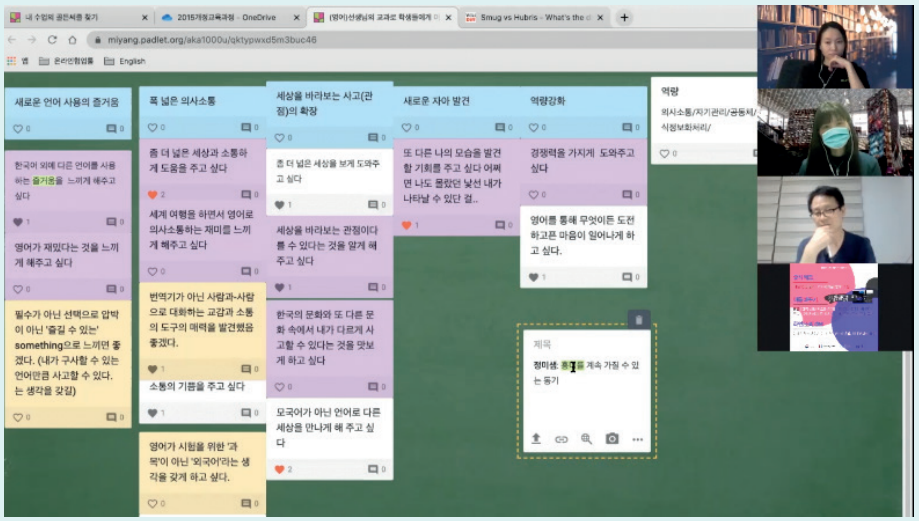
In February 2020, the Korean Ministry of Education took the unprecedented step of transitioning to full online education. Some critical challenges for adapting to this sudden need included how to quickly prepare teachers – many of whom were unfamiliar with such practices – for online teaching and how to keep students motivated during remote learning.

The Future Class Network (FCN), a grassroots organisation that has been leading innovative education in Korea, played an important role by promptly designing and testing solutions to train teachers on a large scale for adapting swiftly to online instruction. Within FCN, its prevailing culture of valuing student-led peer learning and experiences with minimising lecture-based lessons in their classrooms helped them in envisioning new strategies for online teaching and learning while still maintaining student engagement, collaboration and participation.

To realise this, around ten leading teachers came together and exchanged ideas to enhance the quality of online classes and improve them through trial and error. As raw as it were, this core group of teachers shared their experience through an online interactive workshop with other fellow teachers at FCN. The experience was well received and quickly multiplied with ten teachers influencing many others.

In April 2020, the Korean Ministry of Education approached FCN and suggested that they share with general teachers their breakthrough strategies for quickly training teachers for online instruction, thus supporting them during school closures. FCN first large-scale, real-time online interactive teacher training was very successful. FCN reached about 4 000 individual teachers from primary and secondary education in a period of 2-3 weeks.

Prior to the training, almost all teachers expressed their fear of moving to online classes and a resulting sense of confusion. After four hours of hands-on online engagement and peer learning, teachers gained new confidence to overcome their fears and started expressing their curiosity and desire to explore further possibilities for using ICT in support of student learning. The content of the workshop was grounded on experiencing the perspective of students in an online class, from which participants learned how to design online lessons that encourage active student engagement.



Three additional mass online interactive training sessions followed and by February 2021, a total of 17 000 teachers had participated in the training. A monitoring study to gauge the effectiveness of training suggested that teachers who participated in the online workshop went beyond surviving the Covid-19-related school closures to start a deeper reflection about the competencies that students need in the future and how they need to adapt their teaching to support them.

A critical concern during the Covid-19 pandemic is the widening of education gaps. FCN's strategy for that is to encourage peer learning among students, which frees up some time for teachers which can be dedicated to the more vulnerable learners. These can be more easily identified through real-time monitoring of their individual performance and engagement in digital environments.

FCN is currently expanding its online teacher training to support teachers outside of Korea facing similar challenges. This year, with the support of the Korea International Cooperation Agency (KOICA), FCN started providing online interactive workshops to master teachers in Azerbaijan with the aim to make them trainers of other teachers in their own country. FCN intends to continue assisting other communities. To this end, discussions are underway with educational institutions in Viet Nam, Lebanon, and other countries for teacher capacity-building projects. The accumulated experience of FCN has shown that even in times of crisis, a student-centred education, as emphasised by the OECD Learning Compass for 2030, does not need to be compromised but can rather be leveraged to support student and teacher agency.

Source: The OECD Future of Education and Skills 2030 School Networks – Korea Future Class Network. Chanpil Jung (CEO) and Soon Jong Kim (Director of Teacher Training).

Experiences with a digital curriculum are likely to vary from simple applications (e.g. digitalisation of materials and posting of instructional tools on a website), to hybrid models (combining online/remote learning and face-to-face instruction), to a curriculum that is delivered entirely through a digital platform. This is the case of the Foundry College (Box 3), which built online courses based on the latest neuroscience findings of how one learns (content organisation, feedback structure, engagement with peers and tutors, etc.). Their digital platform offers online courses to adults that can interact live with their instructors and peers in a flexible format that suits the busy schedules of working adults.

Box 3 **The Forge online classroom by Foundry College**

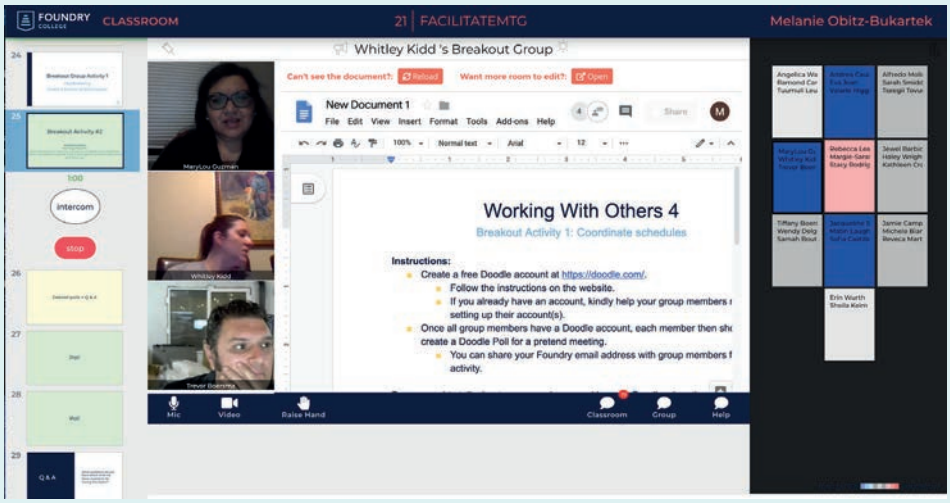
The Forge online classroom offered by the Foundry College replicates and improves upon a physical classroom experience by engaging students in active learning, providing faculty with real-time data to support learning, and facilitating a sense of community between students and faculty – something that asynchronous online learning platforms cannot do. Its design is built on the latest knowledge of learning sciences.

In fact, the Foundry College, a public institution, benefits from years of expertise of its founders/leaders in applying learning science to practical innovations in higher education in the private sector, e.g. at the prestigious Minerva Schools at the Keck Graduate Institute. Their vision for putting that wealth of expertise at the service of public goods was at the heart of their motivation for founding the Foundry College.

What Makes The Forge Different?

Unlike other platforms, built for the business world, The Forge is designed specifically to facilitate learning in online courses by integrating best practices from the science of learning:

- **Student engagement**: a community where participants see each other face-to-face in a scrolling video matrix, take part in live breakout group sessions, and engage in real-time polls;
- **Breakout groups**: small groups of 2-8 students, each with their own live video session, for activities like debates, role-plays, and group problem solving;
- **Data to help students learn**: real-time data within the platform ensures appropriate breakout groups and feedback on participation, as well as regular updates on student attendance, engagement, and learning progress.



The Forge uses forms of active learning to promote student success by engaging students dynamically with the lesson. The Forge's features guide and encourage instructors toward effective active learning methods – even if they were not previously aware of them.

While students are in small breakout groups (which has proven to be most effective for active student engagement), the teacher is provided with a heat map identifying breakout group activity and signalling where and at what point a teacher intervention might be beneficial.

Key features of The Forge:

- User-interface designed to facilitate active learning
- Instructor can drop into and interact with breakout groups
- Scrolling video grid so everyone is present
- Data-driven composition of breakout groups
- Ability to bring content from breakout groups to class
- Save breakout group work in database
- Sequences of breakout groups for multi-step activities
- Ability to "tag" breakout groups into debrief discussion
- "Spotlight" mode to highlight students and breakout groups
- Collection and utilisation of data from quizzes
- Automatic and manual class progression
- Observer mode

Source: Presentation by Akiba Covitz, Foundry College CEO and President, at Education 2030 Focus Group 1 Zoom webinar "Solidarity roundtable on blended-learning/hybrid learning with a focus on supporting teachers" which took place on 9 July 2020.

Finally, as users of digital curriculum resources, teachers are usually interested in their practicality (i.e. a decrease in administrative workload and a good fit with routines and practices) (Choppin and Borys, 2017[66]). This allows teachers to focus more on teaching, providing feedback to students, offering additional support to students who need it most while spending less time on bureaucratic reporting requirements and administrative tasks (OECD, 2018[67]).

Including, engaging, and motivating students

Student motivation is always important in the learning process (Dweck, 1983[68]). Millions of primary and secondary students worldwide take virtual courses (Davis and Ferdig, 2010[69]). However, research shows that not all students are successful (Roblyer, 2008[65]; Davis and Ferdig, 2010[69]). Students who lack motivation and digital skills, and are not able to self-regulate their learning need extra support in virtual schools, as do students with medical issues (Davis and Ferdig, 2018[71]).

Traditional curricula typically have majority-group learners in mind. Designing a digital curriculum offers policy makers the opportunity to co-construct a curriculum with learners, teachers and leaders from minority groups, and to recognise them as change agents, to avoid marginalising learners from these groups (Schönfeld et al., 2020[72]).

The use of interactive applications, such as games and the use of virtual reality (VR), could increase motivation (Information Resources Management Association, 2018[73]), while at the same time increased digital use raises concerns related to student health, such as altered sleep cycles, excessive screen time with potential negative effects on mental health, such as feelings of isolation (Song et al., 2014[74]; Ferguson, 2017[75]; Przybylski and Weinstein, 2017[76]), depression (Bezinović et al., 2015[77]; Ikeda and Nakamura, 2013[78]; Kim et al., 2010[79]) and addiction (Young, 1996[80]) as well as health risks associated with reduced physical activity levels (Balram, 2020[81]; Information Resources Management Association, 2018[73]; Burns and Gottschalk, 2019[82]; Sisson et al., 2010[83]). In one study, a gaming approach to computer-science education in secondary school increased learning and motivation of students in comparison with a traditional curriculum (Papastergiou, 2009[84]). In the experiment, observations of students while using the learning application revealed a greater level of engagement, interest and enthusiasm among students in the gaming condition compared to students in the traditional group; they also showed interest in the application, but were nevertheless less attentive and engaged.

The students independence inherent in a digital curriculum must be supported by teachers, in line with a co-agency model, to avoid the risk of students who lack basic skills to benefit from such approaches missing out on optimal learning experiences (OECD, 2019[63]). Students may also need to balance the use of digital tools with opportunities for the traditional physical presence of teachers, which allow for closer collaboration and can strengthen the student-teacher relationship (Jonker, März and Voogt, 2020[61]; Graham, 2006[85]). The research is inconclusive at this stage, and more research is needed to illustrate the complex relationship between student motivation and the use of technologies.

At this stage the use of technologies carries a lot of potential for making learning more relevant and authentic for learners, stimulating their curiosity and intrinsic motivation, and supporting the development of their individual agency, such as finding purpose in their learning and making sense of the world around them. For example, digital formative assessment can become one of the potential tools to promote students' agency in their learning process, as well as their motivation for learning, which can promote equity and inclusion. Using such tools to change the fundamental makes the difference between "digitalisation of curriculum" (i.e. putting the existing curriculum into digital form) and "digital transformation of curriculum" (i.e. changing the fundamental concepts of learning and teaching), where a curriculum becomes a transformational tool for everyone to achieve the ultimate goals of education in shaping a future that ensures the well-being of self, others and the planet.

Student choice, and customised, individualised and adaptive learning

Digital curriculum resources can include the use of learning analytics to inform teachers about their students' achievement and provide suggestions for how to organise adapted instruction. Research in this area is still exploratory, but preliminary findings suggest that learning analytics may improve teaching and student achievement most when teachers are prepared to act on the information provided to them in a pedagogically sound and effective way (Volman and Stikkelman, 2016[86]). Learning analytics can also be used to identify early warnings of learning difficulties, thus giving educators and learners a chance to intervene earlier and ensure better learning throughout a learning programme or module (Akçapınar, Altun and Aşkar, 2019[87])

For customised and individualised learning, teachers and students favour the possibilities of digital curriculum resources. In addition, for-profit, private-sector education providers have a tradition of offering individualised learning as a complement to "mass education" in school, in particular by embedding adaptive assessment systems into digital curriculum resources. This often results in modest gains in learning compared to programmes offering similar courses without adaptive systems (Yarnall, Means and Wetzel, 2016[88]).

This said, teachers, policy makers, and researchers are attracted by the potential of digital curriculum resources because students experience transformative learning through the collective, interactive capabilities of digital materials, rather than simply learning in an isolated way. Research suggests that adaptive use of digital curriculum resources can respond to the needs and interests of students, and has shown positive effects on learning for low-achieving students, and for students from low socio-economic backgrounds, rural settings, developing countries, and with disabilities (Voogt, van de Oudeweetering and Sligte, 2017[89]).

Taking advantages and disadvantages into account, countries/jurisdictions have developed diverse policies regarding learning resources and digital textbooks, and strategies for enabling student access in their local contexts. As digital technology (including the use of mobile technology) becomes more accessible, and in light of the added flexibility that digital textbooks provide to teachers and learners (e.g. integration of content, pedagogy and assessment), e-textbooks are becoming more popular in various OECD and partner countries[13] (OECD, 2020[1]). While some

digital textbooks look like their paper versions, they provide additional features, including the ability to integrate digital content from various sources and in various formats, to track individual students' assignments and feedback (with customised student and teachers interfaces), to offer tasks that vary in difficulty level for the same content, to link to relevant content in different grade levels, and more. (Figure 6)

Figure 6 **Example of an e-textbook in Estonia**

Source: See Box 7 in *What Students Learn Matters: Towards A 21st Century Curriculum* (OECD, 2020[11])

AI is another application of increasing interest to teachers, allowing them to further customise content in the classroom, enabling more personalised learning (Box 4). AI can also help support teachers and students by delivering content and helping students with frequently asked questions, such as in the use of AI assistants and/or Intelligent Tutoring System thus relieving teachers from preparing repetitive information and from other routine monitoring tasks of student learning (UNESCO Education Sector, 2019[90]). However, the consequences of implementing diverse technologies on a large scale (e.g. learning analytics, digital textbooks and AI) are still unknown.

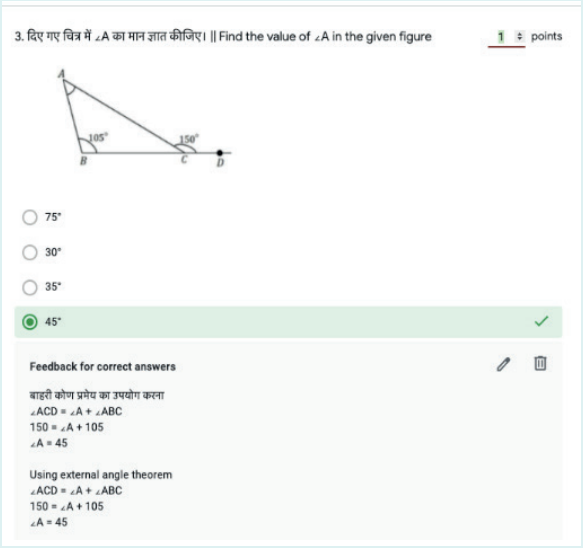
New forms of public-private collaboration and partnership, for example, are likely to evolve in response to growing demands for such services. Some governments may set standards for new education services, such as Ed-Tech, or relax regulations in the existing industries, where appropriate. The typical trends include, for example, publishers developing e-textbooks and software companies developing new learning management systems and/or learning apps. The introduction of private partners into the curriculum delivery process may raise other dilemmas, such as the dependency on specific digital services providers or escalating costs after trial versions of services expire.

Box 4 **Use of AI: Avanti**

Avanti Fellows is among India's largest and most eff ective science and math education organisations and runs large, system-wide interventions in Haryana and Jawahar Navodaya Vidyalaya schools. They provide after-school instruction that helps students prepare for competitive examinations and enter good medicine and engineering universities. They make extensive use of technology for interactive online classrooms and explicitly aim at reducing learning gaps in math and science among students.

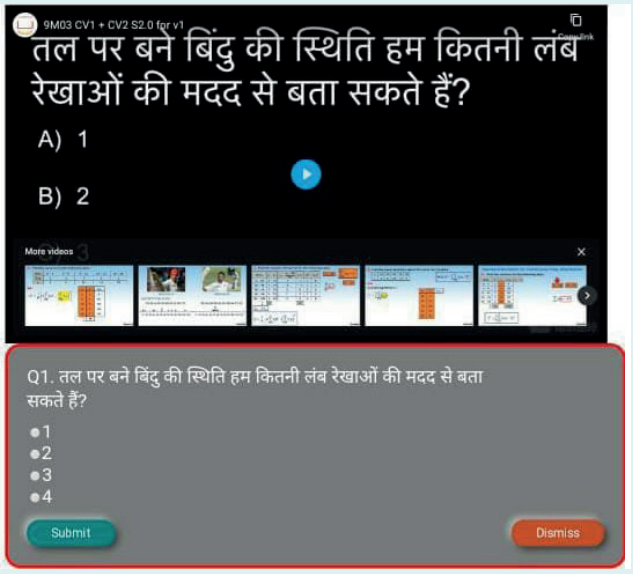
During the Covid-19 lockdown period, state governments of Haryana, Rajasthan, Jharkhand, and Madhya Pradesh agreed to a common teaching and course coverage plan with daily lessons. In collaboration with the state governments, Avanti reaches over 800,000 students every day through more than 6,000 teacher-moderated WhatsApp groups.

These students receive daily messages with a curated playlist on YouTube, PDF assignments, and notes. Over 40% of all students are engaged in these WhatsApp groups and 90% of them participate in weekly quizzes.



Early data indicates that learners are learning new concepts in a purely remote way with an average score of 50% of learned content.

Avanti now focuses on making learning personalised. In the first phase, Avanti has built adaptive lessons that combine videos with quiz items and guide the learner down different learning paths based on their performance. These lessons are built on Google Forms. In the next phase, the lessons will be delivered as interactive videos by layering assessments within the videos to truly understand what part of each video worked for the learner.



As learners respond to questions, Avanti will identify the specific segments that were particularly engaging and effective. This will help generate personalised recommendations for each learner based on their learning level and in their local language. Avanti will leverage AI and machine learning models to effectively drive this phase.

Avanti's platform will always be free for learners and, unlike most existing solutions, the AI models and the data gathered will be open to researchers as a public good.

Source: Presentation by Akshay Saxena and Panchali Dutta (Avanti) at the Education 2030 Thematic Working Group 3 "Aligning assessment and pedagogies with curriculum changes" webinar which took place on 25 September 2020.

Similarly, digital technology can be leveraged to enhance the involvement of parents in their child's education. Dost Education, a private, non-profit company in India, builds and maintains parental engagement in their child's education by opening a path to ongoing communication and customised information through the use of mobile technology (Box 5).

Box 5 **Dost Education – Empowering parents to be leaders**

Dost Education empowers aspiring middle-income parents in India to improve their children's early development and school success. Through widely available mobile technology, Dost delivers local language curricula and a communication platform to arm parents with the knowledge and resources they crave.

Dost helps parents of any literacy level boost their child's early learning and development at home. Through 1-minute podcasts delivered via phone calls four times a week ("phonecasts"), Dost solves everyday parent problems and nudges parents to turn regular moments into learning moments. Current content covers cognitive development, socio-emotional skills, and school preparedness.

Experiencing the COVID-19 pandemic, to supplement the early-learning content, Dost built a six-week-long COVID-19 module addressing stress, physical and mental health for both adults and young children, and recommending positive behaviour management techniques to adopt health routines, build resilience, and create a safe environment at home.

Source: HundrED GLOBAL COLLECTION: 2021. Petrie, Christopher. Katija Aladin (2020). HundrED Research. https://hundred.org/en/research; Published Autumn 2020

Growing awareness that an inclusive curriculum also takes into account the important role of parents in supporting their children's learning is also demonstrated by the consideration of parents themselves as potential readers – if not primary readers – of the curriculum. A recent OECD Future of Education and Skills study reveals that in 86% of participating countries/jurisdictions, parents are considered target readers of the curriculum. In four of those countries (the **Czech Republic**, **Estonia**, **Finland**, and **Singapore**) parents are the main audience for the curriculum, together with teachers, students and the wider public.[14]

Alignment with curricula contents, assessment, support systems, and learning pathways

Digital curricula may ensure equity by aligning curriculum content to learners' developmental needs in several ways: 1) offering individually targeted assessment by computerised adaptive testing; 2) providing supplementary support with intelligent tutoring systems; and 3) developing learning pathways by using big data and/or AI technology (Chen, Liu and Chang, 2006[91]; Scheltens F., 2020[92])

Digital curricula that support vulnerable students in particular

Digital curriculum resources offer opportunities for all learners and, when tailored to students according to their needs, talents, potential for learning, interests and expectations, flexibility opens a variety of learning paths as well as ways to scaffold and enrich learning, promoting inclusion for all. But digital curricula have special potential to

improve both learning and the learning experience of vulnerable students. For example, they can be tailored to students with special needs by combining them with the use of assistive technology and tools (Box 6). They can also respond to the cultural and linguistic diversity of minority students and support designing materials that counter gender and racial stereotypes. They can bring high-quality learning materials and activities to poorly resourced schools and remote rural areas, helping to close gaps in learning opportunities. They can also provide targeted tutoring to low-performing students, helping to close performance gaps. Furthermore, they can provide a host of options for continuous learning in times of crisis, when students may not have access to schools, as is the case with displaced students (e.g. refugees) or students experiencing school closures due to natural disasters or pandemics.

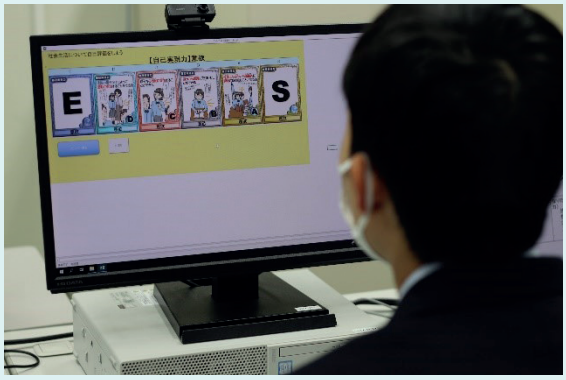
However, not all teachers, students and parents have equitable access to or understanding of digital resources. This could complicate efforts to achieve equity through digital, technical, and curricular materials (Donlan, 2016[93]). Policy makers need to realise that the different perspectives of various stakeholders have an impact on how digital curriculum resources are understood and can be used (Choppin and Borys, 2017[66]). Tensions between different stakeholders on the use of digital curriculum resource materials may lead to unclear messages to teachers, students, and parents about the ultimate goals of a digital curriculum (Choppin and Borys, 2017[66]; Selwyn, 2007[94]). Opportunities must be deliberately embedded into the design of an inclusive curriculum, and they depend on other, concurrent equity measures, such as equal access to infrastructure (computers, laptops, broadband, etc.) and guidance and information for parents on the benefits of such resources.

Students with special needs

By taking advantage of digital technology, digital curricula can serve the special needs of individual students. This can include: accessible formats for Braille readers; text to speech software (for reading) or voice recognition for keyboard entry (for writing); adaptable font sizes and colours; adapted language (for ease of comprehension); and adaptive testing built with algorithms that help with early detection of language impairment. It can also include the use of augmented reality, immersive virtual reality (VR) and motion recognition technology so users can map virtual spaces and change screen representations according to their needs. Assistive technologies, such as magnifying apps and screen readers, can also support SEN students. Such tools remove a number of physical and cognitive barriers to learning for students with visual, auditory or other impairments, thus supporting equitable access to opportunities to learn (See OECD (2020, p. 11[1]) report on the recognition time lag between policy makers and school leaders).

Box 6 **Exercising student agency for special needs students**

At Chiba Prefectural Nagareyama School for Special Needs Education in Japan, the unique curriculum is implemented in order to support the exercise of student agency for students with special needs, with reference to the OECD Learning Compass 2030. Approximately 300 students of high-school age with learning disabilities attend this school.



Schools for students with special needs are encouraged to design a personalised and flexible curriculum. In Japan, typically, certain learning areas (Ryo-iki) do not require grading and students receive a qualitative evaluation, while subjects (Kyo-ka), such as language and mathematics require schools to give students a grade (Hyo-tei). At these schools, more flexibility is also given on assessment to better meet the individual's differing needs. For example, a grade is not required for students with learning disabilities, even for subject areas.

This school has been designated as an experimental school by the Ministry of Education, Culture, Sports, Science and Technology, and has introduced a unique new learning area (Ryo-iki) called "My Time". During "My Time" class, each student consults their teachers, sets out what competencies they wish to develop, design how to achieve the goal, and work towards achieving the goal. Support and learning activities are adapted to suit individual needs so they vary from student to student. To facilitate the creation of individualised plans, the school created an original ICT application easy for special needs students to use, to assess themselves and set their objectives.

In this application, students can choose between different cards, depending on what kind of state they are in and where they want to go with various competencies. These cards include pictures that are visually easy to understand for students with learning disabilities and have 6 levels, which are the rubrics set by the teachers. The method of choosing a card makes it fun for students. Each student can use it at their own pace and receive feedback from teachers.

Using this application, students decide the competencies they want to develop or improve on, think about how they would cultivate them, anticipate paths for problem solving, take actions to implement solutions, and reflect on their learning.

By engaging students actively in such iterative cycles of the OECD's Education 2030's Anticipation-Action-Reflection (AAR) for problem solving, teachers aim to develop students' competencies and students' agency, which are necessary for students to be able to thrive in a volatile, uncertain, complex, and ambiguous society. To promote a whole-school approach to curriculum implementation, teachers work together to enhance the quality of learning for each student by connecting what students learn and experience during "My Time" and what they learn in their existing subjects, with the aim of supporting both students' learning at school and their learning for life.

Source: The website of Chiba Prefectural Nagareyama School for Special Needs Education
https://cms1.chiba-c.ed.jp/nagareyamakotogakuen-sh/

Gender, socio-economic background and the digital divide

Differences in access to ICT and digital technology related to students' socio-economic status and gender potentially play a role in increasing gaps in learning opportunities and outcomes. For example, PISA data reveals that boys and socio-economically advantaged students are more likely to have earlier access to digital devices than girls and students from disadvantaged backgrounds (OECD, 2013[6]).

Innovative curriculum designers must then use digital curricula to minimise, rather than aggravate discrepancies in educational outcomes. Overall, digital textbooks promise a variety of possible advantages, but other issues may arise, such as questions of access to digital devices.

Other efforts to incorporate digital tools, like digital learning materials or apps, could also be a barrier for students from low socio-economic backgrounds, as they may not be able to access them at home (Donlan, 2016[93]). In cases when teachers expect work outside of class, as in a flipped-classroom model,[15] students may not be able to complete assignments. The digital divide means more than just the inability to look up content or questions at home for a report; it has implications for accessing digital tools more broadly.

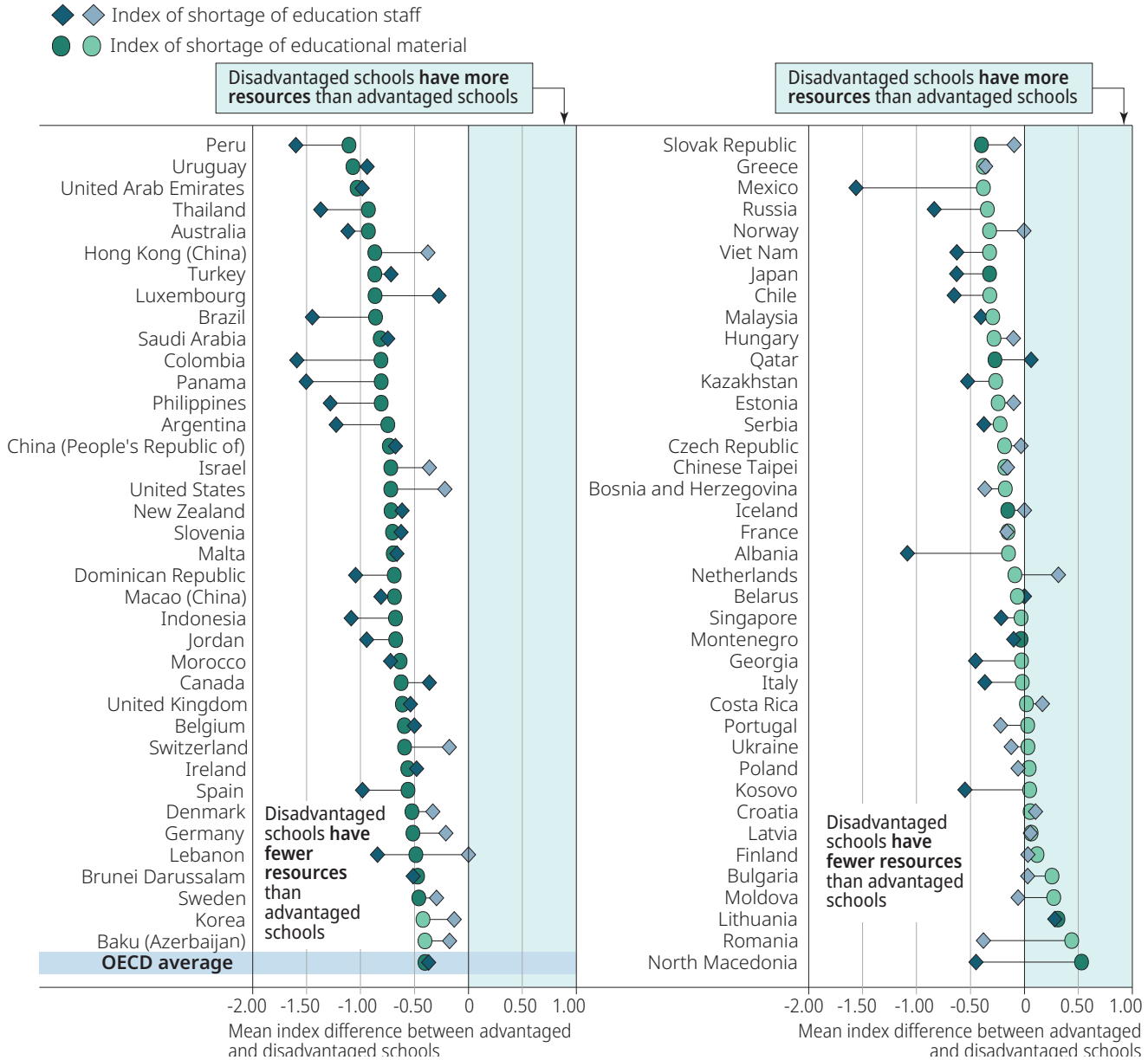
Students and teachers in poorly resourced schools

Policy makers face a challenge to develop a digital curriculum that does not exacerbate differences in learning opportunities and educational outcomes across diverse populations of students. Accessing the digital resources outlined earlier in this section requires a connection to the Internet. Hardware, software, and Internet access are all requisites for equitable access to digital learning materials.

However, not all schools are equally resourced and this may impact the capacity to provide quality instruction (OECD, 2019[95]). PISA data reveal that in some countries disadvantaged schools are more likely to suffer from a lack of physical infrastructure and educational material, like textbooks, laboratory equipment and computers (41 PISA participating countries and economies). Furthermore, in some countries disadvantaged schools are more likely to face shortages of education staff (45 participating countries and economies) (Figure 7). (OECD, 2019[95])

Figure 7 **Difference in shortage of educational material and staff, by schools' socio-economic profile**

Results based on principals' reports

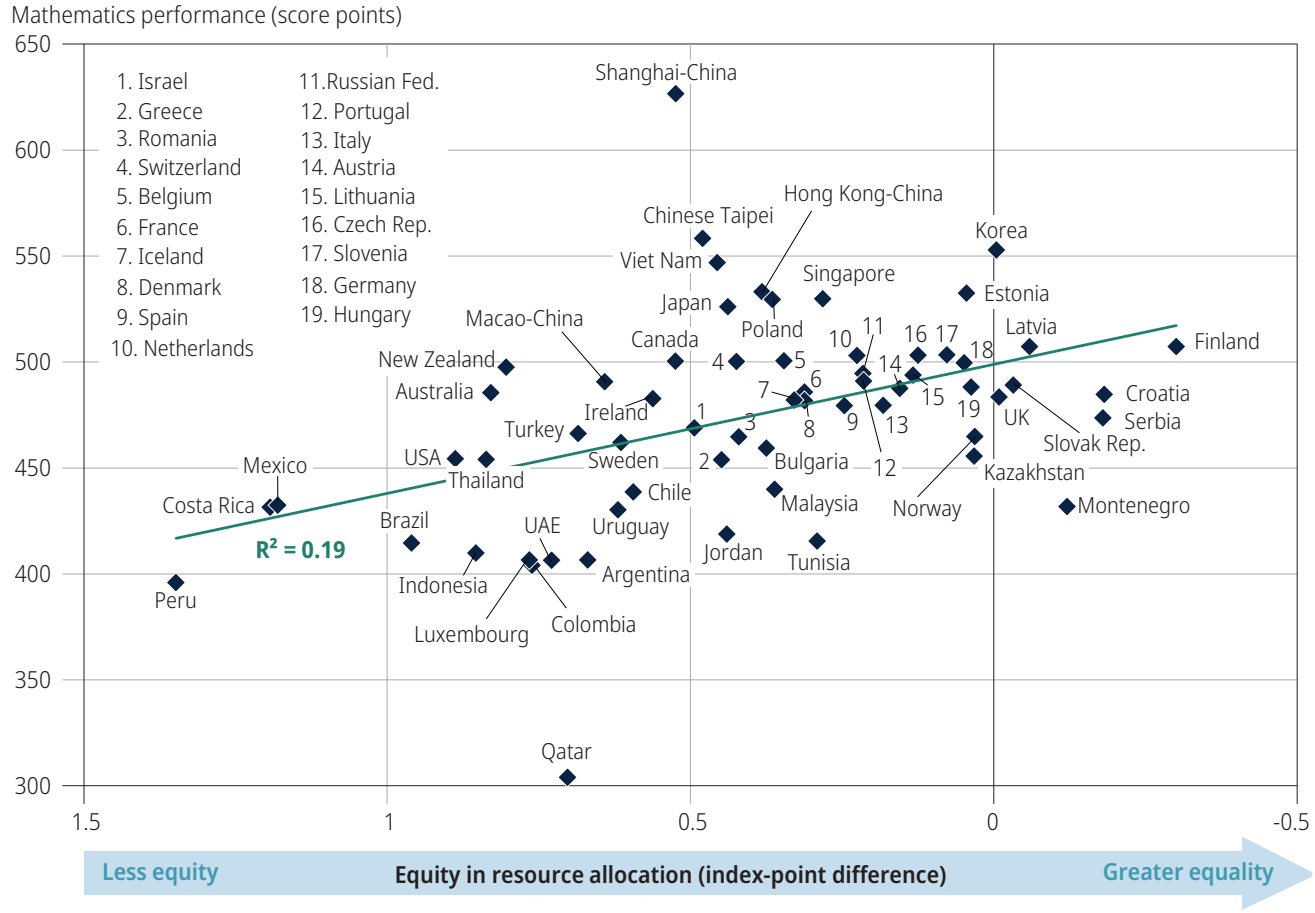


Note: Statistically significant differences are shown in a darker tone. The socio-economic profile is measured by the school's average PISA index of economic, social and cultural status (ESCS). For this analysis, the sample is restricted to schools with the modal ISCED level for 15-year-old students. Countries and economies are ranked in ascending order of the difference in the mean index of shortage of education staff.

Source: OECD, PISA 2018 Database, Tables II.B1.5.13 and II.B1.5.14, https://doi.org/10.1787/888934037678.

PISA data also show that in countries where resources are allocated more equitably, more students have a greater chance to succeed (Figure 8). Basic school infrastructure, such as laboratory equipment and Internet connectivity, as well as access to textbooks, are important factors in reducing gaps in learning and performance. Technology can also be used to provide infrastructure at a lower cost, such as in virtual labs (Vincent-Lancrin, 2019[96]). Deliberate efforts to ensure equal access to optimal conditions for learning do pay off.

Figure 8 **Students perform better when school systems allocate resources more equitably**



Note: Equity in resource allocation refers to the difference in the index of quality of schools' educational resources between socio-economically advantaged and disadvantaged schools.

1. A significant relationship ($p < 0.10$) is shown by the solid line.

Source: (OECD, 2014[97]), Pisa in Focus no. 44, How is equity in resource allocation related to student performance?, https://www.oecd.org/pisa/pisaproducts/pisainfocus/pisa-in-focus-n44-(eng)-final.pdf

Exposure to additional digital tools, such as computers or digital tools for improving writing practice, improves the academic performance of disadvantaged students (Janxia, Sansing and Yu, 2004[98]; Jesson et al., 2018[99]). Providing resources, support for teachers and effective learning strategies (which can include digital curricula and tools) have all demonstrated success in supporting disadvantaged students (OECD, 2012[100]). To sustain the use of digital curriculum resources over time, teachers may need additional professional development, especially in socio-economically disadvantaged schools or in settings where student performance is low (Fishman et al., 2011[101]).

Although some communities may have Internet access, speed of access or reliability may be low. Some communities may finance or co-finance connections to reduce costs and enable more people to access those resources. There is also significant variation in the quality of textbooks, either in terms of physical condition or the extent to which material is up to date. A digital curriculum may require the creation of smart learning spaces, such as technologically enabled libraries, classrooms (for individual and group activities), laboratories (for real-time simulations) and playing fields (for use of wearable technology or performance-tracking tools), and also mobile technology that extends learning beyond the school walls. Students in well-resourced schools are more likely to adopt and more quickly benefit from new technology in teaching and learning (Zhao and Frank, 2003[102]).

As discussed, digital curriculum resources may continue to change, and additional resources may be needed in contexts where teachers often lack the time to spend on additional learning. Policy makers may need to provide additional resources or support, where needed. A one-size-fits-all approach to supporting digital curricula could be a disservice to teachers and students in schools that lack adequate resources.

Rural schools with multiple risk factors

Policy makers need to ensure that digital curriculum resources are accessible to all learners, particularly students in rural areas and schools with many students from low socio-economic backgrounds (Courtney and Anderson, 2010[103]). Research refers to a large number of students, particularly those in rural areas, who enrol in online courses to prepare themselves for further education, who need local support to prevent them from dropping out (De la Varre, 2014[104]).

Research suggests that adaptive use of digital curriculum resources can respond to the needs and interests of students, and has shown positive effects on learning for students from rural settings, low-achieving students, students from low socio-economic backgrounds, students from developing countries and students with disabilities (Voogt, van de Oudeweetering and Sligte, 2017[89]).

Displaced students with additional challenges in times of crisis

In times of crisis, such as during the COVID-19 pandemic or when serving displaced students (e.g. refugees and immigrants), it may be even more challenging to ensure equity in learning for all students. However, new resources may guide approaches to implementing such a model (UNHCR and partners, 2020[105]; You et al., 2020[106]). For example, components such as building relationships with students and families, constructing a vision for equity, and engaging students about their learning experiences may all be effective in designing and implementing innovative curricular practices, especially during COVID-19 (see Box 7).

2. PERSONALISED CURRICULA

Personalised curricula that work for all students

A personalised curriculum recognises that students learn differently, with different learning needs and at different paces. It also acknowledges that students differ in prior knowledge, skills, attitudes and values, and provides various entry points that allow students some degree of choice to tailor how they learn to what they need to learn. By providing learners with means to learn that match their unique interests and needs, a personalised curriculum has the potential to make learning more engaging and motivating. This can support students' performance and overall sense of well-being (OECD, 2006[107]). A popular way for countries to expand the range of subjects students can chose to learn according to their own interests is to offer extra-curricular activities. These, in addition to out-of-school activities, can address students' interests in areas not covered by the standard curriculum, but are likely to vary in the extent to which they are personalised to fit individual needs.

For students to fully benefit from a personalised curriculum, they need to be active participants in their own learning journey, be able to self-regulate, and develop the metacognitive skills required of self-directed learners. Based on students' input, teachers can adapt their instruction and learning environments in a way that best matches individual learning interests. Teachers can also continuously personalise a curriculum and make it rigorous and coherent, by selecting the right types and levels of challenge from which students can grow. This is especially important to avoid stigmatisation that this may be a second class type of curriculum (often associated with lower parental aspirations or teacher biases).

Some ways to do this include the use of scaffolding (including UDL), peer learning, adaptive teaching and learning, and the use of ICT and various digital tools to support such personalisation. The beliefs of teachers regarding their students, particularly whether they have a growth mindset (as opposed to fixed and stigmatising views about what students can accomplish) are important elements in successfully embracing the requirements of a personalised curriculum. Teacher education and professional development can further enhance teachers' preparedness for this type of innovation.

Box 7 **Amala: Hybrid learning for refugees**

	Amala Delivery Models		
Environment	**Online**	**Blended/tech assisted**	**Non Tech Assisted**
Synchronous (live) – 60 % of the time Builds motivation, community and engagement	With class and educator using collaborative tools (e.g. Zoom) **Opportunities** • Agency: Scaffolding carefully for agency using interactive pedagogies e.g. through smaller group breakout rooms • Co-agency: Building motivation and engagement through creating a touch point for learners studying online. **Challenges** • Co-agency: More difficult to interact online, e.g. educators reporting they are unable to read body language to know if students are engaged. Easier for students to disengage, e.g. students turning video and voice off during group discussions, but back on in breakout rooms. • Access: To resources and space e.g. connectivity, device and space issues	With class and educator in person (e.g. traditional classroom) **Opportunities** • Agency: Scaffolding carefully for agency using interactive pedagogies • Co-agency: Building sense of trust and community, e.g. learners reporting they are more able to tell educators about challenges and ask questions. Ability to respond to student needs e.g. reading body language, students feeling more prepared to share issues. • Fewer technical resources required than for online **Challenges** • Agency: Overdependence on in-person learning, e.g. learners asking whether it is compulsory to do the online work, less engagement on our online platform than for online courses. • Prioritisation: Effective use of in-person learning time, need to prioritise engagements where students may need immediate clarification/support.	With class and educator in person (e.g. traditional classroom) **Opportunities** • Agency: Scaffolding carefully for agency using interactive pedagogies • Co-agency: Building strong sense of trust and community, e.g. students reporting they are more able to tell educators about challenges and ask questions, ability to respond to student needs e.g. reading body language. • Fewer technical resources required than for online. **Challenges** • Agency: Overdependence on synchronous learning over asynchronous learning. • Prioritisation: Efficient use of in-person learning time, need to prioritise engagements where students may need immediate clarification/support.
Asynchronous (not live) – 40 % of the time Enables independent learning supported by others	Independent work using online tools **Opportunities** • Agency: learners can set own goals and pursue learning independently. • Co-agency: engagement focused learning platform enables students to connect with each other and educator outside of class times • Personalised learning and rapid feedback (supported by educator/ technology). **Challenges** • Support: Fewer support networks for disadvantaged learners, e.g. to ask for clarifications on terms/concepts, and language issues. • Access: Tension engaging online tools and technology access, choosing technologies that work in low-resource online environment	Independent work using online tools **Opportunities** • Agency: learners can set own goals and pursue tasks independently. • Co-agency: engagement focused learning platform enables students to connect with each other and the educator outside of class times. • Personalised learning and rapid feedback (supported by educator/ technology) **Challenges** • Support: Fewer support networks for disadvantaged learners, e.g. to ask for clarifications on terms/concepts, and language issues • Access: Tension between online tools and technology access, choosing technologies that work in low-resource online environment	Independent work **Opportunities** • Agency: learners can set own goals and pursue tasks independently, building on prior learning. • Co-agency: Learning from and with others beyond the classroom learning community through tasks. • Personalised learning and feedback from educator. **Challenges** • Support: Fewer support networks for disadvantaged learners, e.g. to ask for clarifications on terms/concepts, and language issues. • Co-agency: Fewer opportunities for engagement with educators and peers outside of class.
Insights	→ Need for norms of collaboration for online learning. → More personalised support, e.g. phone calls/check-ins help to ensure retention. → When students study only online synchronously it is easier for them to engage in online work asynchronously.	→ Optimal scenario in terms of engagement and communication taking place within and outside of the classroom. → Beneficial in terms of ensuring flexibility and minimising class time but can create a hierarchy of importance of in-person over online.	→ In-person learning supports engagement but lack of ability to engage more widely with educator and fellow learners outside could lead to decreased sense of engagement.

Source: Presentation by Polly Akhurst and Louie Barnett (Amala) at the Education 2030 Focus Group 1 Zoom webinar "Solidarity roundtable on blended-learning/hybrid learning with a focus on supporting teachers" which took place on 9 July 2020.

Recognition of individual differences such as students' prior knowledge, dispositions, motivations, pace of learning, learning progression

A growing body of research suggests that differences in students' prior knowledge, dispositions, motivations, pace of learning, and learning progression may influence the way they learn best (Duncan et al., 2007[108]; Dweck, 1983[68]; Hanna Dummont, 2010[109]).

The context where learning takes place is just as important. It is useful to have a learning environment characterised by a curriculum with intellectual substance and instructional design that encourages interest, meaningfulness and challenge through developmentally appropriate, cognitive, emotional and behavioural engagement, particularly as children gain more autonomy and enter adolescence (Eccles and Roeser, 2011[110]).

A personalised curriculum, if implemented properly, has the potential to change the curriculum structure from a one-size-fits-all linear learning-progression model to a differentiated, non linear learning-trajectory model, from which all students can benefit. Box 8 offers one example of how the goals of personalised learning can be productively combined with the use of technology for a learning experience that is targeted to learners' specific needs (both in different learning areas and different proficiency levels).

Box 8 **Khan Academy**

Khan Academy is a personalised learning resource for all ages tackling mathematics, science, computer programming, history, art history, economics and other subjects. Khan Academy offers practice exercises, instructional videos, and a personalised learning dashboard that empower learners to study at their own pace in and outside the classroom, in more than 40 languages.

Khan Academy aims to provide free, world-class education for anyone, anywhere. Their interactive practice problems, articles, and videos help students succeed in mathematics, biology, chemistry, physics, history, economics, finance, grammar, and many other topics. With personalised learning, students practice at their own pace, first filling in gaps in their understanding, then accelerating their learning. Khan Academy provides teachers with data on how their students are doing so they can identify gaps in learning and provide tailored instruction to meet the needs of every student. They also offer free personalised SAT and LSAT practice in partnership with the College Board and the Law School Admission Council.

Nearly 20 million learners use Khan Academy every month in over 190 countries and over 40 languages in addition to versions of their site in Spanish, French, and European and Brazilian Portuguese.

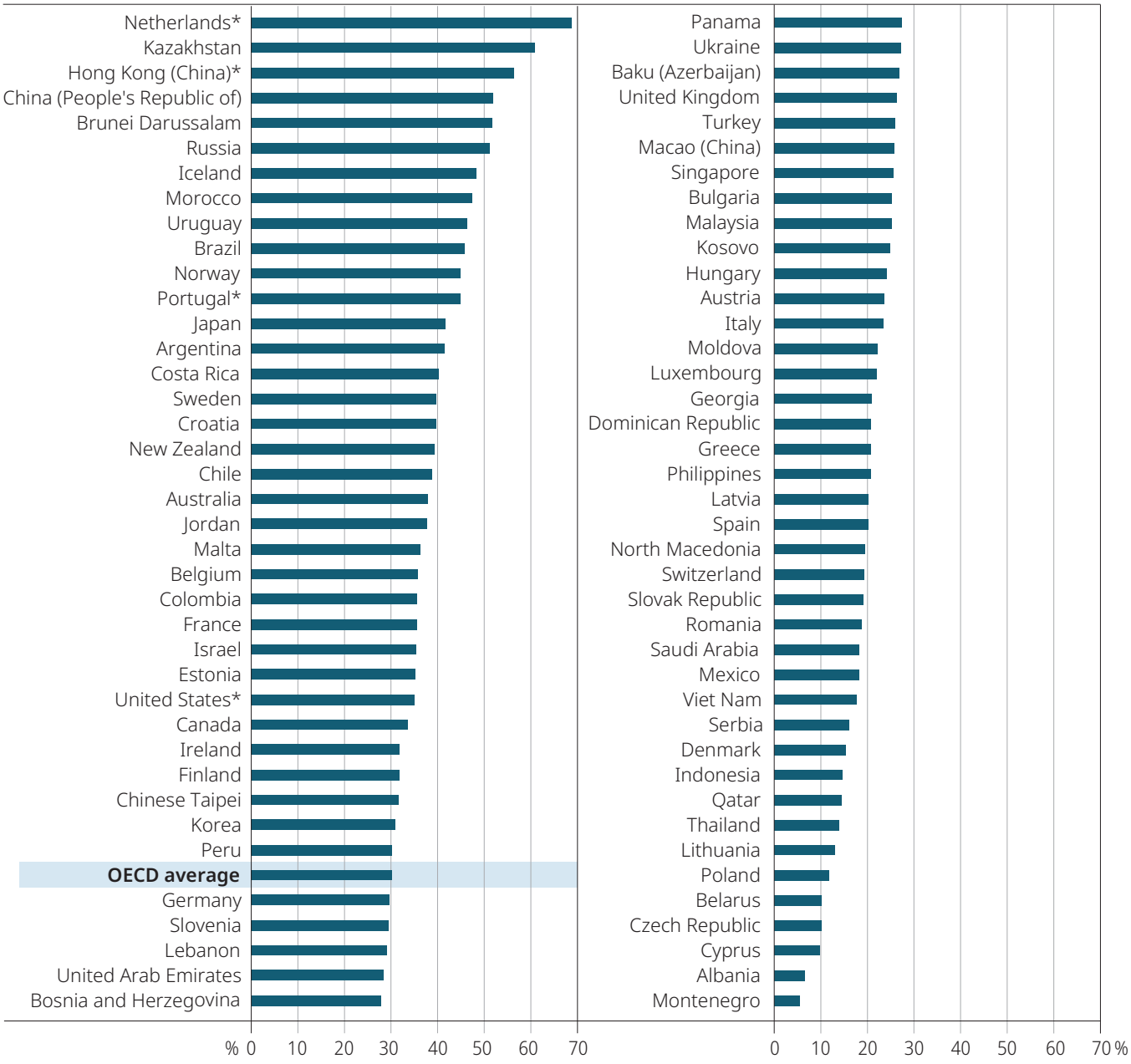
Source: HundrED GLOBAL COLLECTION: 2021. Petrie, Christopher. Katija Aladin (2020). HundrED Research. https://hundred.org/en/research; Published Autumn 2020

Despite growing interest in the potential of personalised curricula, many teachers may still feel unprepared to tailor their practices to best meet the individual needs of all students on a regular basis. Data from the OECD Programme for International Student Assessment (PISA) reveal that, on average across OECD countries, about 30% of students are in schools where principals reported that student learning is hindered by teachers not meeting the needs of individual students (OECD, 2019[111]). When looking at the country-level data (Figure 9), it becomes clear that in many countries this proportion is higher than the OECD average.

Among teachers, this may reflect a lack of awareness, willingness, or ability to be sensitive to their students' needs. This is where teachers' capacity to identify learning needs and adapt teaching accordingly is vital. Among school principals, it may reflect high expectations for teachers to respond to students' needs and future interests, and to support their learning by personalising the curriculum at classroom level.

When teachers have the opportunity to adapt the curriculum to be more student-centred, they need to exercise professional judgment, exploring their students' potential, setting boundaries, and providing guidance to achieve a "negotiated curriculum" that is conducive to coherent, productive and better learning. Implementing a new curriculum may require additional skills and knowledge to effectively meet students' needs. For example, students' interest in the use of technology in the classroom and greater access to the Internet and personal devices would need to be linked to purposeful learning activities, as well as shared awareness of what limits should be observed by teachers and students to minimise online risks for students and disruptive behaviours in the classroom (Burns and Gottschalk, 2019[82]).

Figure 9 **Percentage of students in schools where principals report student learning hindered "to some extent" or "a lot" by teachers not meeting the needs of individual students**



Note: *Data did not meet the PISA technical standards but were accepted as largely comparable.

Source: (OECD, 2019[112]), OECD, PISA 2018 Database, Table III.B1.7.1, http://dx.doi.org/10.1787/888934030971

StatLink https://doi.org/10.1787/888934240788

Extracurricular activities

The availability of extracurricular activities plays an important role in personalising curricula. These activities can enhance students' psychological and social well-being, and can improve student performance directly through tutoring and homework support, or indirectly, for example through drama clubs, science and mathematics competitions, and the like.

At the same time, academically oriented extracurricular activities may harm students' psychological and physical well-being when they are geared only towards test preparation, which some countries/jurisdictions report to be linked to curriculum overload (OECD, 2020[113]).

These activities can be publicly or privately funded, which plays into the question of access. Socio-economic background often determines students' access to extracurricular activities, which has equity implications. Students with other responsibilities at home may be precluded from participating in extracurricular activities outside of school.

Access to publicly funded activities could alleviate the financial burden for families linked to personalised curricula, and make participation more equitable. Countries/jurisdictions can also provide equal opportunities for more diverse options and ensure equity by providing relevant public support for certain targeted groups of students, such as low-income students or those who speak another language at home.

Countries/jurisdictions take many different approaches to manage the overlapping boundaries between curricular content and extracurricular activities (particularly those offered in schools). In **India**, for example, the national education policy (Ministry of Human Resource Development Government of India, 2020[114]) mandates no hard separation between curricular, co curricular, and extracurricular activities. The aim is that students be offered age-specific and interest-specific experiences in physical education, arts and crafts and vocational skills. The same applies to the content of different activities.

Access to extracurricular and out-of-school activities

Most countries/jurisdictions do not collect data on these activities. However, currently available data from E2030 PQC participating countries/jurisdictions (Table 7) offer some glimpses about the sources of funding for extracurricular activities, which have implications for equity. Across participating countries/jurisdictions, publicly funded in-school activities are most common (reported by 96% of countries/jurisdictions), followed by publicly funded out-of-school activities (75%). Privately funded in-school activities are least frequent (42%) while 58% of countries report privately funded out-of-school activities.

Types of extracurricular activities

Activities that go beyond traditional academic subjects can also support a personalised curriculum by proposing a wide range of learning experiences that attract students' interests.

According to E2030 PQC data, the activities most often proposed by countries/jurisdictions are music, arts and cultural activities/groups (47%), and sports activities/groups (47%) (Table 8). Fewer countries/jurisdictions propose STEM activities/groups (26%), solidarity and volunteering activities/groups, including with local communities (26%), language activities/groups (24%), and student assemblies and other student bodies (21%). Also, the formats of these activities vary across countries/jurisdictions:

- *Music, arts and cultural activities/groups*: Schools in the **Czech Republic** offer drama clubs, as well as music and artistic activities, such as ceramics and drawing. **Portugal** also mentions music, theatre, and journalism as activities offered by schools. In **Québec (Canada)** extracurricular activities respond to needs expressed by local communities, through offerings decided by governing boards composed of parents, school staff, students, and community representatives. They work with local partners such as museums to provide activities in and out of school. **Denmark** follows a similar approach that includes the surrounding community, where schools work with local organisations, including music and photo schools. **Turkey's** offerings include sightseeing trips to social and historical sites. **China** offers choir among other activities, and **Kazakhstan** offers multiple artistic competitions, such as classroom decoration, New Year's post cards, and drawing.
- *Sports activities/groups:* Sports clubs often centre on regional outdoor activities, such as surfing, bodyboarding and canoeing in **Portugal**. Countries/jurisdictions also cite competitions and championships in different athletic disciplines, such as school championships in volleyball, basketball, and gymnastics in **Kazakhstan**.
- *Student assemblies and other student bodies or student involvement in governing boards of schools/centres:* Some examples include projects such as the Democracy Education and School Assembly project in **Turkey**, where local student elections are framed in a national context. In **India**, school assemblies and student councils are nationally mandated.
- *Solidarity and volunteering activities and groups:* **Ireland** offers activities with community learning and development organisations. **Turkey** includes visits to science centres. **China, Costa Rica** and **Kazakhstan** propose science fairs. In **Costa Rica**, schools organise drug addiction prevention events under the DARE programme.
- *STEM activities/groups:* **Chile** proposes activities to stimulate mathematics learning. **Portugal** offers activities in scientific, technological and environmental areas. The **Russian Federation** provides more technology-heavy extracurricular activities, such as robotics, 3D modelling and prototyping.

- *Language activities/groups:* Schools in **Chile** often offer reinforcement training in languages, with the types of activities varying from school to school. **Kazakhstan** holds a languages day of the nations of Kazakhstan, and subject Olympiads, as well as thematic classroom hours dedicated to specific topics, including language activities.
- *Other local examples:* In **Hong Kong (China)**, the out-of-classroom learning opportunities strategy, also known as life-wide learning, is adopted in all schools to enable students to gain a variety of experiential learning (including the five essential learning experiences of intellectual development, physical and aesthetic development, moral and civic education, community service, and career-related experiences). Held outside the classroom, these aim to facilitate students' exploration of their interests and abilities, development of values and skills, and whole-person development. The strategy also promotes students' quality reflection on their learning experiences to enhance deep learning. To this end, the Education Bureau has stepped up its financial support, through the provision of a new and recurrent Life-wide Learning Grant since 2019, for all publicly-funded primary and secondary schools to organise more diversified life-wide learning activities for students. All students are entitled to publicly-funded life-wide learning activities in the five domains mentioned above, which include, among others, activities in sports, arts and community service.

Table 7 **Publicly and privately offered extracurricular activities**

		Publicly offered		Privately offered	
		In-school activities	Out-of-school activities	In-school activities	Out-of-school activities
OECD	Australia[2]	✓	✓	✓	✓
	Chile[2]	✓			
	Czech Republic[2]	✓	✓	✓	✓
	Denmark[3]	✓	✓		
	Estonia	✓	✓		✓
	Finland[3]	✓	✓	✓	✓
	Hungary[3]	✓			
	Japan	✓	✓		✓
	Korea	✓			
	Northern Ireland (UK)[1]	✓	✓	✓	✓
	Norway[2]	✓			
	Portugal[3]	✓	✓		
	Québec (Canada)[2]	✓	✓	✓	✓
	Sweden[2]		✓		✓
	Turkey	✓			
Partners	China (People's Republic of)	✓	✓		
	Hong Kong (China)[5]	✓	✓		
	Costa Rica	✓	✓	✓	✓
	India[1,2]	✓			
	Kazakhstan	✓	✓	✓	✓
	Russian Federation	✓	✓	✓	✓
	Singapore[4]	✓	✓	✓	✓
	South Africa	✓	✓		✓
	Viet Nam[2]	✓	✓	✓	✓

Notes: Based on available data from 24 countries/jurisdictions. Countries with missing or not applicable values in all categories of the table were not included in the analysis. They were included if data was available for at least one of the categories in the table and could be clearly coded as "yes" or "no". Data refer to extracurricular activities in which more than 50% of ISCED level 2 students participate, unless noted otherwise.

1. Responses for these countries/jurisdictions were submitted by independent researchers, not government officials.
2. Country/jurisdiction does not formally collect data on these activities.
3. Country/jurisdiction states that activities are offered, but less than 50% of ISCED level 2 students participate in them.
4. Co-curricular activities are compulsory at the secondary school level in Singapore, and all ISCED level 2 and 3 students participate.
5. Under the Hong Kong (China) school curriculum, all students are entitled to life-wide learning activities covering the five domains of "intellectual development", "physical and aesthetic development", "moral and civic education", "community service", and "career-related experiences".

Source: Data from E2030 PQC, item 0.5.

Table 8 **Common publicly offered extracurricular activities**

		Music, arts, and cultural activities and groups	Sports activities and groups	Student assemblies and other student bodies	Solidarity and volunteering activities and groups, including with local communities	STEM activities and groups	Language activities and groups
OECD	Australia[2,3]	✓	✓	✓	✓	✓	✓
	British Columbia (Canada)[2]						
	Chile[2]	✓	✓			✓	✓
	Czech Republic	✓	✓				
	Denmark	✓	✓				
	Estonia	✓	✓			✓	✓
	Finland						
	Hungary						
	Ireland						
	Japan[3]	✓	✓				
	Korea						
	Mexico						
	Netherlands						
	New Zealand						
	Northern Ireland (UK)[1]						
	Norway	✓	✓				
	Ontario (Canada)						
	Poland						
	Portugal	✓	✓		✓	✓	✓
	Québec (Canada)[2]	✓	✓	✓	✓		
	Sweden	✓	✓				
	Turkey	✓	✓	✓	✓	✓	
	United States[1,2]						
	Wales (United Kingdom)						
Partners	Argentina						
	Brazil[1]						
	China (People's Republic of)	✓	✓	✓	✓	✓	✓
	Hong Kong (China)	✓	✓		✓	✓	✓
	Costa Rica			✓	✓		
	India[1,2]			✓			
	Kazakhstan	✓	✓		✓	✓	✓
	Russian Federation	✓	✓	✓	✓	✓	✓
	Singapore						
	South Africa	✓	✓				

Notes: Based on available data from 34 countries/jurisdictions. Countries with missing or not applicable values in all categories of the table were not included in the analysis. They were included if data was available for at least one of the categories in the table and could be clearly coded as "yes" or "no". Data refer to extracurricular activities in which more than 50% of ISCED level 2 students participate.

1. Responses for these countries/ jurisdictions were submitted by independent researchers, not government officials.

2. Country/jurisdiction does not formally collect data on these activities.

3. Country/jurisdiction states that activities are offered, but less than 50% of ISCED level 2 students participate in them.

Source: Data from E2030 PQC, item 0.5.

Students' motivation, self-regulation, and metacognitive skills

A personalised curriculum has the potential to positively motivate students and raise their expectations about their own potential to excel in school and in life, which is particularly important among students from disadvantaged backgrounds (OECD, 2017[10]).

A case study in Australia suggests more motivation and positive attitudes toward school among students in a school where personalised learning was one of the strategies of reform (Prain et al., 2013[115]). The effects were also felt among teachers, who reported more co operation. In addition, students themselves report their desire to have autonomy and a say in decisions in their education (Simmons, Graham and Thomas, 2015[116]), suggesting that personalised approaches to learning are desired by students and could promote their well-being.

For all students to benefit from a personalised curriculum, they must be aware of it and ready to successfully adapt to such a model. Personalised learning should be intentional on the part of both teacher and student, and self-regulatory skills are important in being able to adapt (Duckworth et al., 2007[117]). Students need to have the self-regulatory skills and metacognitive ability to understand how they can appropriately adapt their learning to meet their needs (Eccles and Roeser, 2011[110]; Schunk and Zimmerman, 1994[118]).

As mentioned earlier, digital tools can offer seamless ways for students and teachers to adapt a personalised curriculum. Box 9 shows one example of an instructional platform that is well-suited for personalisation of learning.

Box 9 **Newsela – instructional content platform with integrated assessments**

Newsela brings together engaging, accessible content with integrated assessments and insights to supercharge reading engagement and learning in every subject. Though most powerful as a digital platform, Newsela can be used without devices or the Internet, instead relying on print options and offline access.

Newsela's instructional content platform solves the problem of reading engagement holistically for students, teachers and principals. It offers adaptive reads for every subject, combined with assessment tools such as quizzes, annotations, and writing prompts.

Learners can access dynamic, game-changing content from premier sources such as the Washington Post, Smithsonian and Biography.com, covering topics students care about. Every article comes in five reading levels, tailored to the skill level of each reader. As learners pick up new literacy skills, the language becomes more sophisticated.

Assessments are integrated directly into articles to help students engage with the content and to give teachers and principals actionable insights on students' activity and progress that can be used to improve learning outcomes. The platform's most important function is to enable teachers to assess students' abilities and adjust their instruction in real time.

As well as improving reading skills in general, Newsela aims to boost learners' media literacy. By pairing news consumption with reading comprehension practice, Newsela helps students to develop the higher-order critical thinking skills they need to vet information on their own.

Source: HundrED GLOBAL COLLECTION: 2021. Petrie, Christopher. Katija Aladin (2020). HundrED Research. https://hundred.org/en/research; Published Autumn 2020

Fixed vs. growth mindsets and educator bias

Growing evidence confirms the importance of students' own beliefs and attitudes about various educational outcomes. Their aspirations for the future, their beliefs about what they can achieve, how they explain their own academic success (or failure), their perception of how difficult certain subjects are, and their reaction to stigmatising treatment are just some of the factors that can determine levels of engagement, persistence, resilience and performance among learners (OECD, 2017[10]; Blatchford, 1997[119]), citing (Brown, Brown and Bibby, 2008[120]; Köğce et al., 2009[121]; McLeod, 1992[122]).

For example, a study in the United Kingdom examined teaching practices in response to students' diversity. The authors maintain that teachers who rejected ideas of fixed ability sought to "enhance the capacity of each child in their class to learn, and to create the conditions in which their learning can flourish more fully and effectively" (Ainscow and Miles, 2008[123]; Hart, 2004[124]; Kuhl, 2019[125]) .

The subtle, but potentially harmful impact of biased and fixed views of students' abilities and prospects can be deliberately acknowledged in the curriculum as a way to steer a practice that is more compatible with the offer of equitable personalised curricula. A quality curriculum should thus be one that moves from deficit approaches to teaching to asset approaches; from strict judgments about academic performance to a stronger commitment to whole-child development; from a culture of degrees and qualifications to aspirations for lifelong learning.

Teacher readiness and competencies to personalise curricula

The value of a personalised curriculum that promotes equity in learning opportunities and experiences can be undermined if it is not accompanied by corresponding changes in teacher education and professional development. Teachers' readiness and ability to adapt the curriculum to target the needs of individual students or specific subgroups of students depends to a great extent on the kinds of pre-service and in-service education they receive (Carter, 2016[126]; Klingner, 2016[127]; Paine, Aydarova and Syahril, 2017[128]; Paniagua, 2018[129]; Paniagua, 2018[130]; Guerriero, 2017[131]) .

Some practices are not innovations in and of themselves, but their use can be put at the service of personalised learning and teaching, and be recognised in teacher preparation, as well as in professional development:

- **Scaffolding (including UDL)**: Scaffolding is a process of providing learners with the tools to learn, and to do so just beyond what they currently know. It seeks to provide the tools to enable students to learn effectively, rather than to put the onus exclusively on the student (Vygotsky, 1987[132]).
- **Peer learning**: Students can learn from interactions with peers, group work and peer feedback. Students who are shy or wary of authority figures like teachers can benefit from opportunities to learn from their peers, rather than always relying on teachers' expertise (Mazur, 1997[133]; Bandura, 1971[134]).
- **Adaptive teaching and learning**: Adaptive teaching and learning refers to the use of alternative instructional strategies and resources to meet the learning needs of individual students (Wang, 1980[135]). This requires teachers' understanding of individual students' varying interests, skills and performance level in order to select activities, materials and strategies to match those specific needs. The advantages of adaptive teaching and learning have been widely recognised especially for supporting instruction in the same classroom to a diverse group of students (Parsons et al., 2011[136]; Parsons et al., 2010[137]).
- **The use of ICT in teaching and learning**: ICT can provide additional tools and techniques to facilitate learning. It also can provide a platform for students to interact with their teacher and with learning materials more effectively and fluently in real time (van Dijk, 2005[138]; Kale, 2018[139]; Soomro, 2017[140]).

Personalised curricula that support vulnerable students in particular

For students at risk, a personalised curriculum can be the difference between meaningful, enriching learning experiences and demotivating, disengaging experiences that lead to low performance and increased learning gaps. The specific profile of a student determines the shape and form of a personalised curriculum, but a lot can be done at the design stage to offer a quality curriculum to every learner and help all reach their full potential. This may entail: 1) using assisted technology to help students with disabilities become more independent learners; 2) providing frequent and early screening to identify students' capabilities and needs; 3) offering the curriculum in the language of the learners (including sign language); 4) valuing the social and cultural background of students in school; 5) including positive images of diversity in the curriculum (gender, social, cultural and racial); and 6) addressing overt and hidden teacher biases that can stigmatise students and hinder learning.

Students with special needs

A personalised curriculum can support students with special physical, cognitive or learning needs. Teachers must understand these needs and design and adapt the curriculum accordingly, believing in the potential in every student.

Singapore adapts curricula to special populations. It conducts an early screening of students' learning needs for either low-performing students or those with specific needs. Incorporating such approaches in curriculum design increases the chances for a systematic assessment of students' needs, rather than relying uniquely on teachers'

judgments on who deserves such levels of curriculum adaptation. One way to respond to students who might lag behind is through Learning Support for Math, a programme implemented by schools for students who do not have the basic numeracy skills and knowledge needed to follow the mathematics curriculum (OECD, 2017[10]). This programme represents an early effort in curricular intervention aimed at supporting such students. Students benefitting from this programme are identified through a screening process at the beginning of Primary 1. As part of small groups, students continue attending mathematics lessons within regular curriculum time, while at the same time receiving additional support to help them develop the knowledge and skills needed for regular classes. For example, games and multi-sensory activities are conducted frequently during lessons to make learning engaging for them. Such initiatives may lead to decreasing gaps between low and high-performing students.

Some countries/jurisdictions experience challenges, such as stigmatisation associated with special needs education or getting buy-in from the general public for targeted interventions. It is important that personalisation not be interpreted as special support for a certain group of students. It should be understood as individualised support for any student in need of such assistance. In **Finland**, support measures in the form of special-needs provision have been found to reduce the stigma associated with special-needs education and have instead promoted inclusion (Halinen and Järvinen, 2008[141]). This complementary support is provided in regular classroom settings and offered to all who need it across learning areas, such as those with difficulties in speech, reading, writing and mathematics, including for the most talented students (Halinen and Järvinen, 2008[141]).

Linguistic and cultural diversity

Acknowledging the importance of students' cultural and personal identity in curriculum design sends a clear message to learners about the importance of adapting learning experiences in a way that capitalises on the richness of their unique cultural background and traditions, rather than neglecting them. The deliberate effort to translate the curriculum into various languages is an example that brings the curriculum closer to the realities and contexts of students, facilitating further personalisation.

Curriculum and curriculum guidelines may appear in several different languages, as shown in Table 9, which reports data from E2030 PQC participating countries/jurisdictions. This may vary by level of education, and not all languages are necessarily official languages of the country/jurisdiction.

The number of languages in which the curriculum is available ranges from one language in **Australia, Chile,** the **Czech Republic, Denmark, Korea, Lithuania, Mexico,** the **Netherlands, Poland, Turkey,** the **United States, Argentina, Brazil, China,** the **Russian Federation** and **Viet Nam** to 11 in **South Africa**, 12 in **Hungary**, and 22 in **India**.

In New Zealand, for example, the national curriculum is composed of the New Zealand Curriculum and *Te Marautanga o Aotearoa*, the curriculum specifically designed to serve the Maori community. The curriculum also acknowledges New Zealand Sign Language as one of the country's official languages and sets guidelines for schools that chose to provide teaching in those languages[16].

There is limited research examining this topic, but studies suggest benefits for students learning in their native language. For example, students in Tanzania and South Africa who have to learn in English rather than their native language do not perform as well (Brock-Utne, 2007[142]).

Socio-economic considerations

Gaps in achievement by socio-economic status vary across countries/jurisdictions, but they are a common phenomenon of education systems worldwide (OECD, 2012[100]). Explanations range from school quality and parental support, to equitable investments, and others (Brooks-Gunn and Duncan, 1997[143]; Duncan, Magnuson and Votruba-Drzal, 2017[144]).

Personalised learning approaches can address differences in school readiness, achievement, and well-being. For example, early childhood education programmes offering a range of holistic services aimed at low-income families can help improve school readiness (U.S. Department of Health and Human Services, Administration for Children and Families, 2010[145]). Indeed, learning begets learning, and early skill achievement translates into later skills, and educational, civic and employment outcomes (Heckman, 2011[146]; OECD, 2012[100]). In addition, providing additional resources, either financial or human, can enable more personalised attention to learning to boost the skills of children from low socio-economic backgrounds.

Table 9[1/2] **Languages in which the curriculum or curriculum guidelines are available**

		No. of languages	Languages in which curriculum or curriculum guidelines are available
OECD	**Australia**	1	English
	British Columbia (Canada)	2	English and French
	Chile	1	Spanish Schools can include subjects or programmes in Indigenous languages
	Czech Republic	1	Czech
	Denmark	1	Danish
	Estonia[2]	3	Estonian, Russian and English
	Finland[2]	3	Finnish, Swedish and Sami
	Hungary[2]	12	Hungarian, German, Croatian, Slovak, Serbian, Greek, Bulgarian, Roma, Boyash, Ruthenian, Romanian and Slovenian
	Ireland	2	Irish and English
	Japan[2]	2	Japanese; Not all subjects: English
	Korea	1	Korean
	Lithuania	1	Lithuanian
	Mexico	1	Spanish
	Netherlands	1	Dutch
	New Zealand[2]	2	English and Te Reo Maori Some materials are provided in other languages (i.e. Language learning guidelines provided for Samoan, Tokelauan, Cook Islands Maori, Tongan, and Niuean)
	Northern Ireland (United Kingdom)[1]	2	English and Irish
	Norway[2]	8	Bokmål, Nynorsk, Sami, English, French, German, Chinese and Russian
	Ontario (Canada)	2	English and French Supporting curriculum resources, such as parent fact guides which explain what is included in the curriculum, are available in 24 languages (Arabic, Bengali, Chinese, Cree, Farsi, Gujarati, Hindi, Korean, Kanien'kéha, Nepali, Ojibwe – Syllabic, Ojicree – Syllabic, Pastho, Polish, Portuguese, Punjabi, Romanian, Russian, Somali, Spanish, Tagalog, Tamil, Urdu, and Vietnamese)
	Poland	1	Polish
	Portugal[2]	2	Portuguese and Portuguese sign language School projects for primary education may offer a curriculum simultaneously in English and Portuguese. A minority language curriculum is being planned for Miranda do Douro in Mirandês.
	Québec (Canada)[2]	5	French and English plus pre-primary to lower secondary education in three Indigenous languages: Cree, Inuktitut and Naskapi
	Scotland (UK)[2]	3	English, Gaelic and Scots language
	Sweden[2]	2	Swedish and English
	Turkey	1	Turkish Minority schools' curricula are also published in their own language.
	United States[1]	1	English Some states and school districts propose instruction in Spanish to support learning.

Notes: Based on available data from 36 countries/jurisdictions. Countries with missing or not applicable values were not included in the analysis. The languages listed here include official and non-official languages. Foreign languages taught as part of the curriculum are not included.

1. Responses for these countries/ jurisdictions were submitted by independent researchers, not government officials.

2. The curriculum is translated into both official and non-official languages.

3. The curriculum for indigenous students includes subjects to ensure the teaching of indigenous languages and cultures: Ngäbere language, Boruca language, Bribri language of Buenos Aires, Bribri language of Sulá, Cabécar language of Buenos Aires, Cabécar language of Chirripó, Cabécar language of Sulá, Maleku language, Terraba language, Chorotega culture, Huetar culture, Ngäbe culture, Terraba culture. Boruca language is being revitalised and the Terraba language is in process of being saved from extinction.

Source: Data from E2030 PQC, item 0.7.

Table 9[2/2] **Languages in which the curriculum or curriculum guidelines are available**

		No. of languages	Languages in which curriculum or curriculum guidelines are available
Partners	**Argentina**	1	Spanish
	Brazil[1]	1	Portuguese
	China (People's Republic of)	1	Chinese
	Hong Kong (China)	2	Chinese and English Key information on the education system is produced in other languages (Bahasa Indonsia, Hindi, Nepali, Tagalog, Thai and Urdu) covering areas such as admission to or orientation in different levels of education.
	Costa Rica[3]	1	Spanish
	India[1]	22	Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmir, Konkani, Malyalam, Manipuri, Marathi, Nepali, Oriya, Punjabi, Sanskrit, Sindhi, Tamil, Telugu, Urdu, Bodo, Santhali, Maithali and Dogri
	Kazakhstan[2]	2	Kazakh and Russian Subject programmes are translated into Uzbek, Uyghur or Tajik languages in schools having these as languages of instruction.
	Russian Federation	1	Russian
	Singapore	4	English, Chinese, Malay and Tamil
	South Africa	11	Afrikaans; English; pre-primary: Ndebele; Northern Sotho; Sotho; Swazi; Tswana; Tsonga; Venda, Xhosa; Zulu; From lower primary to secondary curriculum documents are only available in English and Afrikaans for content subjects. Languages curriculum documents are available in all 11 official languages and South African Sign Language
	Viet Nam	1	Vietnamese

Notes: Based on available data from 36 countries/jurisdictions. Countries with missing or not applicable values were not included in the analysis. The languages listed here include official and non-official languages. Foreign languages taught as part of the curriculum are not included.

1. Responses for these countries/ jurisdictions were submitted by independent researchers, not government officials.

2. The curriculum is translated into both official and non-official languages.

3. The curriculum for indigenous students includes subjects to ensure the teaching of indigenous languages and cultures: Ngäbere language, Boruca language, Bribri language of Buenos Aires, Bribri language of Sulá, Cabécar language of Buenos Aires, Cabécar language of Chirripó, Cabécar language of Sulá, Maleku language, Terraba language, Chorotega culture, Huetar culture, Ngäbe culture, Terraba culture. Boruca language is being revitalised and the Terraba language is in process of being saved from extinction.

Source: Data from E2030 PQC, item 0.7.

Approaches to personalised curricula have limited research support, but there is some indication that personalised approaches to mathematics curricula help low socio-economic students in particular. Research in Australia suggests that personalised approaches to the mathematics can help students' performance in mathematics, suggesting the potential for personalised curricula to help more broadly (Prain et al., 2013[115]).

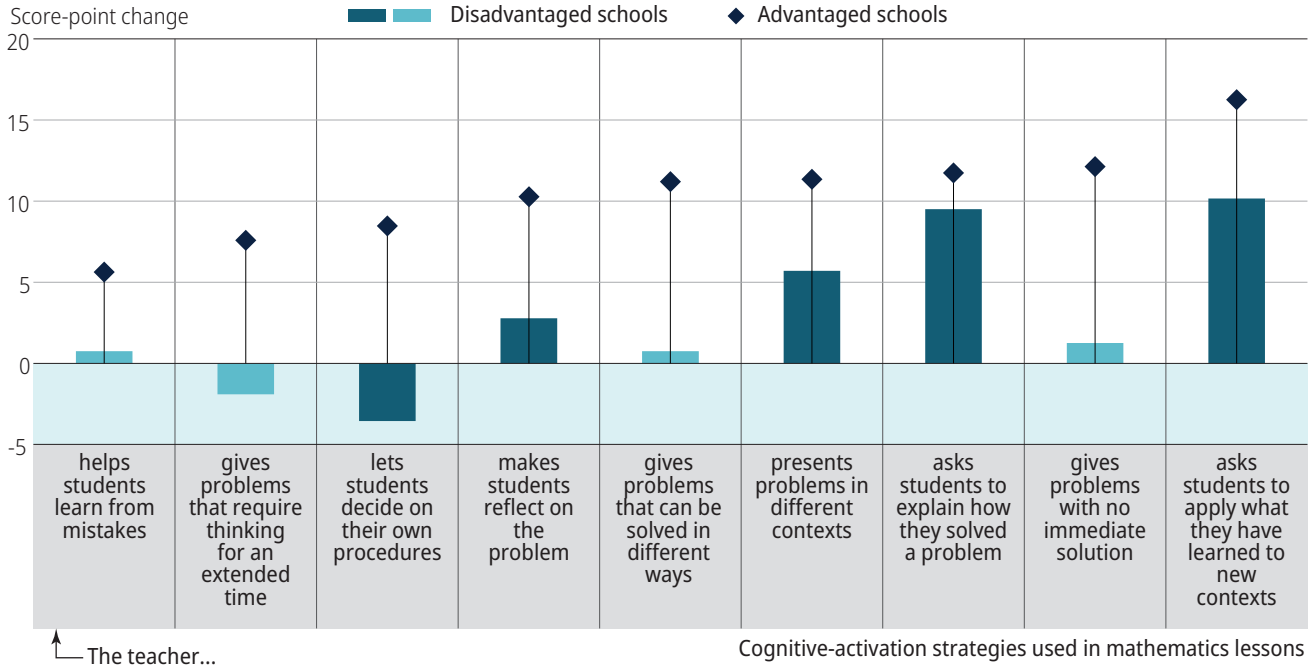
That being said, caution is in order. There is no reason to believe that all types of personalised approach will benefit all students equitably. Curriculum designers recognise, for instance, that students who choose their areas of study based on their interests, and play an active role in designing their own learning path are likely to have increased motivation and better development of metacognitive skills, such as learning to learn (Vansteenkiste, Lens and Deci, 2006[147]).

PISA data (OECD, 2013[148]) suggest that the performance of disadvantaged students in mathematics is negatively affected by certain pedagogical approaches, such as teachers letting students decide their own procedures or give problems that require thinking for an extended time (Figure 10).

Other approaches, such as asking students to explain how to solve a problem or giving problems that can be solved in different ways, are found to have a more positive effect on both socio-economically advantaged and disadvantaged students. This implies that a personalised curriculum must be carefully designed and implemented, with planned teaching strategies to ensure that all student groups can benefit from it.

Figure 10 **Mathematics teaching strategies and student performance in mathematics, by socio-economic status**

Change in mathematics score associated with mathematics teachers' use of cognitive-activation strategies (OECD average)



Note: Disadvantaged (advantaged) schools are those schools whose mean PISA index of economic, social and cultural status (ESCS) is statistically lower (higher) than the mean index across all schools in the country/economy. Statistically significant values for disadvantaged schools are marked in a darker tone. All values for advantaged schools are statistically significant.

Source: (OECD, 2013[148]), PISA 2012 Database, Table 2.25b, http://dx.doi.org/10.1787/888933377210.

The role of gender

A substantial body of literature addresses how gender disparities in students' achievement and aspirations for the future (including further education and career choice) link to biased gender stereotypes found in teaching and learning experiences (OECD, 2015[149]; UNESCO, 2019[25]; OECD, 2015[150]; Borgonovi, Ferrara and Maghnouj, 2018[151]). In many countries, while women with university degrees outnumber men, they lag in STEM degrees (UNESCO, 2019[25]). On average, there are almost four times as many boys as girls who expect to be employed in engineering and computing in OECD countries, and close to three times as many boys as girls in partner countries and economies (OECD, 2015[149]). Teacher and student bias may contribute to these trends.

A study in Australia from 2008 to 2014 examined how gender bias or stereotypes in curricular practices could be behind the low participation of females in three elective subjects (technology studies, engineering technology and information processing, and technology [upper-secondary]). Lack of support, or gender-biased views from teachers and school counsellors on the potential for female success in STEM fields can be linked to low female participation in these subjects. The authors recommend curricular approaches that increase the exposure of female students to STEM subjects in basic education, to support their choice of these subjects in upper-secondary school (Everitt and Pianca, 2015[152]).

Other examples of gender bias were identified in physical education. Lower participation of girls in moderate and vigorous physical activity during physical education classes at school were linked to a curriculum that favours male-oriented sports in some countries and a shortage of female teachers in this field (OECD, 2019[3]).

Appropriate personalisation of curricula might, therefore, be shaped and determined by biased beliefs among teachers and other staff.

Eliminating educator bias about students' ability and potential

A prerequisite for teachers to adequately cater to learners' diversity relates to the types of beliefs, attitudes and expectations that underlie their practice. Teachers with deterministic or fixed beliefs about students' learning

ability or associated gender stereotypes are known to limit students' learning, especially those from vulnerable populations, such as low-performing students, those from disadvantaged backgrounds, or those from indigenous, ethnic or linguistic minorities, as well as immigrant students (Ainscow and Miles, 2008[123]; Schleicher, 2018[153]; OECD, 2017[10]; UNESCO, 2019[25]).

Making explicit references to the types of beliefs and expectations that foster equity in the provision of personalised curriculum, rather than offering additional advantages to high-performing students, can help teachers and school leaders reflect collectively on the belief system behind their practices and the potential consequences for different types of students. Bartolome (1994[154]), cited in (Ainscow and Miles, 2008[123]), argues that "even the most pedagogically advanced methods are likely to be ineffective in the hands of those who implicitly or explicitly subscribe to a belief system that regards some students, at best, as disadvantaged and in need of fixing or, worse, as deficient and therefore beyond fixing".

3. CROSS-CURRICULAR CONTENT AND COMPETENCY-BASED CURRICULUM

Cross-curricular content and competency-based curriculum that work for all students

Curricula based on cross-curricular content and competencies have the potential to make learning more meaningful. Students make explicit connections between knowledge that cuts across subjects, and see how particular competencies can be developed and applied to various learning areas. A cross-curricular content and competency-based approach to curriculum design can support deeper understanding to improve the quality of learning for all students. It supports some of the twelve OECD Future of Education and Skills 2030 Design Principles, such as "Interdisciplinary", "Transferability" and "Authenticity" (See OECD (2020[44])).

One popular interdisciplinary approach to the curriculum is enquiry-based learning. However, studies on the effectiveness of such practices usually look at the performance of students in a single learning area, such as science, where it is practiced most often. So it is difficult to know to what extent these practices help with other types of outcomes. For example, do they help students make connections between different learning areas, and between what they learn in school and the real world? And do they help students improve as self-directed learners?

Another interdisciplinary approach includes explicit instruction, which has been reported as useful in helping students develop critical thinking. Whatever the strategy, it is essential that teachers be prepared for these more holistic approaches to learning. Perfecting the art of teaching in this way will take time, expertise, and effort towards continuous improvement.

Enquiry-based curricula

Several studies document the efficacy of integrative and enquiry-based curriculum. The Science Writing Curriculum (Hand, Therrien and Shelley, 2013[155]; Hand et al., 2018[156]) showed improved critical thinking skills, through improved science test scores. Carroll (1997[157]) demonstrated the positive effect among low-income students of an innovative elementary math curriculum that emphasised exploring mathematics in real-life settings and sharing solutions to mathematical problems.

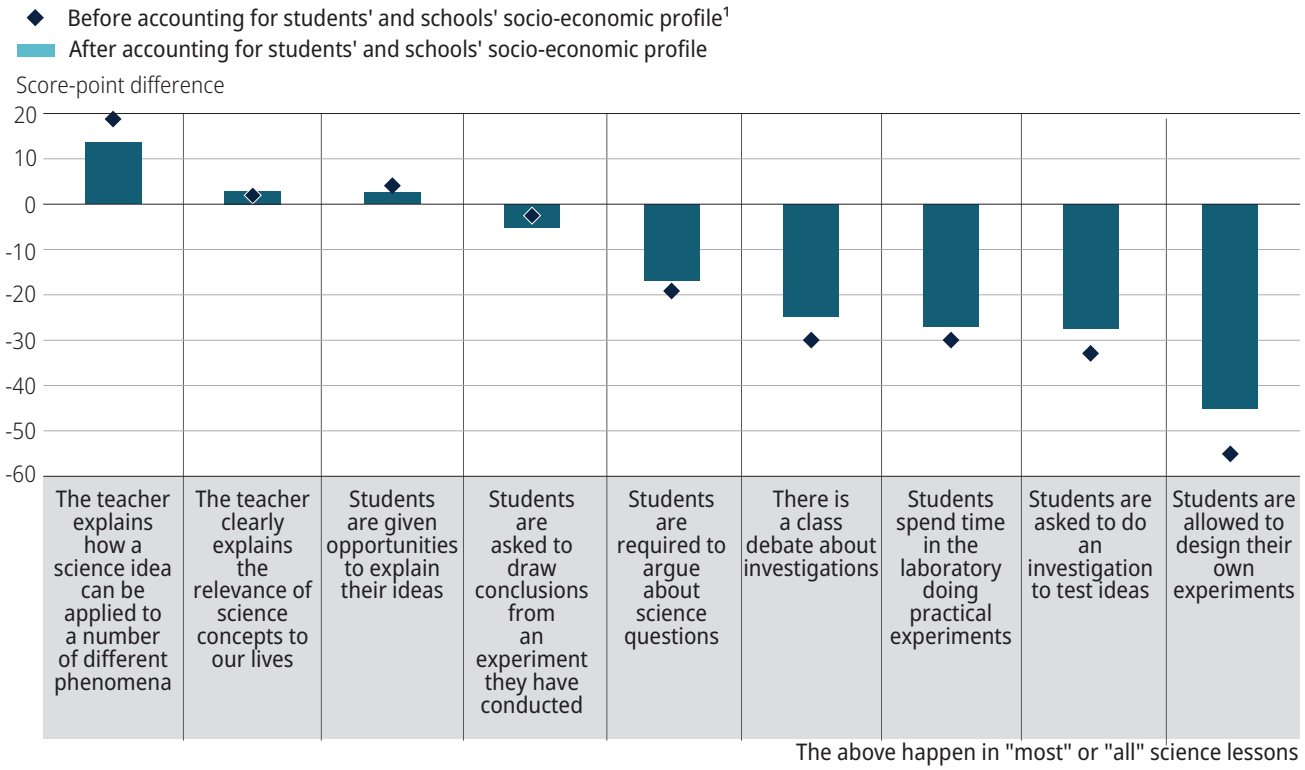
These types of curriculum can contribute to equity because they empower students by offering more engaging, practical, and demanding learning experiences for all students (Thadani et al., 2010[158]), and they integrate literacy into science teaching (Tong et al., 2014[159]; Hand et al., 2018[156]). But they also require teachers to be prepared to lead such enquiry-based practices, which can vary considerably from one setting to another.

Interestingly, PISA data on science performance across countries has not shown positive associations with an enquiry-based approach to learning science (OECD, 2016[160]). Figure 11 shows that a number of practices typically associated with enquiry-based teaching and learning are actually negatively associated with science performance among 15 year old students. PISA data reveals, however, that students who are more frequently exposed to such practices hold stronger epistemic beliefs about science, and are more likely to work in a science-related occupation when they are 30 than students less frequently exposed to such practices.

Not enough elements are available for a more granular analysis of what may explain such international results, but variation across schools and teachers in what they consider enquiry-based learning and how it is implemented could make it difficult to identify consistent results.

Figure 11 **Enquiry-based teaching practices and science performance**

Results based on students' reports, OECD average



Note: All differences are statistically significant.

1. The socio-economic profile is measured by the PISA index of economic, social and cultural status.

Source: (OECD, 2016[160]), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, http://dx.doi.org/10.1787/888933435628.

Explicit instruction in competencies

A recent meta-analysis showed that explicitly teaching generic competencies is the most effective instruction strategy for teaching critical thinking skills (Abrami et al., 2015[161]).

Pedagogy and the role of teachers are essential to achieve equity in integrated science curricula, especially in determining which approach will work best with all types of students. Therrien et al (2017[162]) found that explicit instruction rather than discovery learning is a feasible option in science enquiry curricula that is beneficial for all students, particularly those with learning disabilities.

Teacher confidence, experience, and support

Teachers' experience is also important for how integrative curriculum is taught. Lie et al (2019[163]) found a positive correlation between student attitudes towards STEM subjects and the experience teachers have with such a curriculum. They suggest that professional development can help teachers gain confidence and reduce their anxiety, leading to an improved learning environment for all students. Thadani et al (2010[158]) emphasised the importance of support for teachers in the form of curricular materials and professional development on implementing enquiry curricula in STEM subjects. Such curricula aim to contribute to equity, but there are often major conflicts with the normal routines of many teachers. A concerted effort to train and support teachers may be needed for cross-curricular content and competency-based curriculum to be successful.

Cross-curricular content and competency-based curriculum that support vulnerable students in particular

Connecting content across the curriculum is considered an effective approach to support students from disadvantaged backgrounds or those with special needs. It can give authenticity and purpose to their learning, and thus enhance their motivation. But the research is limited and mixed. In particular, it may be unrealistic to consider that it is possible to close any sort of achievement gaps between low- and high-income students through cross-curricular content and competency-based curriculum, as the theory would not explicitly point to an advantage for low-income students.

Integrated approaches

Favourable associations have been found in some programmes for at-risk students. For example, science enquiry curricula that emphasised argumentation (Hand, Therrien and Shelley, 2013[155]; Hand et al., 2018[156]), integration with literacy (Tong et al., 2014[159]) and knowledge construction (Thadani et al., 2010[158]) showed positive effects on student learning among low-income and minority groups. However, not all studies support the efficacy of such approaches.

Minding gaps: STEM curricula

A recent study on the impact of a STEM curriculum for elementary and middle school students based on engineering design found achievement gaps for black students (middle-school level only), for students with English as a foreign language (elementary level only) and for special education students. Attitudinal differences were found for girls, but not for the other sub-groups (Lie, Selcen Guzey and Moore, 2019[163]). In short, a curriculum alone may not be able to close achievement gaps.

However, as a tool to prepare students for civic life, health and the workforce, cross-curricular content and competency-based curriculum may be a good approach for all. A forward-thinking curriculum that connects relevant and pressing themes may indeed better prepare all students for success, especially in a rapidly changing world.

4. FLEXIBLE CURRICULA

Flexible curricula that work for all students

The research on a flexible curricula is limited, and the results available on various forms of flexibility are mixed. For example, flexibility in content may inadvertently have negative effects on students' performance and can even lead to increased equity gaps between groups of students. Therefore, it is important that flexible curriculum be discussed in the context of curriculum autonomy, where local entities are empowered to make informed decisions, based on the realities of the students.

What seems to matter most is not simply the adoption of flexibility but how it is used.

When positive effects are found, they tend to be in combination with adaptive instruction and enriched activities that give students targeted opportunities for building upon where they are. It supports some of the twelve OECD Future of Education and Skills 2030 Design Principles, such as "Choice", "Student agency" and "Teacher agency" (See OECD (2020[44])).

Using flexibility in assessment, and in the time and place of learning are sensible ways to give students better conditions for learning, and for showing what they know and what they can do. The use of flexible curricula has been reported to be more frequent when curriculum reform explicitly encourages an inclusive approach to instruction (Volman and Stikkelman, 2016[88]).

Box 10 illustrates how a particular student in France benefited from a change from a rigid to a more flexible curriculum.

Flexibility in content

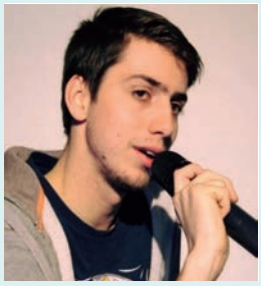
(Cornelisz and van Halem, 2016[164]) report that offering flexibility in content may lead to undesirable differences between schools, resulting in increased gaps between students from affluent backgrounds and students from impoverished backgrounds. For example, schools with more resources may be able to better support the training or other tools needed to implement the curriculum flexibly.

Flexibility in pedagogy

Most research has been conducted on differentiation practices, a form of flexibility in pedagogy. A recent systematic review (Deunk et al., 2015[165]) on this theme in primary education showed that:

- Streaming or tracking students in homogeneous classrooms has a small negative effect, in particular for students with average abilities;
- Homogeneous grouping according to ability within classrooms has overall zero to small effects, but a slight positive effect on students with higher abilities compared to students with lower abilities;
- School reform programmes with an emphasis on differentiation, such as Success for All (Borman et al., 2007[166]), show small to medium effects sizes for all students.

Box 10 **Student voice: Equity through flexible curriculum**



At the Education 2030 project's Informal Working Group meeting held in Paris, France in October 2018, meeting participants discussed the issue of ensuring equity through curriculum innovations. Speaking on behalf of students was **Maxime**, a university student in France and an Ashoka Young Changemaker. He shared his own personal story about why he dropped out of secondary school, explaining that he was actually a lover of knowledge but that the school environment had been a frustrating place for him. Maxime felt that his profile did not seem to fit into the institution, as teachers always tried to "fit him into boxes".

While Maxime found it easy to learn things and gain knowledge, he struggled with reading and writing, and was diagnosed with dyspraxia, also known as developmental co-ordination disorder. In addition to finding it difficult to read and write, Maxime also holds his hand in the wrong position when writing, so the task is actually painful to perform.

His disability made it difficult for him to be in class. Teachers had trouble seeing his potential, and even though Maxime knew he had the capacity to learn, he found himself failing in school over and over again. His mother fought to have his disability recognised by schools with little success. He developed behavioural issues that were disruptive and difficult for teachers to manage, which resulted in Maxime being kicked out of several schools.

In France, the Ministry of National Education, Youth and Sports has an initiative called projet d'accueil individualisé (PAI) (personalised care project), which defines adaptations made to the schooling of students with health problems, e.g. diet, schedule adjustments, exemptions from certain activities and substitution activities. Maxime said his mother went through a complicated process to obtain a PAI for him. Adaptations to his schooling included allowing him to use a computer to type instead of writing with a paper and pencil, and he had someone dedicated to helping him throughout the school day. However, even with his PAI, schooling remained difficult for him.

Teachers and schools were not prepared to work with Maxime. Repeatedly, they recommended he attend a specialised school or encouraged him to do an internship in place of classes. Teachers said negative things about him, and some seemed afraid of him and his case. He grew tired of dealing with the struggles of his learning disability and could not keep going to school.

He dropped out and did nothing for a year after leaving school. He was depressed. His mother encouraged him to get back into society and do something with his life. His greatest source of inspiration was a friend who excelled at school. Maxime spent a lot of time talking with him – deep, philosophical conversations about life and learning. His friend told him he could be really good at school too and encouraged him to try going back.

Maxime contacted the Ministry of National Education to inquire about opportunities for a student like himself. He learnt of a new and innovative high school for students who had dropped out of school, and he enrolled. This school and the teachers that worked there opened Maxime's eyes to new ways of learning and a world of opportunity in which he could realise his potential.

The main goal of the school is to help students obtain their French baccalauréat (high school diploma), and the school has flexibility to work with students to help them reach that goal. The programme is only two years as opposed to the traditional three years of lycée (high school); the weight of the curriculum is reduced to focus on the most important elements students need to learn to obtain their diploma; classes are small with 9 to 12 students per teacher; and teachers use innovative pedagogies to engage students, e.g. blended learning through flipped classrooms.

Most importantly, teachers worked as a team and spent time talking about individual students, attuned to their needs and sensitive to their personal struggles. School did not become easy for Maxime – writing a sentence remained difficult for him – but teachers were empathetic and supportive. They worked closely with Maxime, and he was not only engaged in his learning experience but he was engaged in school life as well, taking on the role of head of his school's youth council. He graduated in 2017 and went on to attend university.

Maxime believes curriculum should be something malleable for the teacher and students, as rigidity in the education system does not allow the students to fulfil their potential. Schools and teachers need to listen to student's challenges and help them find their path to success. He concluded with a powerful analogy: instead of education being like a running race in which everyone starts equal, we need a run in which everyone can cross the finish line.

Source: The OECD Future of Education and Skills 2030, Focus Group 3 (Students). Maxime Zwartjes (Student)

Effects are larger when homogeneous grouping is embedded in environments that include adapted instruction and monitoring student progress. In addition, differentiation in the form of adapted instruction combined with enrichment activities resulted in positive effects on reading, but not on motivation to read (Volman and Stikkelman, 2016[86]).

Flexibility in assessment

Flexibility in assessment refers to what and how skills and knowledge are assessed. From an equity perspective, this could mean flexibility in how students are assessed differently based on their different backgrounds to bring out the full potential of each student. Adaptations are frequent, for example, when assessing the learning of students with special needs. As discussed earlier, providing various means for students to demonstrate what they know is one of the key principles of UDL.

Assessment must be thought about holistically, with the community and context in mind. Some approaches are likely to be more beneficial than others for all types of students. For example, formative assessment may be less stressful and can be better adapted for all types of students than high-stakes tests (Hayward and Spencer, 2012[167]).

Flexibility in time and place of learning

Flexibility in where and when students can learn also helps students of different backgrounds and with different needs. The use of a digital curriculum has the potential to seemingly expand such flexibility, particularly through some form of blended curriculum, which allows students to continue learning outside of school (Jonker, März and Voogt, 2020[61]). A digital curriculum is not, however, the only way in which the place(s) for learning and the timing reserved for learning can be made more flexible.

For example, a high school in the United States lets students start school at 3:00 pm to enable them to work, take care of family needs, or because of their sleep schedule (Lavery, 2020[168]). Students from disadvantaged backgrounds in particular may benefit from alternative schedules, as they may need to support their family's needs. Such flexibility could help students who are 'young carers' who help care for a family member who is disabled, physically or mentally ill, has a long term serious illness, including aging parents or grandparents.

Similarly, service learning (David, 2009[169]), apprenticeship programmes and work-based learning (OECD, 2018[170]), outdoor learning and learning in nature, e.g. by using community facilities for swimming, ice skating and climbing (OECD, 2019[3]) are some other ways in which learning takes place outside of the traditional boundaries of the school walls. They can be positive options for inclusion and engagement of all students in various forms of learning by supporting team work and social responsibility, school-to-work transitions and well-being. Such options can also help students of all backgrounds to connect their learning to their cultural and social context and to experience authentic learning. Diversifying the modes of representation of content (e.g. by presenting them in 'real life' settings) is one of the UDL principles: it removes barriers to learning by allowing learners a range of possibilities for engaging with learning.

Flexible curriculum that supports vulnerable students in particular

Some studies show that a flexible curriculum can be beneficial for both specific groups of students (e.g. gifted students) and for all students (Rao and Meo, 2016[171]). Apprenticeship and work-based programmes, for example, can be particularly helpful to youth at risk (e.g. school drop-out and/or unemployment) who may lack basic literacy and numeracy skills, soft skills or even relevant networks or role models to support them into a smooth school-work transition (OECD, 2018[170]).

When coupled with a digital curriculum added flexibility in where and when to learn can also benefit other groups of students, such as those who need to learn from home, hospitals, rural or remote areas or from refugee camps (See Box 7).

Flexible and inclusive approaches for teaching students with disabilities have also been successful, as perceived by teachers in Finland (Lakkala, Uusiautti and Määttä, 2016[172]). When curriculum reforms in Finland encouraged inclusive methods of instruction, teachers described more differentiated and flexible practices. However, it is unclear how this translated to student performance, and overall research on the impact of a flexible curriculum on specific groups of students is scarce and fragmented.

WHAT REMAINS UNKNOWN

The conceptualisation of digital, personalised, cross-curricular content and competency-based curriculum, and flexible curriculum innovations discussed in this report is still new and often disputed. As a consequence, research on the implications for how they can be leveraged to close equity gaps rather than enlarge them remains limited, often exploratory and fragmented. This review suggests the following areas for further study:

- **Factors contributing to impact**: More granular analysis of student competencies is required to ensure impact of curriculum innovations on student learning and other outcomes, including fairness, inclusiveness, and well-being. In particular, self-regulation is an important competency in curricula that assume some kind of student control over their learning (e.g. personalised curriculum, digital curriculum and flexible curriculum). Research needs to understand interventions that help increase self-regulatory skills, particularly among students at risk. More granular analysis of teacher competencies is also required to ensure impact on student learning and other outcomes. As with research on the impact of curriculum innovations and equity with students, little is known about prerequisites for teachers.
- **Implications for teaching preparation and professional learning**: As a curriculum is often designed with a majority of students (or a normative profile of students) in mind, it may be difficult for teachers to see opportunities in the curriculum to ensure equity in learning. Redesigning curricula to be dynamic and inclusive of all types of learners requires structural changes, including changes in the mindset of practitioners, policy makers and entire communities. Teachers may also need explicit support on how to embrace such innovations while ensuring that they are inclusive of diverse groups of students and individual students' needs.
- **Efficacy of digital innovations to promote equity**: In general, the research on the efficacy of digital curricular innovations is thin. The knowledge base for the efficacy of digital curricular innovations among specific groups, such as low-income, language-minority, or SEN students, is even spottier and less clear. Innovations focused on student well-being and not just achievement are particularly needed. The consequences of implementing diverse technologies (e.g. learning analytics, digital textbooks, and AI) are still unknown. Similarly, research assessing effectiveness, accessibility and affordability of 'e-textbooks' is a growing need.
- **Impact of personalised curriculum on student well-being**. Theory and related research may suggest that personalised learning is an effective tool to teach and engage students. While numerous anecdotes are reported on how personalised learning promotes student well-being, robust evidence is still to be developed.
- **The role of developers, particularly in educational technology**: In two of the four curriculum innovations (digital curriculum and personalised curriculum) for-profit and mixed business educational models emerge alongside the public education sector. Further research is needed to investigate the implications and risks of such developments as well as choice from an equity perspective.

Notes

1. Opportunities to learn or OTL generally refers to the input of schooling that researchers recognise as necessary and predictive of successful learning. This is highly relevant in examining learning gaps among groups of students and identifying schooling factors that may be responsible for increasing equity gaps. Variations exist in how to operationalise and measure opportunities to learn (OTL). Existing research conceptualises the key variables of this construct as being related to the amount of instruction time, the curriculum content and the quality of instruction as key elements of the enacted curriculum that are predictive of academic learning (Stevens, 1996[178]; Kurz, 2011[174]). In PISA 2012 (OECD, 2013[175]) OTL in relation to mathematics literacy is operationalised through three indices that measure students' degree of exposure to three kinds of curriculum content: word problems, formal mathematics topics and applied mathematics problems.
2. Presentation by Shelley Goldman at the OECD Education 2030 Future of Education and Skills Informal Working Group meeting in May 2018. See also (Goldman and Kabayadondo, 2017[45])
3. The United Nations' Convention on the Rights of the Child (https://www.ohchr.org/EN/ProfessionalInterest/Pages/CRC.aspx#:~:text=Article%20 12&text=States%20Parties%20shall%20assure%20to,and%20maturity%20of%20the%20child).
4. https://www.interaction-design.org/literature/topics/design-thinking
5. For UDL at a glance, watch the video: https://youtu.be/bDvKnY0g6e4
6. For a broader discussion on the role of values in the curriculum, refer to the OECD curriculum analysis report Values in the Curriculum, (OECD, forthcoming[177]).
7. See Table 4. Stages of digitalisation of the curriculum in (OECD, 2020[1]), *What Students Learn Matter: Towards a 21st Century Curriculum*.
8. See (OECD, 2020[1]), *What Students Learn Matter: Towards a 21st Century Curriculum*. The report gives examples, such as 1) enhancing pedagogy (e.g. making integrated curriculum content, lesson plans, and worksheets available); 2) monitoring learning (for individuals and groups); 3) identifying specific areas where students might be struggling (e.g. specific content or specific types of problems); and 4) supplementing face-to-face learning with artificial tutors/coaches for students. New ways of using AI are expected to continue evolving from the time of writing.
9. https://e-koolikott.ee/
10. https://www.opiq.ee/Catalog
11. https://www.innove.ee/eksamid-ja-testid/uldpadevustestid/
12. For an example of the growing use of e-textbooks, please see Box 7. E-textbooks in Estonia, in (OECD, 2020[1]).
13. Table 5 Extent to which countries/jurisdictions encourage digitalisation of textbooks in (OECD, 2020[1]). *What Students Learn Matter: Towards a 21st Century Curriculum*.
14. Source: OECD E2030 PQC survey, item 1.4.1.
15. In a flipped classroom approach, students learn about new content as part of their homework and use their face-to-face time with the teacher to clarify questions and develop a deeper understanding of the material. This instructional strategy aims at supporting students' deep learning (Bergmann and Sams, 2012[178]).
16. https://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum

References

Abrami, P. et al. (2015), "Strategies for Teaching Students to Think Critically", *Review of Educational Research*, Vol. 85/2, pp. 275-314, http://dx.doi.org/10.3102/0034654314551063. [161]

Ainscow, M. and S. Miles (2008), "Making Education for All Inclusive: Where Next?", *Prospect*, Vol. 38/1, pp. 15-34. [123]

Akçapınar, G., A. Altun and P. Aşkar (2019), "Using learning analytics to develop early-warning system for at-risk students", *International Journal of Educational Technology in Higher Education*, Vol. 16/40, http://dx.doi.org/10.1186/s41239-019-0172-z. [87]

Apple, M. (2019), *Ideology and Curriculum*, Routledge. [43]

Balram, A. (2020), *How online learning can affect student health*, https://www.jhunewsletter.com/article/2020/04/how-online-learning-can-affect-student-health (accessed on March 2021). [81]

Bandura, A. (1971), *Social Learning Theory, General Learning Press*, https://web.archive.org/web/20131024214846/http://www.jku.at/org/content/e54521/e54528/e54529/e178059/Bandura_SocialLearningTheory_ger.pdf. [134]

Barrientos, J. and L. Lovera (2020), *Diversidad sexual y educación en América Latina y el Caribe, Panorama regional: jóvenes LGBT+E inclusión escolar en América Latina y el Caribe*, UNESCO, Paris. [33]

Bartolomé, L. (1994), "Beyond the Methods Fetish: Towards a Humanizing Pedagogy", *Harvard Educational Review*, Vol. 64/2, pp. 173-195, https://doi.org/10.17763/haer.64.2.58q5m5744t325730. [154]

Bell, G. (ed.) (2016), *Teaching diverse learners*, AERA. [126]

Bell, G. (ed.) (2016), *Teaching students with special needs in the new millennium*, AERA. [127]

Bergmann, J. and A. Sams (2012), *Flip Your Classroom: Reach Every Student in Every Class Every Day*, ASCD, Alexandria, VA. [176]

Bernstein, B. (1971), *Class, Codes and Control,* Routledge. [40]

Bezinović, P. et al. (2015), "Patterns of internet use and mental health of high school students in Istria County, Croatia: cross-sectional study", *Croatian Medical Journal*, Vol. 56/3, pp. 297-305, http://dx.doi.org/10.3325/cmj.2015.56.297. [77]

Blatchford, P. (1997), "Students' self-assessment of academic attainment: accuracy and stability from 7 to 16 years and influence of domain and social comparison group", *Educational Psychology,* Vol. 17/3, pp. 345-359, https://doi.org/10.1080/0144341970170308. [119]

Bonk, C. and C. Graham (eds.) (2006), *Blended learning systems: Definition, current trends, and future directions*, Jossey-Bass/Pfeiffer, San Francisco, CA. [85]

Borgonovi, F., A. Ferrara and S. Maghnouj (2018), "The gender gap in educational outcomes in Norway", *OECD Education Working Papers*, No. 183, OECD Publishing, Paris, https://dx.doi.org/10.1787/f8ef1489-en. [151]

Borman, G. et al. (2007), "Final Reading Outcomes of the National Randomized Field Trial of Success for All", *American Educational Research Journal*, Vol. 44/3, pp. 701-731, http://dx.doi.org/10.3102/0002831207306743. [166]

Bredtmann, J., S. Otten and C. Vonnahme (2018), *Linguistic diversity in the classroom, student achievement, and social integration*, http://dx.doi.org/10.4419/86788911. [19]

Brock-Utne, B. (2007), "Language of instruction and student performance: new insights from research in Tanzania and South Africa", *International Review of Education*, Vol. 53, pp. 509-530, https://www.jstor.org/stable/27715415?seq=1. [142]

Brooks-Gunn, J. and G. Duncan (1997), "The effects of poverty on children", *The Future of Children*, Vol. 7/2 (Summer-Autumn, 1997), pp. 55-71, https://doi.org/10.2307/1602387. [143]

Brown, M., P. Brown and T. Bibby (2008), ""I would rather die": Reasons given by 16-year-olds for not continuing their study of mathematics", *Research in Mathematics Education*, Vol. 10/1, pp. 3-18, https://doi.org/10.1080/14794800801915814. [120]

Brown, T. (2009), *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation,* HarperCollins Publishers, New York. [46]

Brussino, O. (2020), "Mapping policy approaches and practices for the inclusion of students with special education needs", *OECD Education Working Papers*, No. 227, OECD Publishing, Paris, https://dx.doi.org/10.1787/600fbad5-en. [23]

Burns, T. and F. Gottschalk (eds.) (2019), *Educating 21st Century Children: Emotional Well-being in the Digital Age, Educational Research and Innovation*, OECD Publishing, Paris, https://dx.doi.org/10.1787/b7f33425-en. [82]

Carroll, W. (1997), "Brief Report: Results of Third-Grade Students in a Reform Curriculum on the Illinois State Mathematics Test", *Journal for Research in Mathematics Education*, Vol. 28/2, pp. 237-242, http://dx.doi.org/10.5951/jresematheduc.28.2.0237. [157]

Case, K., B. Stewart and J. Tittsworth (2009), "Transgender across the Curriculum: A Psychology for Inclusion", *Teaching of Psychology*, Vol. 36/2, pp. 117-121, http://dx.doi.org/10.1080/00986280902739446. [31]

Chen, C., C. Liu and M. Chang (2006), "Personalized curriculum sequencing utilizing modified item response theory for web-based instruction", *Expert Systems with Applications,* Vol. 30/2, pp. 378-396, http://dx.doi.org/10.1016/j.eswa.2005.07.029. [91]

Chetty, R. et al. (2018), *Race and Economic Opportunity in the United States: An Intergenerational Perspective*, National Bureau of Economic Research, Cambridge, MA, http://dx.doi.org/10.3386/w24441. [13]

Choppin, J. and Z. Borys (2017), "Trends in the design, development, and use of digital curriculum materials", *ZDM*, Vol. 49/5, pp. 663–674. [66]

Cornelisz, I. and N. van Halem (2016), *Startnotitie: De leerling centraal: Een analyse van leerling-centraal onderwijs in relatie tot onderwijsuitkomsten en beleidsinstrumenten*, Vrije Universiteit Amsterdam, Universiteit Utrecht, https://www.onderwijsraad.nl/binaries/onderwijsraad/documenten/rapporten/2017/07/04/studie-de-leerling-centraal-analyse/De-leerling-centraal-analyse.pdf (accessed on 20 April 2021). [164]

Courtney, L. and N. Anderson (2010), "Do rural and regional students in Queensland experience an ICT 'turn-off' in the early high school years?", *Computer Science. Australian Educational Computing,* https://www.semanticscholar.org/paper/Do-rural-and-regional-students-in-Queensland-an-ICT-Courtney-Anderson/93ee6391272572ca96404435b7a31594396b87e9. [103]

Cresswell, J. and C. Underwood (2004), *Location, location, location: Implications of geographic situation on Australian student performance in PISA 2000.* [20]

Darling-Hammond, L. et al. (2020), "Implications for educational practice of the science of learning and development", *Applied Developmental Science*, Vol. 24/2, pp. 97-140, http://dx.doi.org/10.1080/10888691.2018.1537791. [9]

David, J. (2009), "Teaching Social Responsibility: What Research Says About Service Learning and Civic Participation", *Educational Leadership*, Vol. 66/8, pp. 83-84, http://www.ascd.org/publications/educational-leadership/may09/vol66/num08/Service-Learning-and-Civic-Participation.aspx. [169]

Davis, N. and R. Ferdig (2010), "What is special about teacher education for virtual schooling?", *Journal of Technology and Teacher Educatio*n, Vol. 17/4, pp. 425-435, https://www.learntechlib.org/primary/p/30484/ (accessed on 21 April 2021). [69]

De la Varre, I. (2014), "Reasons for student dropout in an online course in a rural K–12 setting", *Distance Education*, http://dx.doi.org/10.1080/01587919.2015.955259. [104]

Dehaene, S. (2020), *How we learn: Why Brains Learn Better Than Any Machine...For Now*, Viking, New York. [52]

Deunk, M. et al. (2015), *Differentiation within and across classrooms: A systematic review of studies into the cognitive effects of differentiation practices, GION onderwijs/onderzoek,* https://www.nro.nl/sites/nro/files/migrate/Roel-Bosker-Effectief-omgaan-met-verschillen-in-het-onderwijs-review.pdf. [165]

Donlan, J. (2016), "Splicing the divide: A review of research on the evolving digital divide among K–12 students", *Journal of Research on Technology in Education*, Vol. 48/1, pp. 16-37, https://doi.org/10.1080/15391523.2015.1103147. [93]

Dronkers, J., G. Veerman and S. Pong (2017), "Mechanisms Behind the Negative Influence of Single Parenthood on School Performance: Lower Teaching and Learning Conditions?", *Journal of Divorce & Remarriage,* Vol. 58/7, pp. 471-486, http://dx.doi.org/10.1080/10502556.2017.1343558. [12]

Duckworth, A. et al. (2007), "Grit: Perseverance and passion for long-term goals", *Journal of Personality and Social Psycholgoy,* Vol. 92/6, pp. 1087-1111, https://doi.org/10.1037/0022-3514.92.6.1087. [117]

Duncan, G. et al. (2007), "School readiness and later achievment", *Developmental Psychology,* Vol. 43/6, pp. 1428-1446, https://psycnet.apa.org/doi/10.1037/0012-1649.43.6.1428. [108]

Duncan, G., K. Magnuson and R. Votruba-Drzal (2017), "Moving beyond correlations in assessing the consequences of poverty", *Annual Review of Psychology*, Vol. 68, pp. 413-434, https://doi.org/10.1146/annurev-psych-010416-044224. [144]

Dweck, C. (1983), "Motivational processes affecting learning", *American Psychologist,* Vol. 41/10, pp. 1040-1048, https://psycnet.apa.org/doi/10.1037/0003-066X.41.10.1040. [68]

Eccles, J. and R. Roeser (2011), "Schools as developmental contexts during adolescence", *Journal of Research on Adolescence*, Vol. 21/1, pp. 225-241, https://psycnet.apa.org/doi/10.1111/j.1532-7795.2010.00725.x. [110]

Everitt, L. and E. Pianca (2015), *What Happened to the "T" in STEM? Paper presented at the Annual Meeting of the Australian Association for Research in Education (AARE) (29 Nov-3 Dec).* [152]

Ferguson, C. (2017), "Everything in moderation: Moderate use of screens unassociated with child behavior problems", *Psychiatric Quarterly*, Vol. 88/4, pp. 797-805, http://dx.doi.org/dx.doi.org/10.1007/s11126-016-9486- 3. [75]

Field, S., M. Kuczera and B. Pont (2007), *No More Failures: Ten Steps to Equity in Education*, Education and Training Policy, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264032606-en. [37]

Fishman, M. et al. (2011), "What Happens When the Research Ends? Factors Related to the Sustainability of a Technology-Infused Mathematics Curriculum", *Journal of Computers in Mathematics and Science Teaching*, Vol. 30/4, pp. 329-353, https://www.learntechlib.org/primary/p/36145/ (accessed on 21 April 2021). [101]

Goldman, S. and Z. Kabayadondo (eds.) (2017), *Taking Design Thinking to School: How the Technology of Design Can Transform Teachers, Learners, and Classrooms,* Routledge, New York. [45]

Graesser, A., D. McNamara and K. VanLehn (2005), "Scaffolding deep comprehension strategies through Point&Query, AutoTutor, and iSTART", *Educational Psychologist*, Vol. 40/4, pp. 225-234, https://doi.org/10.1207/s15326985ep4004_4. [55]

Guerriero, S. (ed.) (2017), *Pedagogical Knowledge and the Changing Nature of the Teaching Profession*, OECD Publishing, https://doi.org/10.1787/9789264270695-en. [131]

Halinen, I. and R. Järvinen (2008), "Towards inclusive education: the case of Finland", *PROSPECTS*, Vol. 38/1, pp. 77-97, http://dx.doi.org/10.1007/s11125-008-9061-2. [141]

Hall, T. et al. (2014), "Addressing Learning Disabilities With UDL and Technology", *Learning Disability Quarterly,* Vol. 38/2, pp. 72-83, http://dx.doi.org/10.1177/0731948714544375. [51]

Hand, B. et al. (2018), "Improving critical thinking growth for disadvantaged groups within elementary school science: A randomized controlled trial using the Science Writing Heuristic approach", *Science Education*, Vol. 102/4, pp. 693-710, http://dx.doi.org/10.1002/sce.21341. [156]

Hand, B., W. Therrien and M. Shelley (2013), *Examining the Impact of Using the Science Writing Heuristic Approach in Learning Science: A cluster randomized study.* [155]

Hanna Dummont, D. (2010), *Nature of Learning. Using Research to Inspire Practice*, OECD Publishing, https://www.oecd.org/education/ceri/50300814.pdf. [109]

Hart, S. (2004), Learning without limits, Open University Press. [124]

Hayward, L. and E. Spencer (2012), "'The complexities of change: formative assessment in Scotland", *Curriculum Journal*, Vol. 21/2, p. 1670177, https://doi.org/10.1080/09585176.2010.480827. [167]

Heckman, J. (2011), "The economics of inequality: The value of early childhood education", *American Educator,* Vol. 35/1, pp. 31-36, https://files.eric.ed.gov/fulltext/EJ920516.pdf. [146]

Heng, S. (2011), *Opening address by Mr Heng Swee Keat, Minister for Education*, https://www.nas.gov.sg/archivesonline/data/pdfdoc/20110929001/wps_opening_address_(media)(checked).pdf. [53]

Ikeda, K. and K. Nakamura (2013), "Association between mobile phone use and depressed mood in Japanese adolescents: a cross-sectional study", *Environmental Health and Preventive Medicine*, Vol. 19/3, pp. 187-193, http://dx.doi.org/10.1007/s12199-013-0373-3. [78]

Information Resources Management Association (2018), *Gamification in Education: Breakthroughs in Research and Practice*, IGI Global, Hershey, PA. [73]

Jackson, P. (1968), *Life in Classrooms,* Holt, Rinehart and Winston. Reprinted as Philip Wesley Jackson (1990). Life in Classrooms. Teachers College Press. pp. 33–37. [39]

Janxia, D., W. Sansing and S. Yu (2004), *The Impact of Technology Use on Low-Income and Minority Students' Academic Achievements: Educational Longitudinal Study of 2002*, Association for Educational Communications and Technology. [98]

Jesson, R. et al. (2018), "A mixed-methods study to identify effective practices in the teaching of writing in a digital learning environment in low income schools", *Computers and Education,* Vol. 119, pp. 14-30, https://doi.org/10.1016/j.compedu.2017.12.005. [99]

Jolly, J. and J. Javis (eds.) (2018), *Designing and adapting curriculum for academically gifted students,* Routledge, https://doi.org/10.4324/9781351227704. [24]

Jonker, H., V. März and J. Voogt (2020), "Curriculum flexibility in a blended curriculum", *Australasian Journal of Educational Technology,* http://dx.doi.org/10.14742/ajet.4926. [61]

Kale, U. (2018), "Contextual factors influencing access to teaching computational thinking", *Computers in the Schools,* http://dx.doi.org/10.1080/07380569.2018.1462630. [139]

Kim, J. et al. (2010), "Brief report: Predictors of heavy Internet use and associations with health-promoting and health risk behaviors among Hong Kong university students", *Journal of Adolescence*, Vol. 33/1, pp. 215-220, http://dx.doi.org/10.1016/j.adolescence.2009.03.012. [79]

Knezek, G. and J. de Voogt (eds.) (2008), *Virtual schools. Redefining a place called school.* [70]

Köğce, D. et al. (2009), "Examining elementary school students' attitudes towads mathematics in terms of some vaiables", *Procedia-Social and Behavioral Sciences*, Vol. 1/1, pp. 291-295, https://doi.org/10.1016/j.sbspro.2009.01.053. [121]

Kosciw, J. et al. (2020), *The Experiences of Lesbian, Gay, Bisexual, Transgender, and Queer Youth in Our Nation's Schools*, http://www.glsen.org/research. [29]

Kosciw, J., N. Palmer and R. Kull (2014), "Reflecting Resiliency: Openness About Sexual Orientation and/or Gender Identity and Its Relationship to Well-Being and Educational Outcomes for LGBT Students", *American Journal of Community Psychology*, Vol. 55/1-2, pp. 167-178, http://dx.doi.org/10.1007/s10464-014-9642-6. [26]

Kosciw, J. and A. Zongrone (2019), *Una crisis global en el clima escolar America-Latina: Perspectivas sobre estudiantes lesbianas, gays, bisexuales, transgénero y queer en América Latina,* GLSEN, New York. [34]

Kuhl, P. (2019), *Developing Minds in the Digital Age: Towards a Science of Learning for 21st Century Education*, OECD Publishing, https://doi.org/10.1787/562a8659-en. [125]

Kurz, A. (2011), "Access to what should be taught and will be tested: Students' opportunity to learn the intended curriculum", in *Handbook of Accessible Achievement Tests for All Students: Bridging the Gaps Between Research, Practice, and Policy*, Springer, New York. [174]

Lakkala, S., S. Uusiautti and K. Määttä (2016), "How to make the neighbourhood school a school for all?", *JORSEN*, Vol. 16/1, pp. 45-56, https://doi.org/10.1111/1471-3802.12055. [172]

Lavery, K. (2020), *At Michigan High School The Day Starts At 3 p.m. And Ends At 8 p.m.,* https://www.npr.org/2020/01/23/798809294/at-michigan-school-the-day-starts-at-3-p-m-and-ends-at-8-p-m?t=1597265253804. [168]

Levin, B. (2003), *Approaches to Equity in Policy for Lifelong Learning. A paper commissioned by the Education and Training Policy Division,* OECD, https://www.oecd.org/education/school/38692676.pdf. [2]

Lie, R., S. Selcen Guzey and T. Moore (2019), "Implementing Engineering in Diverse Upper Elementary and Middle School Science Classrooms: Student Learning and Attitudes", *Journal of Science Education and Technology*, Vol. 28/2, pp. 104-117, http://dx.doi.org/10.1007/s10956-018-9751-3. [163]

M., V. (ed.) (2020), *Testing in Mathematics Education in the Netherlands*, Springer, Cham, https://doi.org/10.1007/978-3-030-33824-4_16. [92]

Maguire, M., S. Ball and A. Braun (2013), "What ever happened to ...? 'Personalised learning' as a case of policy dissipation", *Journal of Educatiton Policy*, Vol. 28/3, pp. 322-338, https://doi.org/10.1080/02680939.2012.724714. [57]

Martino, W., J. Kassen and K. Omercajic (2020), "Supporting transgender students in schools: beyond an individualist approach to trans inclusion in the education system", *Educational Review,* pp. 1-20, http://dx.doi.org/10.1080/00131911.2020.1829559. [30]

Mazur, E. (1997), *Peer Instruction: A User's Manual. Series in Educational Innovation,* Prentice Hall. [133]

McLeod, D. (1992), "Research on affect in mathematics education: a reconceptualisation", *Handbook of Research on Mathematics Teaching and Learning, Macmillan Publishing Co, Inc,* pp. 575-596. [122]

McPhail, G. and E. Rata (2015), "Comparing Curriculum Types: 'Powerful Knowledge' and '21st Century Learning'", *New Zealand Journal of Educational Studies*, Vol. 51/1, pp. 53-68, http://dx.doi.org/10.1007/s40841-015-0025-9. [60]

Meyer, A. and D. Rose (2014), *Universal Design for Learning: Theory and Practice*, CAST Professional Publishing, http://www.cast.org/our-work/about-udl.html#.Xzz2ZOgzbIU. [48]

Meyer, A. and D. Rose (2000), "Universal Design for Individual Differences", *Educational Leadership*, Vol. 58/3, pp. p39-43 2000, https://eric.ed.gov/?id=EJ617848. [49]

Ministry of Human Resource Development Government of India (2020), *National Education Policy 2020,* https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf (accessed on 2 March 2021). [114]

Muller, J. and M. Young (2019), "Knowledge, power and powerful knowledge re-visited", *The Curriculum Journal*, Vol. 30/2, pp. 196-214, http://dx.doi.org/10.1080/09585176.2019.1570292. [35]

Nikolov, R. et al. (2018), "Distance and Flexible Learning in the Twenty-First Century", in Voogt, J. et al. (eds.), *Second handbook of information technology in primary and secondary education*, Springer International Publishing, Cham, http://dx.doi.org/10.1007/978-3-319-53803-7_45-2. [62]

Nusche, D. (2009), "What Works in Migrant Education?: A Review of Evidence and Policy Options", *OECD Education Working Papers*, No. 22, OECD Publishing, Paris, https://dx.doi.org/10.1787/227131784531. [16]

OECD (2021), *The State of School Education: One Year into the COVID Pandemic*, OECD Publishing, https://doi.org/10.1787/201dde84-en. [173]

OECD (2020), Curriculum (re)design: A series of thematic reports from the OECD Education 2030 project. Overview Brochure, OECD, Paris, https://www.oecd.org/education/2030-project/contact/brochure-thematic-reports-on-curriculum-redesign.pdf. [44]

OECD (2020), *Curriculum Overload: A Way Forward,* OECD Publishing, Paris, https://dx.doi.org/10.1787/3081ceca-en. [113]

OECD (2020), *Strength through Diversity: Education for Inclusive Societies: Design and Implementation Plan*, https://one.oecd.org/document/EDU/EDPC(2019)11/REV2/en/pdf. [5]

OECD (2020), *What Students Learn Matters: Towards a 21st Century Curriculum*, OECD Publishing, Paris, https://dx.doi.org/10.1787/d86d4d9a-en. [1]

OECD (2019), *Measuring the Digital Transformation: A Roadmap for the Future,* OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264311992-en. [64]

OECD (2019), *OECD Future of Education 2030: Making Physical Education Dynamic and Inclusive for 2030 - International Curriculum Analysis,* https://www.oecd.org/education/2030-project/contact/OECD_FUTURE_OF_EDUCATION_2030_MAKING_PHYSICAL_DYNAMIC_AND_INCLUSIVE_FOR_2030.pdf. [3]

OECD (2019), *OECD Future of Education and Skills 2030: Conceptual learning framework. A series of concept notes*, https://www.oecd.org/education/2030-project/teaching-and-learning/learning/learning-compass-2030/OECD_Learning_Compass_2030_concept_note.pdf. [63]

OECD (2019), *PISA 2018 database*, http://dx.doi.org/10.1787/888934030971. [112]

OECD (2019), *PISA 2018 Results (Volume II): Where All Students Can Succeed*, PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/b5fd1b8f-en. [95]

OECD (2019), *PISA 2018 Results (Volume III): What School Life Means for Students' Lives,* PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/acd78851-en. [111]

OECD (2018), *Education at a Glance 2018: OECD Indicators*, OECD Publishing, Paris, https://dx.doi.org/10.1787/eag-2018-en. [67]

OECD (2018), *Seven Questions about Apprenticeships: Answers from International Experience*, OECD Reviews of Vocational Education and Training, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264306486-en. [170]

OECD (2018), *The Future of Education and Skills: Education 2030: The Future We Want*, OECD, Paris, https://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf (accessed on 6 January 2021). [59]

OECD (2017), *Educational Opportunity for All: Overcoming Inequality throughout the Life Course*, Educational Research and Innovation, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264287457-en. [10]

OECD (2017), *Promising Practices in Supporting Success for Indigenous Students*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264279421-en. [17]

OECD (2016), *PISA 2015 Results (Volume II): Policies and Practices for Successful Schools*, PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264267510-en. [160]

OECD (2015), *Immigrant Students at School: Easing the Journey towards Integration*, OECD Reviews of Migrant Education, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264249509-en. [150]

OECD (2015), *The ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence,* PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264229945-en. [149]

OECD (2014), "How is Equity in Resource Allocation Related to Student Performance?", *PISA in Focus*, No. 44, OECD Publishing, Paris, https://dx.doi.org/10.1787/5jxvl3zwbzwg-en. [97]

OECD (2014), P*ISA 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://dx.doi.org/10.1787/9789264208780-en. [7]

OECD (2013), "Chapter 3. Measuring Opportunities to Learn Mathematics", in *PISA 2012 Results: What Students Know and Can Do (Volume I): Student Performance in Mathematics, Reading and Science*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264201118-6-en. [175]

OECD (2013), *PISA 2012 database*, https://www.oecd.org/pisa/pisaproducts/pisa2012database-downloadabledata.htm. [148]

OECD (2013), *PISA 2012 Results: Excellence through Equity (Volume II): Giving Every Student the Chance to Succeed*, PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264201132-en. [6]

OECD (2012), E*quity and Quality in Education: Supporting Disadvantaged Students and Schools*, OECD Publishing, Paris, https://doi.org/10.1787/9789264130852-en. [100]

OECD (2006), *Personalising Education, Schooling for Tomorrow,* OECD Publishing, https://doi.org/10.1787/9789264036604-en. [107]

OECD (2004), *Equity in Education: Students with Disabilities, Learning Difficulties and Disadvantages*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264103702-en. [36]

OECD (forthcoming), *Values in the Curriculum* (title TBC). [177]

Paine, L., E. Aydarova and I. Syahril (2017), "Globalization and Teacher Education", in Clandinin, D. and J. Husu (eds.), *The SAGE Handbook on Teacher Education*, Sage. [128]

Pane, J. et al. (2017), *Informing Progress: Insights on Personalized Learning Implementation and Effects*, https://www.rand.org/pubs/research_reports/RR2042.html. [58]

Paniagua, A. (2018), *Early Career Teachers: Pioneers Triggering Innovation or Compliant Professionals?*, OECD Publishing, https://doi.org/10.1787/4a7043f9-en. [130]

Paniagua, A. (2018), *Teachers as Designers of Learning Environments: The Importance of Innovative Pedagogies,* OECD Publishing, https://doi.org/10.1787/9789264085374-en. [129]

Papadakis, S. (2016), "Creativity and innovation in European education. Ten years eTwinning. Past, present and the future", *International Journal of Technology Enhanced Learning*, Vol. 8/3-4, pp. 279-296, http://dx.doi.org/10.1504/IJTEL.2016.10001503. [56]

Papastergiou, M. (2009), "Digital Game-Based Learning in high school Computer Science education: Impact on educational effectiveness and student motivation", *Computers and Education,* Vol. 52/1, pp. 1-12, https://doi.org/10.1016/j.compedu.2008.06.004. [84]

Parsons, S. et al. (2011), "The case for adaptability as an aspect of reading teacher effectiveness", *Voices from the Middle*, Vol. 19/1, pp. 19-23. [136]

Pegg, J. and D. Panizzon (2007), "Inequities in student achievement for literacy: Metropolitan versus rural comparisons", *The Australian Journal of Language and Literacy,* Vol. 30/3, pp. 177-190, https://search.informit.com.au/documentSummary;dn=772932320480156;res=IELHSS. [21]

Pepin, B. et al. (2015), "e-textbooks in/for Teaching and Learning Mathematics: A Disruptive and Potentially Transformative Educational Technology", in English, L. and D. Kirshner (eds.), *Handbook of International Research in Mathematics Education. Third Edition,* Taylor Francis. [54]

Prain, V. et al. (2013), "Personalised learning: lessons to be learnt", *British Educational Research Journal,* Vol. 38/4, pp. 657-676, https://doi.org/10.1080/01411926.2012.669747. [115]

Przybylski, A. and N. Weinstein (2017), "A large-scale test of the Goldilocks Hypothesis", *Psychological Science*, Vol. 88/4, pp. 797-805, http://dx.doi.org/dx.doi.org/10.1177/0956797616678438. [76]

Rao, K. and G. Meo (2016), "Using Universal Design for Learning to Design Standards-Based Lessons", *Special Education*, Vol. 6/4, http://dx.doi.org/10.1177/2158244016680688. [171]

Reygan, F. (2009), "The School-Based Lives of LGBT Youth in the Republic of Ireland", *Journal of LGBT Youth*, Vol. 6/1, pp. 80-89, http://dx.doi.org/10.1080/19361650802379789. [28]

Rosen, Y. and E. Manny-Ikan (2011), "The social promise of the Time to Know Program", *Journal of Interactive Online Learning,* Vol. 10, pp. 150-161. [65]

Rubén, Á. (2018), *LGBTQI Inclusive Education Report*, IGLYO, Brussels. [32]

Rutigliano, A. (2020), "Inclusion of Roma students in Europe: A literature review and examples of policy initiatives", *OECD Education Working Papers*, No. 228, OECD Publishing, Paris, https://dx.doi.org/10.1787/8ce7d6eb-en. [18]

Sally Power, M. (2018), "How child-centred education favours some learners more than others", *Review of Education. British Educational Research Association*, Vol. 7/3, pp. 570-592, https://onlinelibrary.wiley.com/doi/full/10.1002/rev3.3137. [42]

Santín, D. and G. Sicilia (2016), "Does family structure affect children's academic outcomes? Evidence for Spain", *The Social Science Journal*, Vol. 53/4, pp. 555-572, http://dx.doi.org/10.1016/j.soscij.2016.04.001. [11]

Schleicher, A. (2018), *World Class: How to Build a 21st-Century School System, Strong Performers and Successful Reformers in Education*, OECD Publishing, Paris, https://dx.doi.org/10.1787/9789264300002-en. [153]

Schmidt, W., P. Zoido and L. Cogan (2014), "Schooling Matters: Opportunity to Learn in PISA 2012", *OECD Education Working Papers,* No. 95, OECD Publishing, Paris, https://dx.doi.org/10.1787/5k3v0hldmchl-en. [8]

Schönfeld, M. et al. (2020), *Cross-Cultural Alignments, Fertilization, Differentiation: Bridging the Gaps through Technology,* https://edusummit2019.fse.ulaval.ca/files/edusummit2019_ebook.pdf. [72]

Schreiber, J. (2017), "Universal Design for Learning: A Student-Centered Curriculum Perspective", *Curriculum and Teaching*, Vol. 32/2, pp. 89-98(10), https://doi.org/10.7459/ct/32.2.06. [50]

Schunk, D. and M. Zimmerman (1994), *Self-regulation of learning and performance: Issues and educational applications,* Lawrence Earlbaum Associates, Inc. [118]

Selwyn, N. (2007), "Curriculum online? Exploring the political and commercial construction of the UK digital learning marketplace", *British Journal of Sociology of Education*, Vol. 28/2, pp. 223-240, http://dx.doi.org/10.1080/01425690701192729. [94]

Simmons, C., A. Graham and N. Thomas (2015), "Imagining an ideal school for wellbeing: Locating student voice", *Journal of Educational Change,* Vol. 16, pp. 129-144, http://dx.doi.org/10.1007/s10833-014-9239-8. [116]

Simon, H. (1996), *The sciences of the artificial,* MIT Press, Cambridge, MA. [47]

Sisson, S. et al. (2010), "Screen Time, Physical Activity, and Overweight in U.S. Youth: National Survey of Children's Health 2003", *Journal of Adolescent Health*, Vol. 47/3, pp. 309-311, http://dx.doi.org/10.1016/j.jadohealth.2010.02.016. [83]

Snyder, B. (1971), *The Hidden Curriculum*, Alfred A. Knopf. [41]

Song, H. et al. (2014), "Does Facebook make you lonely?: A meta analysis", *Computers in Human Behavior,* Vol. 36, pp. 446-452, http://dx.doi.org/doi.org/10.1016/j.chb.2014.04.011. [74]

Soomro, K. (2017), "Development of an instrument to measure faculty's information and communication technology access (FICTA)", *Education and Information Technologies*, http://dx.doi.org/10.1007/s10639-017-9599-9. [140]

Sørensen, R. et al. (2015), *Culture and school performance: Evidence from second generation immigrants to Norway,* https://www.semanticscholar.org/paper/Culture-and-school-performance-%3A-Evidence-from-to-S%C3%B8rensen-Iversen/201eb6fa1a22f42842645b260063bf7960d5d60e. [14]

Stevens, F. (1996), *The Need To Expand the Opportunity To Learn Conceptual Framework: Should Students, Parents, and School Resources Be Included?, A Paper Presented at the Annual Meeting of the American Educational Research Association,* April 8-12, 1996, https://files.eric.ed.gov/fulltext/ED397523.pdf (accessed on 21 April 2021). [178]

Szabo, S. et al. (eds.) (2010), *How and why teachers adapt their literacy instruction,* ALER, Commerce, TX. [137]

Thadani, V. et al. (2010), "The Possibilities and Limitations of Curriculum-Based Science Inquiry Interventions for Challenging the "Pedagogy of Poverty"", *Equity & Excellence in Education*, Vol. 43/1, pp. 21-37, http://dx.doi.org/10.1080/10665680903408908. [158]

Therrien, W. et al. (2017), "Explicit Instruction and Next Generation Science Standards Aligned Classrooms: A Fit or a Split?", *Learning Disabilities Research & Practice*, Vol. 32/3, pp. 149-154, http://dx.doi.org/10.1111/ldrp.12137. [162]

Tong, F. et al. (2014), "A Randomized Study of a Literacy-Integrated Science Intervention for Low-Socio-economic Status Middle School Students: Findings from first-year implementation", *International Journal of Science Education*, Vol. 36/12, pp. 2083-2109, http://dx.doi.org/10.1080/09500693.2014.883107. [159]

U.S. Department of Health and Human Services, Administration for Children and Families (2010), *Head Start Impact Study. Final report,* Washington, DC, https://www.acf.hhs.gov/sites/default/files/documents/opre/hs_impact_study_final.pdf (accessed on 21 April 2021). [145]

UNESCO (2019), G*lobal Education Monitoring Report 2019: Gender Report - Meeting our commitments to gender equality*, UNESCO, Paris, https://unesdoc.unesco.org/ark:/48223/pf0000368753 (accessed on 21 April 2021). [25]

UNESCO (2018), *Global Education Monitoring Report, 2019: Migration, displacement and education: building bridges, not walls,* UNESCO, Paris, https://unesdoc.unesco.org/ark:/48223/pf0000265866 (accessed on 4 April 2021). [15]

UNESCO Education Sector (2019), *Artificial Inteeligence in Education: Challenges and Opportunities for Sustainable Development.* [90]

UNHCR and partners (2020), *The impact of the COVID-19 pandemic on refugee protection, event realised as part of the German Federal Foreign Office's Long Night of Ideas in partnership with UNHRC and Kiron,* https://www.unhcr.org/dach/wp-content/uploads/sites/27/2020/06/Concept-note_The-Impact-of-COVID19-on-Refugee-Education_V17_06.pdf (accessed on 30 March 2021). [105]

UNICEF (2014), *Conceptualizing Inclusive Education and Contextualizing it within the UNICEF Mission*, https://www.unicef.org/eca/sites/unicef.org.eca/files/IE_Webinar_Booklet_1_0.pdf (accessed on 20 April 2021). [38]

van Dijk, J. (2005), *The deepening divide: Inequality in the information society.*, Sage Publications. [138]

Vansteenkiste, M., W. Lens and E. Deci (2006), "Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation", *Educational Psychologist,* Vol. 41/1, pp. 19-31, https://psycnet.apa.org/doi/10.1207/s15326985ep4101_4. [147]

Vecellio, S. (2012), "Enacting FAIR Education: Approaches to Integrating LGBT Content in the K–12 Curriculum", *Multicultural Perspectives*, Vol. 14/3, pp. 169-174, http://dx.doi.org/10.1080/15210960.2012.697015. [27]

Vincent-Lancrin, S. (2019), *Measuring Innovation in Education 2019: What Has Changed in the Classroom?,* OECD Publishing, https://doi.org/10.1787/9789264311671-en. [96]

Volman, M. and R. Stikkelman (2016), *Startnotitie: De leerling centraal. Literatuurstudie naar de effecten van en pedagogische en didactische argumenten voor leerling-en studentgericht onderwijs [Start report: The focus on the student. Literature review of the effects of pedagogical and inst,* Universiteit van Amsterdam, https://hdl.handle.net/11245.1/aaffa205-77ab-4f56-9a8d-69e94732ebbd. [86]

Voogt, J., K. van de Oudeweetering and H. Sligte (2017), *Technology in Education: Effects, affordances and conditions for effective implementation: A review of recent literature.* [89]

Voogt, J. et al. (eds.) (2018), *Virtual schools: A global perspective*, Springer. [71]

Voogt, J., N. Nieveen and A. Thijs (2018), *Ensuring equity and opportunities to learn in curriculum reform.* [4]

Vygotsky, L. (1987), *The collected works of L.S. Vygotsky: The Fundamentals of Defectology (Abnormal Psychology and Learning Disabilities)*, Springer Science & Business Media, New York. [132]

Wang, M. (1980), "Adaptive instruction: Building on diversity", *Theory Into Practice*, Vol. 19/2, pp. 122-128, http://dx.doi.org/10.1080/00405848009542885. [135]

WHO (2011), *World Report on Disability*, http://who.int/disabilities/world_report/2011/en/. [22]

Yarnall, L., B. Means and T. Wetzel (2016), *Lessons Learned from Early Implementation of Adaptive Courseware,* SRI International. [88]

You, D. et al. (2020), "Migrant and displaced children in the age of COVID-19: How the pandemic is impacting them and what can we do to help", *Migration Policy Practice,* Vol. X/2 (April-June 2020), pp. 33-39, https://www.unicef.org/media/68761/file. [106]

Young, K. (1996), "Psychology of Computer Use: XL. Addictive Use of the Internet: A Case That Breaks the Stereotype", *Psychological Reports*, Vol. 79/3, pp. 899-902, http://dx.doi.org/10.2466/pr0.1996.79.3.899. [80]

Zhao, Y. and K. Frank (2003), "Factors affecting technology uses in schools: An ecological perspective", *American Education Research Journal*, Vol. 40/4, pp. 807-840, https://doi.org/10.3102%2F00028312040004807. [102]

Challenges and strategies for equity in curriculum innovation

This section presents the challenges faced by countries/jurisdictions attempting to address inequity through curriculum innovation, and the strategies they have adopted to the four main types of curriculum innovations examined: digital curriculum, personalised curriculum, cross-curricular content and competencies, and flexible curriculum. The strategies described are not recommendations, but rather opportunities for countries/jurisdictions to learn from one another, in line with the Education 2030 project's peer-learning mission[1].

Before describing challenges and strategies for each of the four curriculum types, this section will begin reporting on cross-cutting theme 'coping with uncertainty'. This has been the real case study brought by the coronavirus pandemic in 2020 and 2021; national, regional and local policy makers, school leaders, teachers, students and parents, and other stakeholders had to adapt their curriculum to the realities on the ground as timely as possible, while ensuring equity.

COPING WITH UNCERTAINTY

- The COVID-19 outbreak in 2020/21 has shed light on and amplified existing inequalities in the education system while providing an opportunity to rethink education, in particular, for vulnerable students. In 2021, at the time of writing, many fear the crisis could wipe out gains from policies that had been effective in addressing achievement gaps. This was the biggest policy concern discussed at the first virtual workshop of the Global Forum of the OECD Future of Education and Skills 2030 project in May 2020.[2] The forum brought together stakeholders including policy makers, teachers, school leaders, academic experts, teacher educators, foundations, social partners, and students. Participants shared by survey responses seven types of curriculum challenges they were facing with regard to remote learning, fully online learning, and other forms of digital curriculum (hybrid learning) (Table 10).

The discussion revealed the following findings on the three major policy concerns, namely, access to learning, quality of learning and student well-being:

- **Access to learning**: Equity issues are not limited to the immediate challenge of whether or not students have access to devices. But access raised longer-term concerns. For example, access to connectivity was a key question, i.e. who should cover or co-finance costs that have long-term budgetary implications. Access to content was an even bigger equity concern as some countries already anticipated larger dropout rates and observed differing approaches between schools for deciding what to teach from the curriculum during the crisis period.
- **Quality of learning**: Concerns referred to the achievement of curriculum objectives in the new learning environment, to which students might struggle to adjust. There were concerns about students' preparedness for self-directed learning and self-motivation, and their ability to cope with potential disruptions at home that would not be experienced in a school setting (e.g. younger siblings at home, household responsibilities, etc.). The differences in the support for learning received by students during remote learning was also raised. This is a concern as not all students have parents with time and knowledge to help learning at home. Students' access to teachers who could provide support during distance learning was thus also seen as crucial. Student anxiety about existing examination requirements as well as about grades and marks they would get during remote learning, were seen as potential disruptors for learning.
- **Student well-being**: One of the main areas of concern was that students be provided with the support they need to manage stress and anxiety during the remote learning period. Concerns were also noted on students'

ability to pursue physical activities while at home, their access to medical attention and care when affected by COVID-19, and their ability to keep in touch with their peers and friends during school closure. It was also an important reminder for some countries/jurisdictions that school is not just a place to learn, but also a place to socialise and learn citizenship, and in some cases to be protected, especially for students from vulnerable families.

In a survey, government representatives from the countries/jurisdictions participating in the Education 2030 project identified the following groups of learners as vulnerable during the COVID-19 crisis:

- students with special needs (cognitive, physical, social, emotional)
- students unable to access learning
- students who are disengaged with schooling, absent or have been considered at risk of dropout
- students with socio-economically disadvantaged backgrounds
- students at risk of domestic violence, child abuse and child neglect
- students with different linguistic/cultural backgrounds
- displaced students[3]

Table 10 **Policy concerns and challenges regarding education during the COVID-19 crisis**

Policy concerns	Challenges
Access to learning	1. Access to learning devices, content, and Internet connections
	2. Access to opportunity to learn (organisation/ reorganisation of learning time)
Quality of learning	3. Maintaining students' motivation and keeping them on track with their studies
	4. Anxiety about examinations and transition to higher levels of education and university
	5. Shrinking of curriculum coverage
Student well-being	6. Safe places to live and learn
	7. Social functions of schools

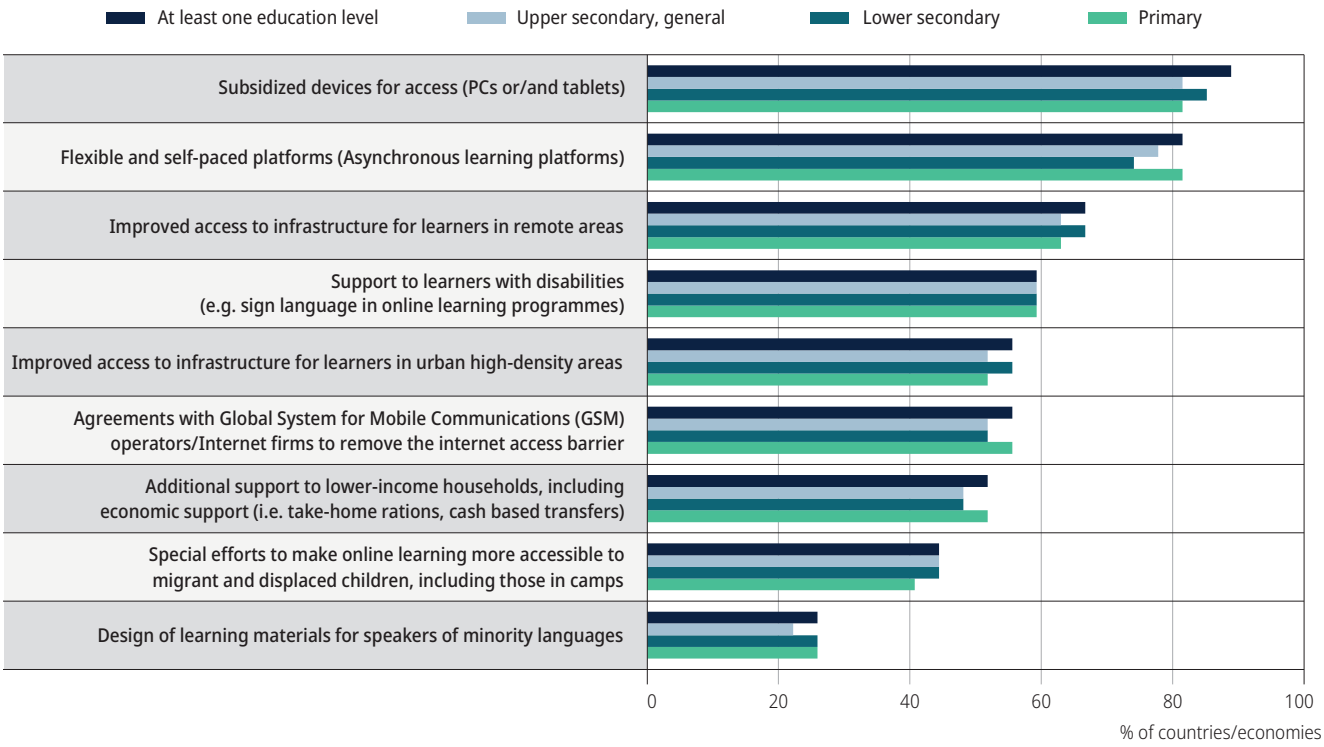
Source: First meeting, Global Forum Future of Education and Skills 2030 (https://www.oecd.org/education/2030-project/global-forum/previous-events/).

The coronavirus has created a continuously changing reality for students, teachers, parents, policy makers and all related stakeholders. Governments and schools were tested for their agility, flexibility and adaptability in both curriculum design and delivery at high speed, so as to ensure both learning and well-being of all students. Countries' experiences with the pandemic should be able to suggest lessons learned for countries to better prepare for complex and uncertain future scenarios by making curriculum design and delivery more flexible already under normal circumstances.

The preliminary findings of a Survey on Joint National Responses to COVID-19 School Closures suggest that countries took a wide range of approaches, to ensure equality, equity and inclusiveness in distance education during the pandemic (OECD, 2021[1]). Some took a strategy targeting specific traits of students (e.g. learners with disabilities such as with sign language in online learning programmes, migrant and displaced children by making online learning more accessible, speakers of minority languages by designing learning materials fit for them); targeting areas (e.g. learners in remote areas and learners in urban high-density areas for better access to infrastructure); or targeting socio-economic status (e.g. students with low-income household by offering to take-home rations, and cash-based transfers. Others took a universal approach such as providing subsidised devices for access (PCs or/and tablets), undertaken by the majority of countries; providing flexible and self-paced platforms (Asynchronous learning platforms); or establishing agreements with mobile communications operators/Internet firms to remove accessibility barriers (Figure 12)

Figure 12 **Measures targeting populations at risk of exclusion from distance education platforms**

Measures taken during the first closure of schools in 2020 at school level



Source: (OECD, 2021[1]), *The State of School Education: One Year into the COVID Pandemic*, https://doi.org/10.1787/201dde84-en

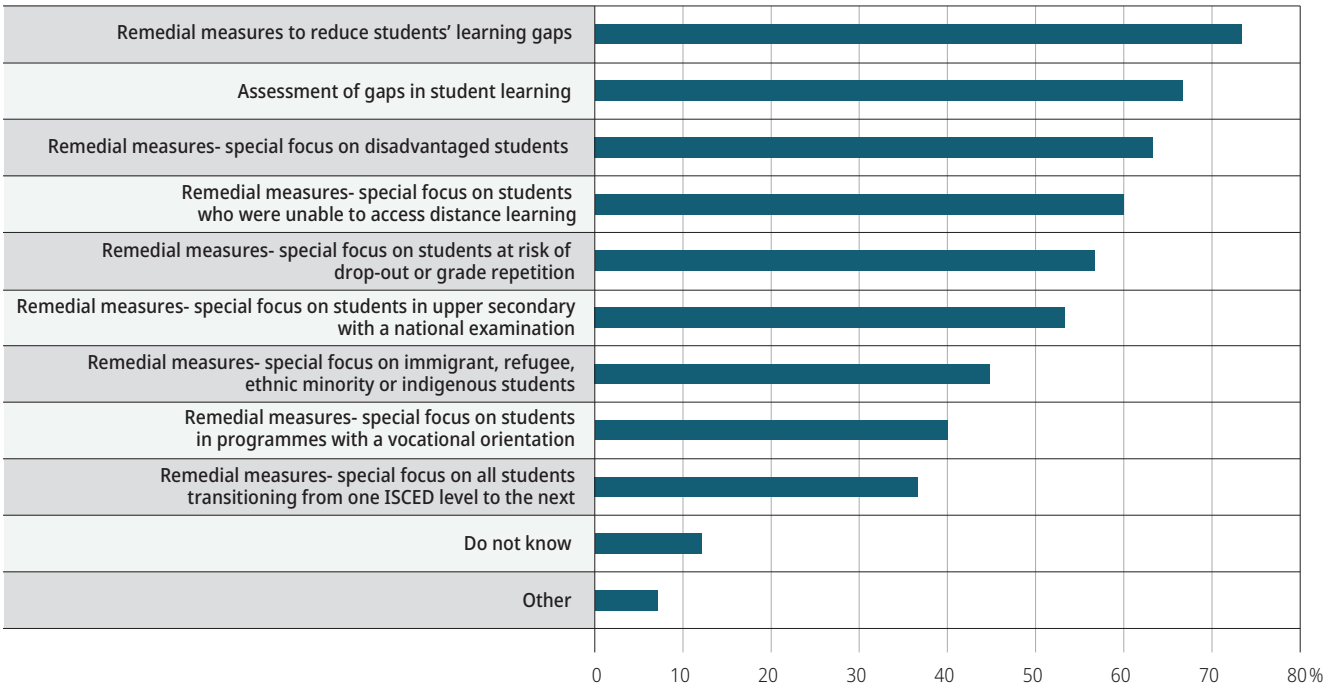
Furthermore, countries have undertaken strategies to address learning gaps when schools re-opened after the first closure in 2020 and, in doing so, many countries have combined strategies targeting vulnerable students. Many provided remedial measures at upper secondary education, as students at this level are expected to pass a national examination as an important transition to higher education. Among such countries, remedial measures focused on students without access to distance learning; students at risk of drop-out or grade repetition; immigrant, refugee, ethnic minority or indigenous students; immigrant, refugee, ethnic minority or indigenous students; and/or students in a vocational orientation. Other countries took an equality approach, such as, remedial measures to reduce students' learning gaps; adjustments on assessment of gaps in student learning; or remedial measures for all students focusing on transition from one education level to another (Figure 13).

In addition, the pandemic highlighted that schools are not simply physical buildings where students learn and study. Students themselves reaffirmed the importance of social functions of schools, in particular, coping with the pandemic, as it provided a real situation for students to ask themselves about the purpose and value of going to school for them. Namely, making and keeping friends, navigating through uncertainty and ambiguity, learning to keep oneself and others safe and healthy, managing conflict and overcoming adversity through the pandemic, etc. It also reinforced the idea that schools become a safe space for students' overall well-being, in particular to vulnerable students, serving their social and psychological needs.

To meet various needs, countries have undertaken varying outreach and support measures, especially for students at risk, including refugees, migrants and displaced children; minorities and speakers of minority languages; other populations at risk; and children with disabilities (Figure 14). More specifically, such measures include "tracking students not returning to schools (e.g. specific measures for students with disabilities in Ireland)" and "adjusted the accessibility of sanitation and hygiene services (e.g. children with specific learning disabilities or other specific disorders not being obliged to wear face masks with special care in the Czech Republic", "community engagement activities", "reviewing access policies", followed by "provision of financial incentives or waived fees (e.g. cash, food or transport or waived school fees)".

Figure 13 **Strategies to address learning gaps when schools re-opened after the first closure in 2020**

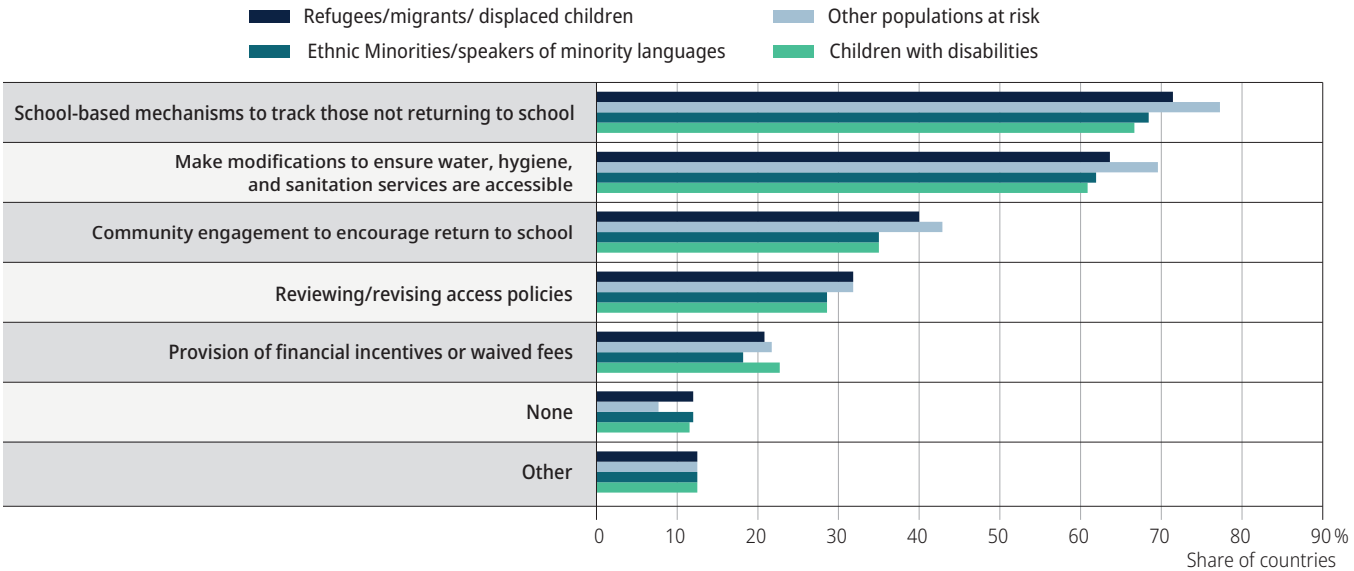
Upper secondary education



Source: (OECD, 2021[1]), *The State of School Education: One Year into the COVID Pandemic*, https://doi.org/10.1787/201dde84-en

Figure 14 **Outreach and support measures to encourage the return to school of vulnerable populations (pre-primary to upper-secondary education)**

Share of countries that responded having implemented specific measures



Note: The share of countries calculated includes only countries that responded "yes" or "no" to the question.
Source: (OECD, 2021[1]), *The State of School Education: One Year into the COVID Pandemic*, https://doi.org/10.1787/201dde84-en

1. DIGITAL CURRICULA

The digitalisation of curriculum content and associated material allows education systems to better customise students' learning experiences. A digitalised approach can help educators respond and adapt to students' learning progress, maximising the likelihood that all learning needs are identified and met. The digital curriculum can also be used to reach out to marginalised students, such as those who already dropped out of the education system, by providing remote learning opportunities.

As mentioned earlier, the COVID-19 crisis accelerated the move to digital learning. This section summarises several challenges in the context of the COVID-19 crisis as well as challenges previously present in the countries/jurisdictions that reported them.

Variation in access to hardware and Internet connectivity, for example, can increase rather than reduce gaps in learning between students in different regions or from different socio economic backgrounds (see the "What does research say?" section of this report). Moreover, the limited capacity of some teachers, students and parents to use the digital curriculum effectively may widen learning gaps between students (Duncan et al., 2007[2]). While these concerns pre-date the COVID-19 crisis, it threw this issue into sharp relief.

As curriculum designers develop digital curriculum content, they must take steps to ensure that all students are equally able to access it. Strategies to effectively implement digital curriculum and tools must thus take equity into consideration to ensure appropriate access for diverse groups of students, parents and teachers.

Table 11 **Challenges and strategies related to digital curriculum**

	Challenge/strategy	Countries/jurisdictions reporting the challenge/strategy
Challenges	Varying levels of access to hard and soft infrastructure	Australia, Québec (Canada), China (People's Republic of), Russian Federation
	Teacher and student preparedness for using digital curriculum and tools	Viet Nam
	Varying levels of home learning environment such as parental support and digital equipment at home	Korea, New Zealand
	Budget to finance connectivity	Japan
Strategies	Mobilising all available resources to provide digital devices and connectivity for all students	Australia, Estonia, Japan, New Zealand, Norway, Portugal, Hong Kong (China), Singapore
	Engaging and supporting parents for digital learning at home	Estonia, Ireland, Portugal, Singapore
	Designing digital platforms to meet individual students' needs and to support teachers	Québec (Canada), Estonia, India[1], Kazakhstan
	Making digital textbook and learning and assessment resources accessible to all students	Mexico, Scotland (United Kingdom), China (People's Republic of), India[1], Kazakhstan
	Continuing the use of print and alternative distribution channels	Australia, France, Korea, Portugal, New Zealand, Chile, Colombia, Kazakhstan
	Using digital curriculum to reintegrate out-of-school students or early school leavers	Québec (Canada), Ireland, Japan
	Preparing a post-crisis "new normal"	Canada, Denmark, Estonia, Finland, Hungary, Iceland, Latvia, Lithuania, Norway, Portugal, Scotland (United Kingdom), Sweden, Singapore

Note: 1. Responses for these countries/jurisdictions were submitted by independent researchers, not government administrations.

Source: Data from the PQC, findings from the research section and from *The impact of COVID-19 on student equity and inclusion* (OECD, 2020[3]).

Challenges

While the potential benefits of a digital curriculum became more apparent in recent years, and particularly salient during the COVID-19 crisis, many countries/jurisdictions face challenges that slow the shift to a digital curriculum. Varying levels of access to hard and soft infrastructure between schools and regions can hinder access to digital curriculum content for some students, further exacerbating existing educational inequalities. There is a recognition gap between governments and schools on "who should cover/finance connectivity" that causes delays and other

issues related to Internet access (see Chapter 1 of (OECD, 2020[4]) for a broader discussion of time lags and gaps in curriculum design). In difficult times, as during the COVID-19 pandemic, this can cause confusion and delays in access at a time when Internet access and remote connections are critical for students.

In addition, countries/jurisdictions have reported that students and teachers are not always sufficiently prepared to use digital curriculum and textbooks. Students' limited competencies in the use of ICT, and also in problem solving and self-regulation may limit their capacity to use digital content effectively (Dweck, 1983[5]). This can be particularly challenging in a context of remote or distance learning, when students' access to support from their teachers is limited, as during the COVID-19 school closures. Varying access to parental support and digital tools at home can further exacerbate inequities. Children come from diverse backgrounds and may not be fully equipped to participate with digital tools, and their parents may not be able to help.

Varying levels of access to hard and soft infrastructure

As the move towards digital curricula accelerates, disparities in access to hard and soft infrastructure may limit the use of such technology in some regions or schools (see Table 11). For example, Australia, Québec (Canada) and the Russian Federation report that the quality of Internet access in some regions limits the use of digital components of their curriculum. Limited availability of devices such as computers or tablets in schools may also prevent effective use of digital curricula, leading to gaps in learning between students who have access to the digital curricula and those who do not.

- **Québec (Canada)** does not currently approve digital textbooks because of provisions in the Education Act requiring that all students have a personal copy of the chosen textbook. Each student would thus have to have their own digital device (computer, tablet, or mobile phone) to access the digital textbook, which is not possible for the moment. Moreover, certain communities have difficulties accessing technological tools and modernising existing infrastructures, and some areas do not have the infrastructure required to fully develop digital integration.
- In recent years, **China** promoted the digital transformation and upgrading of education publishing to keep up with trends in digitalisation and ensure educational fairness. But there is opposition to this transformation, mainly based on imbalance in the development of regional economies and digitalisation, and the possibility that it will lead to greater inequalities.
- In the **Russian Federation**, differences in the condition of school buildings and their equipment create unequal access to high-speed Internet.

Teacher and student preparedness for using digital curriculum and tools

Countries/jurisdictions note that students and teachers need specific skills in order to use the digital curriculum. Limited digital literacy among teachers and students is a major barrier to the design and use of digital curriculum in some countries/jurisdictions. Issues of digital literacy are particularly pronounced for more complex and interactive curriculum platforms, such as adaptive learning platforms.

Moreover, digital literacy alone is not sufficient for digital curricula to be used effectively. In addition to digital skills, students and teachers need other competencies, such as self-regulation and problem-solving, to make effective use of a digital curriculum.

- **Viet Nam** offers textbooks in electronic and printed versions. However, most teachers and students use only printed textbooks. While the digital curriculum gives teachers and students access to a rich and diverse source of information and promotes students' self-study competence, it has limitations, such as: 1) the need for modern teaching facilities and equipment; 2) the need for teachers and students to have a standard level of IT skills; and 3) the need for students to demonstrate high self discipline when using the digital curriculum.

Varying levels of home learning environment such as parental support and digital equipment at home

As many digital curricula promote self-learning or facilitate remote learning, differences in parental support and/or familiarity with digital tools can increase learning gaps, as observed in **Korea** and **New Zealand**. In most countries, parents' engagement in their children's education is linked to household socio-economic status, contributing to disparities in learning outcomes between children from advantaged and disadvantaged backgrounds, observed worldwide (OECD, 2019[6])

Differences in home learning environments became particularly salient in the period of school closures during the COVID-19 crisis, when many countries moved to fully digital learning.

- In **Korea**, student access to computers from home is high, at around 75%, and 96.5% of households have Internet access (OECD, 2019[6]). In addition, most Korean parents have cell phones and/or iPads. Therefore, access per se was not a major equity issue during the COVID-19 school closure period. Instead, the problem relates to an educational divide between middle-class parents and working-class parents, due to working-class parents not having time to support their children's learning at home.
- **New Zealand's** COVID-19 response and the need to rapidly move to digitally enabled distance learning highlighted the inequitable access to digital technology that was an ongoing issue for New Zealand learners. Responses to this issue had previously been largely locally determined, with schools and charities supporting students to access digital technology according to local needs.

Budget to finance connectivity

There can be a gap in understanding how connectivity should be financed, and who should finance or co-finance it. Frequently, this manifests in a disconnection between national and local authorities. For example, during the COVID-19 crisis, countries/jurisdictions and teachers both reiterated the importance of relationships and recognised the need for students to get connected to teachers and schools via digital devices. However, when it came to access to stable Internet connections at home or at school, teachers and students reported greater concern than government representatives. This suggests difficulties to agreeing on how and by whom the connectivity should be financed, potentially causing delays in recognising true needs and closing that gap.

- In order to support learning during school closures, **Japan** accelerated the implementation of the GIGA school program. The goal of the program is to ensure that each student has access to a computer as well as to a good Internet connectivity both at school and at home. During school closures due to COVID-19 crisis, the Ministry of Education ensured support to low-income households to cover the costs of Internet connection, building on existing subsidies and other programs. Special efforts were made to ensure that final-grade students could have proper access to online learning (6th graders in elementary school and 3rd year students in junior high school). In order to enable a rapid response to student's needs, the Ministry of Education supported fast track procurement by contacting suppliers and ensuring specialist advice to local governments.

Strategies

Since equity issues are at the heart of the design of digital curriculum, a growing number of countries/jurisdictions aim to ensure equal access for all students. This is done by equipping schools with the necessary hardware and providing financial subsidies to schools and students in need. A further approach taken by several countries and jurisdictions designs digital learning platforms to meet individual students' needs. It includes adaptive content or assessment to tailor learning to students' individual progress (Zhao and Frank, 2003[7]), and provides alternatives to digital means when it comes to ensuring equity.

Digitalising textbooks, teaching materials, and learning resources can help countries/jurisdictions to provide a wider set of pedagogical tools to teachers and students. Additionally, it can support parents and help reintegrate out of school students by providing an alternative to in school learning.

Finally, preparing for digital learning and teaching as the post crisis "new normal" can both fulfil an immediate need and address broader equity issues.

Mobilising available resources to provide digital devices and connectivity for all students

Some countries/jurisdictions take active steps to reduce the digital divide between students via equitable access to digital resources and devices. For instance, government led initiatives in **Japan** equip schools with the hardware and software students need to engage with the curriculum both at school and home. **Hong Kong (China)**, instead provides one off grants to schools to enable access. **Estonia** offers a mix of initiatives, combining annual grants with local initiatives and effective monitoring, to ensure every student uses digital resources to the extent needed. In **Singapore**, multiple stakeholders, from the government to the private sector, offer initiatives to target the connectivity gap. Subsidising Internet access for socio-economically disadvantaged students is also a strategy to reduce disparities in accessing the digital curriculum. The COVID-19 crisis accelerated use of this strategy in a number of countries/jurisdictions, including **New Zealand** and **Singapore**.

- **Estonian** schools offer computer classes, have mobile computer racks to use computers in various lessons, and resort to a bring-your-own device (BYOD) approach. Students feel more comfortable focusing on subject-learning when using their own device instead of simultaneously learning how to properly handle a new device or software. Additionally, yearly grant schemes let schools upgrade their digital infrastructure to enhance IT education (e.g. educational robots, labs). Applicant profiles and competencies are screened to ensure capacity to handle the technical base/teaching methodology. During the COVID-19 crisis, schools lent their computers to students in need. Local initiatives also pair families in need with families having an extra device at home, helping to bridge the access-to-device gap. In addition, in order to ensure that every student uses digital resources to the extent needed, a service was developed to collect digital footprints of students and analyse their alignment with the national curriculum. This provides advanced insight into the usage and effect of the digital curriculum for each student. Usage metrics, coupled with powerful diagnostics and planning tools for teachers, leverage equal access to the digital curriculum.
- In December 2019, **Japan's** Ministry of Education, Culture, Sports, Science and Technology announced a new initiative known as the Global and Innovation Gateway for All School Package (GIGA). GIGA supports individual students to develop optimal learning by providing one tablet per student in all primary and lower-secondary schools by 2023, as well as equipping schools with the necessary network facilities, cloud services, etc. The initiative also includes software to use tablets effectively in the classroom, and provides digital learning materials, examples of learning activities in each subject, teacher training, and support staff. The new National Curriculum Standard was implemented in April 2020. This initiative supports equal learning environments for all students, and is aligned with implementation of the new curriculum.
- As part of **New Zealand's** COVID-19 response, the locally determined response to gaps and needs was augmented by a national push to address learner access to digital devices and Internet connections. During New Zealand's lockdown period, the government provided students in high-need areas with over 23 000 laptops and arranged Internet connections for close to 52 000 households. Alongside this, the government works to build teachers' capability to use digital tools as part of their teaching practice, to ensure that equitable access is accompanied by effective use of digital technology.
- **Norway** took the path of providing grants to strengthen digital education, including for pedagogical digital competencies for teachers, as well as necessary equipment/infrastructure and digital learning resources for schools.
- **Portugal** instituted in April 2020 the Digitisation Program for Schools, within the scope of the Digital Transition Plan. As part of this program, a technological kit consisting of a computer and broadband for Internet access is being distributed to each member of the school community (teachers and students of all compulsory education).
- **Hong Kong (China)** launched its Fourth Strategy on IT in Education (ITE4) in the 2015/16 school year. This strategy aimed to unleash the power of all students to learn and excel by realising the potential of IT to enhance interactive learning and teaching experiences. Under ITE4, schools can implement the Bring Your Own Device policy according to their own pace and context. The Education Bureau disbursed a one off grant to schools to acquire mobile computing devices, either as an initial development or to supplement existing resources.
- **Singapore** schools from pre school to Junior College entered into full home-based learning from 8 April to 2 June 2020 as a result of the COVID-19 crisis. At the start of this period, Singapore's Ministry of Education (MOE) loaned 3 300 tablets and laptops, and over 200 dongles for Internet access to students whose families required financial assistance. Corporate sponsors also provided students in need with free dongles and Internet subscriptions. For example, an Internet and telecommunications service provider sponsored unlimited mobile broadband connections for 550 students from lower-income families who did not have access to broadband at home. Singaporean society also pitched in. For example, a national athlete formed a small-business computer company to collect used laptops locally, and refurbish and distribute them to students in need. Others collated tips and resources to help parents and students cope with home-based learning and work. For students still unable or from environments not conducive to participate in home-based learning, schools were opened to them with teachers to support their learning. As of 15 April 2020, about 12 500 laptops and tablets were loaned out, with 1 200 Internet-enabling devices, including dongles. Low-income families can also apply for subsidised computers and free broadband through the Infocomm Media Development Authority's NEU PC Plus programme.
- New South Wales in **Australia** has a long-standing practice using technology to offer real-time distance teaching sessions through video conference, phone, lessons via satellite and virtual excursions. It also offers non-real-time teaching practices (e mail and online learning management systems, such as Moodle) to students in remote regions who would otherwise be excluded from learning (OECD, 2020[3]).

Engaging and supporting parents for digital learning at home

Parental support and/or familiarity with digital tools is crucial to stay on top of students' learning, preventing or decreasing learning gaps. Some countries, such as **Estonia**, have successfully involved parents in digital learning platforms and propose seminars to improve digital skills. Others, like **Ireland**, **Portugal** and **Singapore**, provided documents and other information with guidance for parents on developing positive school-home partnerships.

- **Estonia** went through a successful pilot during COVID-19, buying licenses of digital textbook platforms for all stakeholders, including students, school staff, and parents, enabling equal access to all, no matter the autonomous school preferences. Parents were included in the agreement to ensure they are able to provide support to their children by logging in with their own digital identity. Ever since, parents are more involved in the information exchange between schools and homes, moving to the virtual environment instead of ad hoc calls and meetings. Schools also organise various seminars for parents to improve their digital skills.
- In **Singapore**, during the COVID-19 pandemic, the Ministry of Education (MOE) recognised that home-based learning would be a difficult transition not only for teachers and students, but also parents. As such, MOE set up a website called the MOE Parent Kit and digitally distributed this information to all parents. In it, MOE shares "a few key areas where you can work with your child's school to develop positive school home partnerships"[4].
- In **Ireland**, the Ministry of Education provided online resources to parents during school closures. Among the materials are several documents providing guidance for parents of children in primary schools on the continuity of schooling. Documents specifically dedicated to parents of children at risk of educational disadvantage and with students with SEN were also provided (OECD, 2020[3]).
- In **Portugal**, families with children younger than 12 (who did not return to school until after the summer holidays in 2020) received extra financial support by the government. This support was extended to families with children who suffer from chronic illness or physical impairments, even if older than 12. A document on the role of the Resource Centres for Inclusion (CRI) in supporting families was published on the Apoio às Escolas website. CRI goes home offers strategies and activities for children, young people, and families, with a set of practical guidelines related to psychology, psychomotricity, and occupational, physical and speech therapy (OECD, 2020[3]).

Designing digital platforms to meet individual students' needs and to support teachers

Countries/jurisdictions are developing online platforms to host the curriculum, related learning materials and assessment tools. The complexity of these digital platforms varies. In some countries/jurisdictions like India, the platforms are a simple repository as a catalyst for collecting open source materials, while in others they are interactive platforms that provide adapted content based on students' learning progression and needs. Often, as in **Québec (Canada),** these are designed to provide teachers with materials to organise teaching and learning for their students. Some also target students directly and have an adaptive component that personalises learning to students' needs, as in **Estonia**.

- **Québec (Canada)** has a Digital Action Plan for Education and Higher Education that encourages use of digital technology and innovative practices in teaching and learning more generally. The Ministry of Education oversaw the introduction of a platform providing diverse, high quality digital education resources, which are presented in a user-friendly and evolving environment that simplifies searches for teachers. It could also be easier to monitor students through the data collected via the platform, subject to best practices in security and confidentiality.
- To facilitate the personalisation of learning paths, **Estonia** initiated development of an AI driven personal learning path infrastructure (https://nation.education), providing standards, services, and data to reduce costs and increase impact of personalisation in education. Data-driven services, backed up with modern AI technologies, support evidence-based decision-making and provide advanced insights and diagnostics for each student in real time. Learning analytics dashboards provide visualisations, which help understand students' learning behaviour – how they learn, what motivates or inhibits their learning – enabling teachers to intervene prior to drop out or test failures.
- In **India**, the Department of School Education and Literacy and Ministry of Human Resource Development launched the VidyaDaan Programme: A Remote Learning Initiative Across India in April 2020. The programme uses contributions/donations of educational e learning resources by educational bodies, and private-sector and individual experts. These resources are made available on the DIKSHA, a digital learning platform that caters to students and teacher learning needs. The VidyaDaan programme also catalysed the creation of various digital learning initiatives (e.g. Swayam Prabha Television Channel, Shiksha Vani students' e learning application, E-Pathshala, NROER – an open repository of textbooks and additional resources).

- **Kazakhstan** created an Educational Resource Platform to support teachers in updating the content of secondary education. It is a comprehensive online platform providing methodological support and an opportunity to share experiences through publishing their best work online. The platform currently hosts more than 160 000 items, including methodological materials, short-term plans, didactic and laboratory works, materials on formative and summative assessment, audio and video files, presentations, and many other useful teaching and learning materials in Kazakh, Russian, and English (learning and teaching materials in English are available for upper-secondary education). Using these, teachers organise their teaching process through the application of necessary components, which eases the search for information by specific parts of the subject while planning a lesson. In addition, students and teachers have access to digital textbooks and learning materials approved by Ministry of Education and Science. They also have access to approved digital textbooks and learning materials on a number of websites.[5]

Making digital textbooks and learning and assessment resources accessible to all students

- Many countries/jurisdictions, including **Mexico**, **China**, and **India** develop digital textbooks and learning resources to help reach all students. While the use of these resources became evident during school closures resulting from the COVID-19 crisis, they also help enlarge sources and methods of learning.
- **Mexico** acknowledges that a digital curriculum can be considered an advantage for students with disabilities, since it allows for the use of adapted technologies, and students with sensory disabilities can benefit. However, this results in the need to integrate adapted technologies by type of disability in both teacher training and the equipment of educational centres.
- **Scotland (United Kingdom)** designed assessments during COVID-19 that integrated video and self-assessment. The government gathered and shared advice on practice that supports clarity of instruction, and design and set-up of digital learning environments.
- **China** introduced various policies to encourage digitalisation of teaching materials. The 13th Five-Year Plan for Education Digitalisation, issued by the Ministry of Education, builds a networked, digital, personalised, and lifelong education system. The 2010 document entitled "Opinions on Accelerating the Development of China's Digital Publishing Industry" proposed that, by 2020, traditional publishing units should complete the digital transformation fuelled by the growing trend toward digitalisation and the concern for educational fairness, as well as the characteristics of a green economy, environmental protection, rich media, relevance, openness and interactivity of digital textbooks. From this perspective, digitalisation has the potential to support multiple levels of education and diversity, and help educators meet personalisation requirements.
- **India's** National Policy on ICT in School Education, revised in 2012, states that textbooks, guides for teachers and students, question banks, frequently asked questions, laboratory manuals, problem sets, activities, notes, and a variety of other print-based learning resources available in the public domain will be digitised and deployed on national and state level web based digital repositories. The National Council of Educational Research and Training (NCERT) has initiated the provision of access to all educational content, including e books through e portals and mobile apps for schools to NCERT vendors, parents and students. Online learning platforms were launched to enable students and youth to adapt the curriculum to their areas of interest. In addition, some state governments partner with technology-based education organisations to implement Android tablet-based gamified learning solutions that cater to individual student needs, especially for students with special education needs and those referred to remedial classes.
- In **Kazakhstan** a new online platform (Online Mektep) was developed in 2020 to support students during the Covid-19 pandemic and ensure equal access to a high-quality education for all students. The goals of the platform include the creation of a database of digital educational content from grades 1 to 11 in accordance with the State Compulsory Educational Standards (SCES) of the Republic of Kazakhstan, supporting students in distance and personalised learning, and monitoring learning achievements. Content is developed by leading specialists and available in three languages: Kazakh, Russian and English. It is free of charge and it has been approved and recommended by the Ministry of Education and Science of the Republic of Kazakhstan. Taking into account the different levels of achievement and pace of learning, students have the opportunity to study the materials on the platform on their own (in a personalised way). This helps to consolidate the material studied, and to design individual learning schedules. The platform supports the teaching process through a variety of functionalities, such as online exercises in real time, monitoring class progress through lessons and exercises, online chat with the class or with individual students, creating homework, checking and grading, lesson design, statistics and analytics, conducting online lesson in video conference mode, among others.

Continuing the use of print and alternative distribution channels

Sometimes, digital resources might not be the best strategy to enable equitable access to the curriculum for all students. Students might have learning needs that render paper more appropriate. They also might lack the resources to obtain digital access. Thus, some countries/jurisdictions, including Australia, Portugal, New Zealand and Chile, ensure equity by supplementing digital materials with printed materials. Other countries like **France**, **Korea**, **Colombia** and **Kazakhstan**, increased use of alternative channels such as TV and radio to ensure equity in environments where access to connectivity or devices lacks.

- In response to the COVID-19 crisis, the **Australian** Curriculum, Assessment and Reporting Authority facilitated the sharing of digital resources among educational sectors. State and territorial authorities provided schools and systems with online resources and learning programmes aligned with the Australian Curriculum. In some instances, digital material was supplemented or complemented by print materials to ensure continuity and equity of access. Schools and teachers adapted methods and modes of communication, interaction, and instruction in both digital and traditional classroom environments to maintain student engagement and learning.
- The **French** Ministry of Education created and strengthened partnerships with several national media, such as culture- and education-oriented television and radio channels, in order to offer further educational material and reach as many students as possible.
- **Korea's** agility in expanding education services beyond schooling, to ensure learning opportunities for all students, helped the country cope during the COVID-19 school closures. Korea rapidly deployed online learning platforms, but also quickly co operated with the Korean Educational Broadcasting System and other telecommunications companies, providing an option for students with difficulties accessing computers or Internet connectivity.
- In **Portugal**, schools, and public and private organisations partnered to provide laptops and Internet access to students from disadvantaged backgrounds. In co operation with the Post Office Services and the National Scouts Group, a mechanism was implemented allowing students who live far from schools or without access to Internet to receive hard-copy lessons and tasks. Deliveries of homework/assignments on paper to students, and collection and return to teachers were organised (OECD, 2020[3]). The Portuguese Ministry of Education also launched the #EstudoEmCasa educational programme to enrich students' education during the crisis. This programme, mainly directed at primary students, broadcasts on the public television channel. To enhance this educational resource, a roadmap with nine guiding principles was provided to students, families, and schools with information on the operation of this initiative. Weekly television grids were shared with students, families, and schools in order to plan the viewing of transmissions.
- In **New Zealand**, a new online learning space, hard-copy learning packs, and special television programmes were offered to reach all learners (OECD, 2020[3]).
- Besides the creation of online learning platforms and the distribution of computers, the Ministry of Education of **Chile** distributed printed pedagogical materials to more than 380 000 students in rural schools, disadvantaged areas, and locations with poor Internet connection. In the most remote regions, the Ministry partnered with the national Air Force to distribute needed materials to many students (OECD, 2020[3]).
- In **Colombia**, the government developed an online platform with more than 80 000 pedagogical resources to which low-income families have free access. When these families do not have an Internet connection, they can access the platform without consuming their mobile data (OECD, 2020[3]).
- In **Kazakhstan** digital materials were supplemented with the availability of alternative learning formats. For example, TV lessons on "EL ARNA" and "Balapan" channels, as well as lessons broadcasted through the radio. During school closure teachers had the opportunity to choose the most convenient learning format to achieve the learning objectives defined in the national curriculum.

Using digital curriculum to reintegrate out-of-school students or early school leavers

Some countries/jurisdictions use a digital curriculum to reach students unable to attend school, or who have left the formal school system early. While distance or remote learning is not new, digitalisation of the curriculum simplifies access to the learning content.

In the past, distance learning relied on mailing students textbooks and other paper-based materials needed to engage with the curriculum. Current practices rely more prominently on online platforms. In Japan, for instance, upper-secondary correspondence schools (education through distance learning) use a mix of online learning and face to face time with a teacher or tutor to provide guidance to students.

The experience of remote learning during the COVID-19 crisis also underscores potential uses of digital curriculum for out of school students and hospitalised children. The opportunity to join virtual classrooms to meet the psychological, social, and informational needs of hospitalised children is being seized, creating a favourable learning environment and decreasing the need to catch up, as well as better re integration into schools in the future (Kozareva Veronika, 2016[8]) – provided that a teacher can support the process in the hospital (see the Lessons Learned section of this report).

- In **Québec (Canada)**, distance education helps meet the needs of students who spend time away from school for a variety of reasons (e.g. enrolment in a sports study programme, hospitalisation, and travel), are home-schooled, go to school in a remote region, or attend a small school that does not have resources to offer all courses on site.
- In **Ireland**, an initiative called iScoil offers early school leavers (age 13 16) an alternative path to learning, accreditation, and progression via an online learning community. Learning is tailored to students' needs, interests and abilities, and is undertaken by students at home or in a local blended-learning centre. Each student is assigned an online mentor. The initiative receives funding from the state under the What Works initiative, and referrals to the service are made by the Education Welfare Service under Tusla, the Child and Family Agency.
- **Japan** has an established system of upper-secondary correspondence schools. They enrol approximately 5% of all high-school students. In some of these, students can learn online at their own pace by selecting their study time, learning method etc. To ensure the quality of education, the National Curriculum Standard requires these schools to review students' work and provide feedback and guidance, as well as to ensure a given amount of face to face instruction. These high schools include students who have a variety of learning experiences and motivation, including students who are often absent from school, those who have dropped out of regular upper-secondary schools, or are physically unable to go to school due to illness, and those who need flexible school-time arrangements to pursue their passion in sports or cultural activities. They also serve as a safety net for students at a high risk of dropping out. This correspondence system is not allowed in primary and lower secondary schools, given the importance of learning collaboratively with friends at those stages.

Preparing a post-crisis "new normal"

During the COVID-19 crisis, infrastructure, connectivity and devices were made available to students who did not previously have access to them, offering additional possibilities in the post-crisis world. Increased, innovative collaboration between stakeholders, including with the private sector, was also observed, for instance in **Canada** and **Estonia**. Also, training to support teachers' transition to a digital environment, which quickly translated to meet needs during the COVID-19 pandemic, was beneficial to countries such as **Hungary**, **Portugal**, and **Norway**.

- In the context of school closures stemming from COVID-19, education systems in Canada delivered education remotely to ensure continuity of curriculum-based study and learning objectives for all students. Distance learning was implemented through a mix of media and channels. This included print-based materials, one way mass broadcasting (TV and radio), and web-based exchanges using social media or learning platforms, as well as innovative teacher-parent-community arrangements. For example, in Saskatoon**, Saskatchewan (Canada)**, school boards, school authorities, the Saskatoon Teachers' Association, SaskTel, and the non-profit Neducation collaborated to support students and families lacking access to stable Internet or devices to continue learning during school closures. Phones that acted as hotspots were delivered with devices within ten days of schools being closed. The hotspots provided access to permitted sites and were tethered to the devices provided by the school divisions.
- In **Estonia**, educational e services are systematically co created via a multi-stakeholder approach including researchers, schools, students, and the private sector, enabling the latter to come up with better services and a business model to allow wider access to services for the population.
- In **Hungary**, during the pandemic, the digital work schedule outside the classroom was supported by previous in service teacher training courses. In recent years, a significant number of teachers attended courses on the use of digital instruments and methods. However, further development of digital skills for teachers and parents remains a critical task. In public education, in order to assist the implementation of distance learning due to COVID-19, detailed and continuously developed recommendations and guidance were prepared and disseminated through the Educational Authority website.[6] Further attention and measures were necessary to provide online access to education for disadvantaged students. Schools offered their infrastructure to students

in need. Teachers support learning in innovative ways. They guided students, including via telephone calls or even personal delivery of lessons in smaller groups. This period brought new challenges and solutions for schools and teachers, who experienced how use of digital tools and online communication can facilitate pedagogical work. It is expected that the up to date digital technology and methodology will be mainstreamed into normal education from the next school year onwards.

- Glow, **Scotland's (United Kingdom)** national Intranet for learning and teaching, provides learners and practitioners with industry-standard productivity and collaboration tools at no cost. It also provides professional learning communities and practitioner resource-sharing features, such as the National Numeracy and Mathematics hub.
- In **Singapore**, in mid 2020, six government ministers described, on a special series of national broadcasts[7], how Singapore could emerge as a stronger and more cohesive society that is able to survive and thrive after the COVID-19 crisis. One area to receive more support is the acceleration of plans to equip all secondary-school students with a personal laptop or tablet for learning. This will be carried out by 2021, seven years ahead of the schedule.
- In **Portugal**, after the suspension of face-to-face classes in schools due to the pandemic, the main goal of the Ministry of Education was to ensure that every student could continue to learn from their home. For this purpose, the document "8 Guiding Principles for the Implementation of Distance Learning"[8] was published, in order to support schools conceiving their strategy and distance learning plans which could better respond to their contexts. The Portuguese Ministry of Education developed the website *Apoio às Escolas*[9] with resources to support schools in distance learning methodologies. A Facebook page was created with information, documents, and suggestions for working with students, as well as a YouTube channel for sharing classes and educational initiatives. Teachers' associations and scientific associations were involved in the production and sharing of pedagogical and didactic materials from the disciplines of the national curriculum. Contacts were developed with the main educational content publishers in order to expand online resources available to teachers. A digital library model was also developed for teachers to access and share content (OECD, 2020[3]).
- To support teachers and parents in this new situation, the Nordic countries shared their e learning solutions for free. They jointly shared over 40 remote-learning solutions from **Estonia**, **Finland**, **Denmark**, **Iceland**, **Latvia**, **Lithuania**, **Norway** and **Sweden** (OECD, 2020[3]).
- In collaboration with universities, **New Brunswick (Canada)** developed an online module aimed at training teachers for culturally and linguistically diverse classrooms. It was put in place to support mainstream teachers in gaining skills required to teach English as an additional language to students from migrant backgrounds during school closures (OECD, 2020[3]).

2. PERSONALISED CURRICULA

Designing personalised[10], differentiated, or individualised curriculum content can address equity concerns by ensuring that the learning needs of a wider range of students are met. Countries/jurisdictions use various forms of personalisation depending on the targeted student population.

Challenges centre around identifying individual student needs, training and bias among teachers, assessment, and budgeting at the school or policy level (Bredtmann, Otten and Vonnahme, 2018[9]; Borgonovi, Ferrara and Maghnouj, 2018[10]). Parental lack of awareness and expectations are also a challenge, potentially impeding access to personalised assistance.

Strategies involve policies and legislation supporting personalised needs. For example, curriculum designers can adapt curriculum content to better meet the learning needs of students at risk of falling behind or students with special educational needs. They can also make the language of curriculum content accessible to a wider group of students. Finally, they can make sure that curriculum content responds to the cultural context of a local community or ethnic minority. Training and appropriate financial/technical support are also critical, to ensure teachers have the necessary tools and students have appropriate expectations.

Table 12 **Challenges and strategies related to personalised curriculum**

	Challenge/strategy	Countries/jurisdictions reporting the challenge/strategy
Challenges	Curriculum adaptation to certain groups of students	Australia, British Columbia (Canada), Ireland, Portugal, China (People's Republic of), South Africa, Viet Nam
	Support for students with special needs	Norway, Portugal, Kazakhstan
	Support for students at risk of leaving school early	Estonia, Hungary, Portugal, Singapore
	Teacher preparedness	Estonia, Costa Rica, South Africa
	Teacher bias	Ireland, Argentina
	Standardised testing and parental expectations	Hong Kong (China)
	Misalignment with assessment and certification	Estonia, Costa Rica
	Insufficient budgeting	Wales (United Kingdom)
Strategies	Supporting schools to develop individual study plans and syllabuses	Denmark, Estonia, Finland
	Integrating personalised learning in education legislation or in the curriculum	Estonia, Norway
	Aligning the focus of teacher training and support	Hong Kong (China), Singapore, South Africa
	Involving teachers and community partners in curriculum design	British Columbia (Canada), Saskatchewan (Canada)
	Adapting materials and assessment	Estonia, Portugal, Poland
	Providing targeted funding and technical support for schools	Finland, Ireland, Japan, Norway, Russian Federation
	Using extracurricular activities to provide personalised support for students at risk	Hungary
	Involving and engaging stakeholders to design culturally responsive curricula	British Columbia (Canada), Saskatchewan (Canada), New Zealand, Costa Rica
	Publishing the curriculum in multiple languages	Finland, Hungary, Norway, Mexico

Source: Data from the PQC, findings from the research section and from *The impact of COVID-19 on student equity and inclusion* (OECD, 2020[3]).

Challenges

Countries/jurisdictions reported several challenges in designing and implementing personalised curricula, in particular, when identifying the student populations in need of a personalised curriculum and adapting the curriculum accordingly. In some cases, despite a national curriculum or education law that promotes personalisation, schools still design and use one static curriculum for all their students due to lack of teacher preparation for personalising the curriculum.

Biases among teachers and school leaders relating to students' ability and potential may pressure curriculum designers to use a one-size-fits-all approach (Hosterman and DuPaul, 2008[11]; Borgonovi, Ferrara and Maghnouj, 2018[10]). Parents' limited awareness and expectations of personalised curricula can also pressure schools and curriculum designers to limit the extent of personalisation.

Furthermore, challenges arise in misalignment between personalised curricula and policies related to student assessment and certification. Ensuring accountability for national or regional standards with the alignment of personalised curriculum content, pedagogies and assessment adapted to diverse groups of students (special needs, immigrant students, students at-risk of drop-out) then becomes a concern.

Finally, insufficient budget planning before launching personalised curriculum can jeopardise its effective use. Managing costs includes not only direct, but also indirect costs associated with the implementation of personalised curriculum; opportunity costs of teachers to ensure teacher well-being; supporting teacher agency so that they can design and manage personalised curricula for all students.

As curriculum designers plan the structure and content of personalised curricula, they must consider the resources available to schools and the possible need to mobilise additional support.

Curriculum adaptation to certain groups of students

Countries/jurisdictions aim to ensure that diverse student populations meet minimum learning standards. To reach this goal, curriculum designers need to accurately identify learning needs and provide guidance to teachers on how to adapt the curriculum to meet them. However, some countries/jurisdictions, including **Australia**, **China**, **South Africa** and Viet Nam report difficulties doing so.

Some countries/jurisdictions, such as **Ireland**, identify the need to further adapt their curriculum to the learning needs of Indigenous students, those of ethnic or linguistic minorities, and of immigrant backgrounds. Adaptation of the curriculum is necessary to the equity of learning outcomes. For example, without adaptation, students who do not speak the language of instruction at home may face difficulty mastering literacy in that language. Similarly, supplementary language classes may be needed for new-immigrant students.

- The **Australian** Curriculum was designed for all young Australians and can be differentiated to meet the needs of each student. A Review of the Australian Curriculum (2014) identified the need to improve advice on curriculum accessibility for the full range of learners: students with a disability; gifted and talented students; and students for whom English is an additional language or dialect.
- **British Columbia (Canada)** notes that, while the provincial curriculum needs to apply to all learners, teacher resources and tools aligned with the curriculum can further enhance inclusion, equity and the integration of Indigenous perspectives and diverse world views. Furthermore, immigrant and refugee students who do not speak the language of instruction (English or French) face the challenge of learning a new language before they fully engage with content in different areas of learning.
- **Ireland** cites the need to ensure additional support for vulnerable groups – particularly Traveller students and students for whom English or Irish is not the first language – and that all children, particularly in areas of social and economic disadvantage, reach acceptable standards of literacy and numeracy.
- In **Portugal** the law in force offers the possibility of implementing curriculum adaptations for specific groups of students or even individually.
- **China** reports a solid common foundation among its students but insufficient development of students' individual needs.
- **South Africa** notes that a large percentage of learners lag because teachers are unable to identify barriers to learning (particularly in literacy and mathematics) early enough to address them in a timely manner.
- **Viet Nam** has a national curriculum to help ensure that all students meet a common minimum standard. However, there are challenges in implementing the curriculum, particularly related to students with learning difficulties (including disabilities) and students whose native language is not Vietnamese, and to schools with difficult conditions (especially in disadvantaged areas).

Support for students with special needs

Some countries/jurisdictions, such as **Norway** and **Kazakhstan**, report challenges related to identifying and supporting students with special educational needs[11]. Some countries/jurisdictions noted that SEN support targets only the most acute cases, leaving many students with limited in-school support for learning. Some countries and jurisdictions report a deficit approach[12] to the education of students with SEN, which has implications for how these students are supported.

- In 2018, **Norway** established a national group of experts to review its system of support for children and young people with special education needs. The group found that Norway's system for identifying and addressing needs for support in learning does not help all students. Students who do not meet the criteria for SEN support but are still underperforming in schools receive limited additional learning support (Nordahl, 2018[12]). To address this issue, in 2020, Norway experimented with a differentiated, multi-tier approach to teaching and learning in about 300 schools (Borgonovi, Ferrara and Maghnouj, 2018[10]). In addition, in 2019, the Norwegian Government presented a white paper (Meld. St. nr 6, 2019-2020) on the system of support for children and students with special educational needs. The aim is to improve the capacity of kindergartens and schools to intervene early, when children and pupils encounter difficulties in learning. All schools should have access to teacher specialists in initial training, and all kindergartens and schools should have teachers with formal competence in special education.

- **Portugal** approved a new decree-law on inclusive education. The legal framework for inclusive education (Decree-Law No. 54/2018, 6th July, with the amendments introduced by Law No. 116/2019, 13th September), following a rigorous evaluation process of the past ten years of policies and practices in supporting students with special education needs, establishes the principles and regulations that ensure inclusion as a process which responds to the diversity of needs and capabilities of each and every student, through increased participation in the learning processes and educational community. The methodological approach establishes a continuum of provision for all students according to the universal design for learning and the multi-level approach to access the curriculum. Schools have autonomy to organize flexible curriculum responses to the needs and capacities of their students rather than established student categories based on clinical labels, recognising that every student can learn.
- In **Kazakhstan**, children with special needs and disabilities are taught in separate so called correctional schools, in special groups and classes in general education schools, and in the children's homes. But such conditions limit learners' opportunities to access the full curriculum, interact with other children, and develop the abilities and potential that they share with them. The concept of disability in Kazakhstan is still influenced by the Soviet concept of defectology, which focuses on a person's particular disability and trains practitioners as specialists in care and correction of that specific disability.

Support for students at risk of leaving school early

Some countries/jurisdictions, including **Estonia**, **Hungary** and **Singapore**, highlighted the challenge of identifying and supporting students at risk of leaving school early. Failure to do so leads to significant disparities in learning outcomes and school completion rates along socio-economic lines, with students from poorer backgrounds more at risk of falling behind or leaving school than their socio-economically advantaged peers.

- In **Estonia**, 3% of students need special support because of their socio-economic status, which can impact whether they drop out. System-wide support includes extracurricular activities, which are mainly offered publicly within or outside of school. At least 60% of Estonian students engage in system-wide extracurricular activities. Youth work, including counselling and other activities, focuses on co-operation with schools to work with young people with low socio-economic background, and those who might belong to the group at risk of dropout in an effort to keep them in school.
- In **Hungary**, students who repeat grades sometimes drop out of school, and there is no system wide support to provide them with an inclusive educational experience. Assistance at the individual level also lacks among high skill, talented learners.
- In **Portugal**, in order to reduce school dropout and promote educational success of disadvantaged learners, several actions are in place, such as: i) support measures related to socio-economic conditions in the schools' locations, within the Priority Intervention Educational Areas Programme (TEIP); the development of typologies of work and the organisation of educational activities in the scope of the Programme for the Promotion of School Success (PNPSE); and School Social Assistance (ASE) for students with a poor economic condition.
- Despite high overall achievement, in **Singapore** 7% to 8% of students begin the first year of formal schooling with limited oral English language skills and lack developmentally appropriate early literacy skills. They are academically not ready for school and are at risk of failing.

Teacher preparedness

While allowing and promoting the personalisation of curricula is an important first step, the approach will only ensure equity if teachers are adequately prepared to undertake personalisation. This is not the case in all countries/jurisdictions, as reported by **Estonia**, **Costa Rica** and **South Africa.**

- **Estonia** finds that the problem implementing personalised curricula is not so much a lack of money, but a lack of shared understanding of what personalised curriculum is and how to implement it.
- **Costa Rica** has two practices for teachers to customise learning to students' needs: non-significant curricular adaptations and significant curricular adaptations. Non-significant adaptations have to do with adjustments to teaching time, organisation and pedagogy, and they are determined and implemented by teachers. Significant adaptations require modifications of the learning objectives and contents. These shall be timely proposed by teachers and they must be approved by the Committee of Educational Support. However, teachers do not receive adequate training in contextualisation and adaptation of the curriculum to modify their teaching practices.

- Few teachers in **South Africa** are equipped with skills to differentiate and individualise instruction. Students with learning difficulties (including disabilities) are not effectively supported in the classroom, and education support services are inadequate, especially in rural and disadvantaged areas.

Teacher bias

Students of different abilities are at risk of being separated from peers who have more traditional behavioural, or physical, cognitive or developmental paths. Without policies, programmes or legislation to mandate equitable access and services, students may face consequences ranging from implicit bias to outright segregation. Teacher bias, such as towards students from minority backgrounds, is well documented (Tenenbaum and Ruck, 2007[13]; Warikoo et al., 2016[14]). Imprecise policies and procedures could further exacerbate inequities for students from diverse racial/ethnic, gender, or special needs backgrounds.

A number of countries/jurisdictions report that some teachers and school leaders hold strong beliefs about the inability of some students to meet learning standards. Often called deficit models, these beliefs can constrain designing personalised curricula at the school level to ensure that all students achieve their full potential.

- **Ireland** cites the challenge of ensuring that pupils with special needs in mainstream education receive an education that allows them to reach their true potential. Ireland cautions against categorising learners and assigning labels of contested disabilities that may result in lowered expectations for individual children and their learning.
- In **Argentina**, some teachers and principals have a negative mindset regarding the ability to learn of students from disadvantaged populations.

Standardised testing and parental expectations

Parental expectations for their children's education can hinder the design and implementation of personalised curricula. Some parents, as reported by **Hong Kong (China)**, put pressure on schools to cover all the content in the curriculum, leaving little space for personalisation. This is often due to the pressure of high-stakes standardised examinations which, in many countries/jurisdictions, are not personalised to accommodate all students.

- The curriculum in **Hong Kong (China)** applies to all students in the same age cohort and aims to cater to the full range of the ability spectrum. The original intention of the curriculum was to meet the needs of all students, through curriculum adaptation by teachers to cater for learner diversity. But some schools and parents tend to encourage students to study all curriculum content in both core and elective subjects, which can prove challenging for students who are struggling.

Misalignment with assessment and certification

Countries/jurisdictions such as **Estonia** report that their assessment systems are not compatible with a personalised approach to learning. In **Costa Rica**, the certification offered students who receive significant curricular adaptation or customisation is viewed as less legitimate. This creates risks to equity by limiting students' future prospects.

- In **Estonia**, the current five-grade summative assessment does not encourage personalised learning. But formative assessment principles have been adopted in national curricula since 2010. Teachers are provided with a lot of training to use formative assessment.
- In **Costa Rica**, two practices allow teachers to customise learning to meet students' special needs: non-significant and significant curricular adaptations Non-significant adaptations affect teaching time, organisation and pedagogy and can be decided by teachers. Significant adaptations also impact learning objectives and contents, and they need to be approved by the Committee of Educational support. However, when students finish their school year, the certification awarded to students with special needs does not have the same validity or offer the same opportunities as certification awarded to students without those needs.

Insufficient budgeting

As curriculum designers develop personalised curricula to meet the learning needs of a wider set of students, they must think about the resources needed at school level to manage and implement these. For example, schools might need funds to hire teacher assistants, trained SEN staff or language teachers. They might also need funding to train teachers on how to personalise teaching and learning to their students. Such funding should be sufficient and stable over time to allow schools to plan.

- **Wales (United Kingdom)** finds that schools and teachers lack the resources to meet the diverse learning needs of all students. Funding programmes are administratively demanding and fail to provide the stability needed to build internal capacity. In addition, the role of support staff engaged in students' learning is not sufficiently recognised.

Strategies

In a growing number of countries/jurisdictions, it is schools' responsibility to adapt the national curriculum and develop personalised learning content for all students. To do so, schools need adequate support. Many countries and jurisdictions integrate guidelines on personalised learning into education legislation or into the curriculum itself to help guide schools in designing and managing personalised curricula. Moreover, to empower teachers and schools to design inclusive curriculum content, many countries/jurisdictions align the focus of teacher training and support with personalised curricula.

Countries/jurisdictions target curriculum processes and content to specific student populations. For example, some design curriculum or related interventions for students with special needs. Others offer extracurricular activities to students at risk or design culturally responsive curricula to meet the needs of Indigenous students. Publishing the curriculum in other languages is another strategy to target specific student populations through personalisation.

Supporting schools to develop individual study plans and syllabuses

In many countries/jurisdictions where schools enjoy a high level of flexibility over curriculum design, it is the schools' responsibility to design personalised curricula to meet the learning and well-being needs of students. Countries and jurisdictions such as **Denmark**, **Estonia**, and **Finland** support schools by a national legislative framework that encourages personalisation (e.g. mandatory in-school time for individualised learning, health and psycho-social support staff, and teacher assistants).

- In **Denmark**, all students must have a plan showing their learning goals, and a meeting with parent(s) is held to discuss the student's academic and social standing. Teaching differentiation ensures that students have the opportunity to reach their learning goals in different ways and at different paces. Supplementary teaching or other professional support can be provided to students who need it. Students who cannot attend school for a long period of time due to illness must be offered teaching at home or at the institution in which they are staying. In addition, help with homework is a mandatory part of the school day, when students get the time and help to immerse themselves and work with elements that they find particularly difficult or exciting.
- In **Estonia**, each school designs its curriculum on the basis of the national curriculum. The school curriculum is the underlying document of teaching and learning in the school. It sets out content choices based on national curricula to adapt to the unique characteristics of the school. The school curriculum focuses on the specifics/uniqueness of the school context and specifies the activities for achieving the expected learning outcomes. The particularities of the school and the region, the wishes of the school staff, parents and pupils, and the available mental and material resources are all taken into consideration in preparing the curriculum. Teachers and other school staff must participate in preparing the school curriculum. The principal's task is to involve students, parents and representatives of other interest groups.
- **Finnish** legislation guarantees equal education in all parts of the country, and the National Core Curriculum is mandatory. Special-needs education services are available in every basic education school, as are school attendance services. The organisation of these is based on inclusion, and the state gives financial support to education providers. The syllabuses can be personalised and adapted for individual pupils. There are also possibilities for grade independent studies and flexible basic education, which reduce dropout and prevent exclusion. The student welfare system developed over the last two decades relies on health and social care staff working in co operation with education staff to help students and their families when they are in difficulty. This multi-professional co operation is based on law and organised locally, alongside support for learning and school-attendance services. Both forms of support are described in the curriculum. The state also gives financial support to education providers for additional weekly lessons for students from minority backgrounds, in their home languages during their years of basic education. The Basic Education Act and the Finnish National Core Curriculum explicitly state how to provide teaching of religions and ethics.

Integrating personalised learning in education legislation or in the curriculum

Several countries/jurisdictions, such as **Estonia** and **Norway**, report that guidelines to schools on how to develop individual learning plans are provided in legislation or in the curriculum document itself. Such guidance can specify the modalities for organising personalised learning, such as how to organise school time and the level of adjustment of the curriculum allowed. It can also suggest tools to adapt the curriculum to students' needs.

- In **Estonia**, legislation ensures the right of all students to education. Teaching students with special educational needs is based on the principle of inclusive education. In order to ensure the right to education for all, Estonia recognises the importance of providing students with adapted support based on their needs. An individual curriculum is drawn up for all students with moderate, severe and profound learning difficulties. The student, their parent(s), and support specialists are involved in drawing up an individual curriculum. A school may change or adjust the time, contents, process, and environment of study. In cases where the changes or adjustments substantially increase or decrease the weekly workload or intensity of studies compared to the school curriculum, or where they reduce or replace the learning outcomes provided for in the national curricula, the individual curriculum can be implemented upon recommendation of the external advisory team and with written parental consent (Estonian Parliament (Riigikogu), 2010[15]).
- In **Norway**, the Education Act and the National Curriculum contain a number of guidelines and key values for customised training, as well as instruments to ensure that all students experience improved learning outcomes. Customised training applies to all students, both those who follow mainstream education and those who receive special education.

Aligning the focus of teacher training and support

Some countries and jurisdictions, including **Hong Kong (China)**, **Singapore** and **South Africa**, recognise the importance of adequately preparing and supporting teachers to personalise curricula to diverse student needs, and take action to doing so.

- **Hong Kong (China)** made great efforts to help schools understand the importance of learner diversity through curriculum adaptation. This includes training teachers to strengthen their professional capabilities in assessment, literacy and technological, and pedagogical content knowledge, conducting curriculum development visits, and providing school-based support services.
- Effective strategies in **Singapore** include: 1) equipping teachers with theoretical understanding of reading development and pedagogical knowledge and skills to support students with literacy difficulties and disabilities; 2) providing support programmes developed by the Ministry of Education to ensure alignment with the core English instruction programme and relevance of additional support; and 3) supporting teachers through on-the-job coaching and regular monitoring.
- **South Africa** developed Guidelines for Responding to Diversity (2011), as well as the Policy on Screening, Identification, Assessment and Support (SIAS) (2014). Significant effort goes into institutionalising these two strategies through training of teachers and int1roducing Guidelines to Resourcing Inclusive Education, which are meant to strengthen support services. The SIAS guides teachers to develop Individual Support Plans and Schedules for Curriculum Differentiation. Both strategies combat grade retention and support learners promoted to the next grade without meeting all the requirements.

Involving teachers and community partners in curriculum design

Countries/jurisdictions such as **British Columbia (Canada)** and **Saskatchewan (Canada)** involve teachers in the design of curriculum content that values equity and inclusion. Such a strategy helps build ownership and educate teachers on the importance of these two values in their teaching. It also helps to ensure that curriculum design is responsive to the challenges of inclusion and equity actually encountered in the classroom.

- In **British Columbia (Canada)**, learning partnerships among a diverse range of equity, education, and community partners develop and implement tools, resources, and professional learning to embed the principles of equity and inclusive education in the curriculum.
- Curricula in **Saskatchewan (Canada)** contain a component called the Adaptive Dimension that allows teachers to adjust the learning environment, instruction, assessment, and resources to make learning meaningful and appropriate, and to support student achievement. Saskatchewan also recognises the importance of assisting educators and community partners to develop a deeper understanding of gender and sexual diversity, and to provide safe, equitable and inclusive learning environments for all students, regardless of their actual or perceived differences.

Adapting materials and assessment

To address misalignment between personalisation of curricula, available learning materials, and assessment practices, countries/jurisdictions such as **Estonia**, **Portugal** and **Poland** take steps to adapt assessments and learning materials to cater to diverse needs of students.

- In **Estonia**, SEN students are provided with special conditions for performing standard-determining tests and examinations. As a principle, if a student is offered support in the process of learning, they should also be offered support in the process of assessing learning outcomes. Co-operating with the school, the government strives to be flexible in finding the most suitable way for the student to take the test or examination. At state level, learning materials are developed and provided for students with special educational needs. These are especially suitable for pupils who study under the simplified curriculum, but can also be successfully used in regular classrooms with pupils who study under an individual curriculum, as well as with non-Estonian-speaking students for language learning and vocabulary building. Methodological instructions for teachers using these learning materials are available free of charge. New digital interactive learning materials for SEN pupils are being prepared.
- In **Portugal**, students are entitled to assistive products to access the curriculum and to improve participation. How they are used must be decided according to the individual characteristics of the student. These assistive products/devices are granted by the Ministry of Education.
- **Poland** provides textbooks, educational and exercise materials, and auxiliary books adapted to the educational needs and psychophysical abilities of students with special education needs. It also equips primary-school pupils with textbooks and educational materials in Braille, adapted to the needs of students with a visual impairment, and in Polish Sign Language, for students with a hearing impairment or learning/communication difficulties. The strategy extends to students with intellectual disabilities, autism and aphasia, using alternative communication methods, such as Picture Communication Symbols.

Providing targeted funding and technical support for schools

As curriculum designers develop personalised curricula, they need to plan the right level of resources for schools to manage and implement these curricula. This may be through targeted funding for support to sub-groups of students, as in Ireland, or broader funding allocations, as in Norway. It can also involve putting human resources, such as teaching assistants, psychologists, and health specialists at the disposal of schools.

Countries/jurisdictions use different strategies to adapt the curriculum to the learning needs of SEN students. **Finland**, for example, uses a continuous approach with various degrees of adaptations based on the student's profile, while other countries, such as **Japan** and **Norway**, provide specific curricula or learning plans to students identified as having special educational needs.

- In 2007, **Finland** introduced a new Special Education Strategy in response to concerns expressed by several municipalities about the increasing number of students referred to Special Education Needs support. This policy was strongly supported by national authorities, who provided financing to municipalities over a period of four years to renew their curriculum, develop guiding documents for schools, and train teachers prior to the change in legislation (Borgonovi, Ferrara and Maghnouj, 2018[10]). The new strategy, fully implemented in 2011, introduced three tiers of support for students at risk of falling behind. Tier 1 is accessible to all students and includes in-class differentiation of learning, remedial teaching, co-teaching with a SEN teacher, and part-time special education support. Organisation of this is at the discretion of the classroom or subject teacher. Tier 2 includes a learning plan for intensified support for students identified by teachers as at risk of falling behind. If Tier 2 is deemed ineffective, a pedagogical evaluation is conducted by a multi-professional team in the school to provide students with the adequate support (transitioning to Tier 3). Tier 3 requires confirmation by the municipality and is regularly monitored by the multi-professional team.
- In **Ireland**, the Delivering Equality of Opportunity in Schools (DEIS) action plan provides support to students at risk of falling behind in their learning or leaving school early. Schools identified as having large concentrations of students experiencing educational disadvantage (defined as impediments arising from social or economic disadvantage that prevent students from deriving appropriate benefit from education) receive targeted funding to adopt a whole school strategy, as well as specialised programmes such as Reading Recovery, Maths Recovery and the Junior Certificate School Programme. The literacy, numeracy, and attainment levels of marginalised pupils rose significantly since the introduction of the DEIS programme (Kavanagh, Weir and Moran, 2017[16]; Weir and Kavanagh, 2018[17]). Furthermore, Ireland ensures additional support for vulnerable groups, particularly Traveller students and students whose first language is not English or Irish.

- In **Japan**, there are separate curricula for students with difficulties communicating in Japanese, those who are disabled, and those who need special care and assistance due to frequent absences from school. While they are based on general curricula, these separate curricula are extensively customised to the needs of each student.
- In **Norway**, the government allocated approximately EUR 40 million for measures to support vulnerable students disproportionately affected by COVID-19 measures. Among these, EUR 17 million are disbursed to school leaders to help vulnerable students catch up learning losses. The funding was used for initiatives including the establishment of summer schools, the implementation of accelerated education programmes, homework assistance, hiring more teachers, etc. Also, in Norway, students who receive special education have the right to an individual education plan that shows learning objectives and content, and how training is organised.
- In the **Russian Federation**, the 2014 Special Educational Standard for children with special needs and physical impairments sets requirements for the facilities, equipment, clothing, safety procedures, etc. necessary to work with children with mental or physical disabilities for whom adjusted curriculum programmes were developed.

Using extracurricular activities to provide personalised support for students at risk

Some countries/jurisdictions, such as **Hungary**, use extracurricular programmes to meet students' learning needs that cannot be adequately addressed during instruction time due to resource constraints.

- Many schools in **Hungary** lack material and human resources. In particular, many schools do not have dedicated teaching assistants to deliver a differentiated curriculum to students who are falling behind. Thus, while the curriculum calls for adapting learning to students' needs, this is rarely done. Instead, some out-of-school programmes help students at risk of dropping out or who have already dropped out.

Involving and engaging stakeholders to design culturally responsive curricula

Both **British Columbia (Canada)** and **New Zealand** report engaging Indigenous communities in the design of curriculum content to make sure that it is representative of their needs, values, and aspirations. Often these design requirements are spelled out in policy, as in **Saskatchewan (Canada).**

- **British Columbia (Canada)** added Indigenous content across the curriculum. Integrating Indigenous perspectives and different worldviews was a fundamental part of the curriculum redesign. The Ministry of Education worked with a number of Indigenous educators and education groups to seek input, review curriculum drafts, and provide feedback. In addition, the Ministry of Education promoted development of education agreements between school districts and local Indigenous groups to enhance education within their districts.
- In 2007, **Saskatchewan (Canada)** implemented mandatory treaty education for students from kindergarten to Grade 12. First Nations and Métis content, perspectives, and ways of knowing are always integrated within the renewed curricula. These are co-constructed, as the ministry engages teacher-writers, First Nations and Métis Elders or Knowledge Keepers, and others to ensure that multiple perspectives are heard and supported in curricula.
- In **New Zealand**, discussions of equity/diversity and 21st Century learning recognise that the changing global environment requires people to engage and be able to work with people from cultural, religious, and/or linguistic backgrounds or world views different from their own. At a national level, New Zealand offers two parallel curriculum documents: the New Zealand Curriculum for English-medium learning, and *Te Marautanga o Aotearoa* for Māori-medium learning. Although they come from different perspectives, both start with visions of young people who develop the competencies they need for study, work, and lifelong learning, and will go on to realise their potential. Together, the documents help schools embody the partnership at the core of the nation's founding document, *Te Tiriti o Waitangi*/the Treaty of Waitangi. At the local level, New Zealand encourages schools to work with communities, and especially with local Māori bodies, to develop a school curriculum that reflects the interests and needs of learners, the values and aspirations of parents and whanau ("extended family" in Maori). Boards of trustees, made up of community members, can have significant input into the curriculum, but the extent varies from school to school. The curriculum includes a legal requirement that each board of trustees, through the principal and staff, develop and implement a curriculum for students in years 1-13. They are also required, in consultation with the school's Māori community, to develop and make known the plans and targets for improving the achievement of Māori students.
- In **Costa Rica**, the curriculum for indigenous students includes subjects to ensure the teaching of indigenous languages and cultures: Ngäbere language, Boruca language, Bribri language of Buenos Aires, Bribri language of Sulá, Cabécar language of Buenos Aires, Cabécar language of Chirripó, Cabécar language of Sulá, Maleku

language, Terraba language, Chorotega culture, Huetar culture, Ngäbe culture, Terraba culture. Boruca language is being revitalised and the Terraba language is in process of being saved from extinction.

Publishing the curriculum in multiple languages

To ensure equity in learning, countries/jurisdictions publish the curriculum in multiple languages, either partially (e.g. some grades or subjects) or entirely. The curriculum can be published in minority heritage languages, as is the case in **Finland**, **Norway** and **Hungary**, or others to facilitate integration of recent immigrant students. The availability of curricula in multiple languages makes it possible to have different languages of instruction to accommodate the learning needs of different student populations. As research shows, this is particularly important in the early years of learning, when instruction in the mother tongue plays an important role in the acquisition of fundamental literacy and numeracy skills.

- In **Finland** one of the basic principles is to ensure that the same opportunities to education are available irrespective of students' ethnic origin, age, socioeconomic status or place of residence. With funding from the state, municipalities can provide instruction preparing for basic education to all pupils of compulsory age and pre-primary (6-year-olds) whose knowledge of Finnish or Swedish isn't sufficient for instruction in a basic education group. The goal of the instruction preparing for basic education as stated in the national core curriculum is to support the student's development and integration into Finnish society and also to provide the necessary language skills to attend basic education. In the education of migrant students, particular emphasis is given to the sufficient command of Finnish or Swedish. Migrant students are entitled to get instruction in Finnish/Swedish according to the syllabus Finnish or Swedish as a second language, instead of Finnish or Swedish as a mother tongue. The municipalities can apply for funding for organising this instruction. If, for some reason, the school does not offer instruction in Finnish or Swedish as a second language, the pupils participate in the mother tongue and literature classes, which will be modified to meet the needs of each individual student. In addition to learning Finnish or Swedish, all pupils must be able to maintain and develop their own mother tongue. The objective is functional bilingualism and strengthening the student's intercultural identity. The curriculum also includes guidelines for teaching Sámi, Romani and sign language. Instruction in mother tongue for pupils with a migrant background is provided as instruction complementing basic education by means of a separate state subsidy.
- **Hungary** reports that, although the language of instruction is Hungarian for the majority of schools, students of ethnic minorities can access instruction in another language in both pre primary education and schools where there are more than eight students of a given ethnic minority. The curriculum is available in German, Croatian, Slovak, Serbian, Greek, Bulgarian, Roma, Boyash, Ruthenian, Romanian, and Slovenian.
- In **Norway**, the revised national core curriculum that came into effect in 2020 was translated into Sami and English. The Sami curriculum (an alternative curriculum for students of Sami background) is also available in both Sami and Norwegian. Some subject curricula are also written in both the Norwegian written languages Bokmål and Nynorsk, but others are written in just one of them.
- During the COVID-19 pandemic, the Government of **Mexico** shared both information on prevention and learning materials in Spanish and Indigenous languages through the National Institute of Indigenous Languages, part of the Ministry of Culture. By the beginning of April 2020, 61 interpreters and translators, and nearly 140 learning tools (audio, video, maps, etc.) were available in Spanish and most of the Indigenous languages spoken in the country.

3. CROSS-CURRICULAR CONTENT AND COMPETENCY-BASED CURRICULUM

Content to foster cross-curricular competencies is a powerful tool for advancing the values of equity and diversity in schools. Indeed, equity, inclusion and diversity are typically embedded in the curriculum as content across subjects rather than in a specific subject. Such an approach helps students and teachers exercise these values throughout the school day and perceive different moments at school as learning opportunities for equity, inclusion and diversity. This approach can also mitigate curriculum overload (see (OECD, 2020[18])), and alleviate time lags as the curriculum may be adaptable across content areas (see (OECD, 2020[4])). Research shows that teaching values such as respect, diversity and inclusion in schools can help students become more empathetic and show greater kindness to one another (see the What does research say?" section of the Values report (OECD, forthcoming[19])).

Cross-curricular content can also embed local, regional or indigenous values in the curriculum. In many cases, this is done by giving schools or local governments the opportunity to adapt their curriculum to better fit the local context. In some countries, indigenous values and content are introduced in the national curriculum with the goal of ensuring that all students are exposed to these values, regardless of the school context.

Table 13 **Challenges and strategies related to cross-curricular content and competency-based curriculum**

	Challenge/strategy	Countries/jurisdictions reporting the challenge/strategy
Challenges	Variations in capacity to promote minority or Indigenous values as a cross-curricular theme	Australia
	Support for students with special needs	Norway, Portugal, Kazakhstan
Strategies	Articulating equity as a goal of education	Estonia, Hong Kong (China), Singapore
	Mainstreaming diversity and equity oriented values into curriculum	Australia

Source: Data from the PQC, findings from the research section.

Challenges

Countries/jurisdictions face challenges as they aim to design cross-curricular content to promote values of equity and inclusion. Some report limited capacity to design cross-curricular content that can promote minority or indigenous values. Without a strategy to take into account a wide range of competencies, countries/jurisdictions recognise the risk of stigmatising and segregating some students.

Variations in capacity to promote minority or indigenous values as a cross-curricular theme

National curricula in many countries/jurisdictions aim to respond to the needs of ethnic minorities and Indigenous communities, and actively promote their values and culture. However, schools' awareness and capacity to design and manage a school curriculum that embodies these ideals may vary.

- **Australia**'s cross-curriculum priority, Aboriginal and Torres Strait Islander Histories and Cultures, is designed to ensure that Australia's First Peoples see themselves in the curriculum. It is also designed so that Australia's First Peoples participate in the curriculum and all Australian students participate in reconciliation, respect, and recognition of the world's oldest continuous living culture. However, geographic remoteness, along with a range of socio economic factors, contribute to the challenges of realising this goal.

Strategies

Countries/jurisdictions report that they aim to create shared responsibility for equity by articulating in the curriculum that equity is an overall goal of education. In order to make this goal operational, countries/jurisdictions provide practical guides and examples of mainstreaming diversity and equity-oriented values as a cross-curricular priority.

Articulating equity as a goal of education

In order to ensure that the value of equity is both taught and modelled in schools, several countries/jurisdictions explicitly articulate it as a core value to embed across the curriculum. For example, **Estonia** articulates values of "honesty, compassion, respect of life, justice and human dignity" as cross-curricular themes. Similarly, **Hong Kong (China)** and **Singapore** put the value of respect of others at the centre of curriculum design.

- **Estonia** explicitly articulates core values in its curriculum. These include general human values related to equity, such as "honesty, compassion, respect for life, justice, human dignity and respect for self and others", as well as societal values such as "liberty, democracy, respect for mother tongue and culture, patriotism, cultural diversity, tolerance, environmental sustainability, rule of law, solidarity, responsibility and gender equality".
- **Hong Kong (China)** places priority on values as part of the Hong Kong school curriculum, including those related to equity, such as "respect for others, responsibility and integrity, and care for others".
- **Singapore** places core values at the centre of curriculum design, including "respect, responsibility, resilience, integrity, care and harmony".

Mainstreaming diversity and equity-oriented values into curriculum

Some countries/jurisdictions provide clear guidelines in their curriculum documents on how schools model and teach values of diversity and equity. Having such guidelines in the curriculum document helps ensure that values promoted by the curriculum are central to the teaching and learning process.

- As an example, the **Australian** curriculum website contains materials to support student diversity and the Aboriginal and Torres Strait Islander Histories and Cultures as a cross curricular priority. These materials include illustrations of practice and advice for schools.

More country experiences will be reported in the forthcoming thematic report on 'values in curriculum'.

4. FLEXIBLE CURRICULA

Giving schools and local authorities flexibility over the curriculum can address equity issues by taking students' and communities' needs into account in the curriculum. Given their proximity to the students and communities they serve, schools and local education authorities are positioned to design content that is context-specific and respectful of local culture and needs. While research on the impact of flexible curriculum is limited, some studies show that such an approach can benefit students' learning and well-being, particularly for gifted students, SEN students, and students with disabilities. However, a flexible curriculum having positive effects requires both strong curriculum design and strong management capacity at local and school levels.

Table 14 **Challenges and strategies related to flexible curriculum**

	Challenge/strategy	Countries/jurisdictions reporting the challenge/strategy
Challenges	Regional and local variation in the use of flexible curriculum to ensure quality of learning	Finland, Québec (Canada), United States[1]
	Local decisions on investment in teaching and teachers	Finland, Brazil[1]
Strategies	Allowing for flexibility, in particular, for students from linguistic minorities	British Columbia (Canada)
	Adapting curriculum for low-achieving students	Japan, Norway, China (People's Republic of), Hong Kong (China)
	Encouraging schools to be flexible and proactive to support students from disadvantaged backgrounds, e.g. the use of individual educational plans	France, Portugal, Viet Nam

Note: 1. Responses for these countries/jurisdictions were submitted by independent researchers, not government administrations.

Sources: Data from the PQC, findings from the research section and from *The impact of COVID-19 on student equity and inclusion* (OECD, 2020[3]).

Challenges

A flexible curriculum approach can lead to variation in how a curriculum is delivered across schools and localities. It can result in variations in the quality of learning between students, based on where their school is located and their socio-economic background, making this an equity issue (Donlan, 2016[20]; Pegg and Panizzon, 2007[21]). This variation can result from varying levels of investment by regional or local government to support flexible curricula.

Regional and local variation in the use of flexible curriculum to ensure quality of learning

A number of countries/jurisdictions, including **Finland** and **Québec (Canada)** report that curriculum flexibility in learning content can lead to difficulties ensuring that all students meet national standards. Similar issues have been observed in the **United States**.

- **Finland** aims to offer good educational opportunities and the best possible education for all children, regardless of their family background, the place where they live, or personal characteristics. However, challenges include regional/municipal differences in providing education.
- When **Québec (Canada)** decentralised responsibility to schools in 2001, the intention was for local bodies to meet community needs and expectations more effectively. Québec's Conseil supérieur de l'éducation observed that, at the primary level, there was no consensus on schools being able to make local choices. For some groups,

including administrators, devolution led to the launch of projects based on students' needs and characteristics. The teachers' unions saw them as a source of inequality in educational service delivery. However, the Conseil supérieur de l'éducation decided that flexibility should be maintained. At the secondary level, the sought-after diversification led to problems organising programmes in some schools, especially small schools. To address the challenges related to curriculum flexibility the ministry of education has implemented a number of measures to mitigate these issues such as provision of teacher training, creation of partnerships, a shared platform, etc.

- In the **United States**, because the curriculum is developed locally, there may be no continuity between school districts, even within the same state. Local control over education decisions means that the federal government does not determine required content. Therefore, it is nearly impossible to ensure a consistent coherent, focused and rigorous curriculum system-wide.

Local decisions on investment in teaching and teachers

In high-autonomy contexts, such as **Finland** and **Brazil**, ensuring that schools are able to design and implement a flexible curriculum is a challenge in states and cities with fewer human and financial resources to invest in education.

- In **Finland**, some studies show relatively wide variations between schools in different parts of the biggest cities, with learning outcomes related to the socio-economic background of the city districts. Adequate investment to support teaching and teachers may not be possible there, even while they are in other areas of the country.
- In **Brazil**, levels of investment in education vary between states and at local levels across the country (e.g. differences in teacher salaries and teacher training). This is despite constant efforts from the federal government to provide financial and technical support through programmes such as the Fund for Maintenance and Development of Basic Education and Promotion of the Teaching Profession.

Strategies

Recognising that a flexible approach can promote equity, countries/jurisdictions report providing schools and local authorities with flexibility in curriculum content, pedagogy, assessment, and school organisation to better meet the needs of students. Such strategies often need to be accompanied by providing local authorities and schools with guidelines and technical support to design quality curriculum content.

Allowing for flexibility, in particular, for students from linguistic minorities

Diverse strategies can support students from a linguistic minority background. Flexibility in practices might best support their needs, which can vary considerably, ranging from the need for full translation to assistance with punctuation or idioms. In **British Columbia (Canada)**, teachers can have a range of practices rather than a prescribed curriculum for working with linguistic-minority students.

- In **British Columbia (Canada)**, flexibility within the curriculum and multiple entry points for learners allow teachers to offer a range of instructional practices for students who do not speak English or French. This also holds true for students with diverse abilities. The Ministry of Education does not create a specific curriculum for English Language Learners or students with diverse abilities, but the expanded flexibility within the curriculum allows teachers more options to teach a range of diverse learners.

Adapting curriculum for low-achieving students

Low-achieving students might be served best not by the set curriculum, but by flexibility to meet their interests, skills and needs. Several countries/jurisdictions, such as **Japan**, **China** and **Hong Kong (China)**, give schools the flexibility to add or create original subjects to meet students' needs. In others, like **Norway**, students demonstrate competencies in multiple ways.

- **Japan**'s curriculum aims to ensure equity across the country by making all schools follow one coherent National Curriculum Standard. All students are expected to acquire the competencies stipulated in the national standard. However, as some students are not able to achieve the goals expected in the curriculum, high schools have many options: 1) they can add and/or create original subjects to fit these students' achievement levels and/ or interests; 2) they can choose to have these students repeat a grade (this option is rarely used); 3) they can rearrange learning time to adjust to students' learning needs; 4) they can teach topics usually taught at lower school levels (e.g. provide education at lower-secondary level for upper-secondary students who have difficulty understanding the stipulated content); and 5) they can offer more time to learn certain content (e.g. provide 3 credits for a subject whose standard number of credits is 2).

- In **Norway**, students can reach the same competence objectives in different ways. Subject curricula offer flexibility at the local level to select content, teaching strategies, working methods, and organisation to reach the same competence objectives. It is also possible for individual schools to customise how they work with progression and assessment for learning. Students should take an active part in planning, implementing, and evaluating teaching and learning practices. These should be aligned with students' abilities and aptitudes, and should provide all students with challenges they can master to move forward. Good classroom management and insight into the school/class learning environment are essential.
- **China** gives local governments and schools the right to develop courses independently to meet the individual needs of students. It finds that three tier curriculum management (national, local, and school levels) is effective to demonstrate the characteristics of schools and develop education tailored to local conditions, which can promote educational equity.
- In **Hong Kong (China)**, the school curriculum as recommended by the Curriculum Development Council and adopted by the Education Bureau is an open framework with flexibility that allows schools to develop their own curricula to suit a wide range of contexts at various levels and cater to learner diversity, including not only low achievers but the full spectrum of students.

Encouraging schools to be flexible and proactive to support students from disadvantaged backgrounds, e.g. the use of individual educational plans

Individual education plans can be provided for more students than those identified as having special needs. In **Viet Nam**, education plans can be used for students from disadvantaged backgrounds, whereas in **France**, initiatives such as Learning Holidays, provide support for students lagging behind.

- **France** has developed the Learning Holidays initiative after school closures due to COVID-19, allowing students to use the summer holiday period for new experiences, reinforcing learning and solidarity for vulnerable students. The initiative, targeting one million children, uses the summer holidays to close learning gaps and address students' drop-out risk, relying on summer camps, day leisure centres, and several schools remaining open during the summer, in partnership with local authorities and social welfare associations.
- In **Portugal**, school autonomy, curriculum flexibility and internal participation models have been consolidated with the new curriculum framework approved in 2018. The new curriculum framework offers greater autonomy and flexibility in how schools manage curricula, thus consolidating their ability to combat inequalities and construct a digital society. Likewise, the ongoing decentralisation process has made it possible to transfer various powers to municipalities regarding the management of infrastructure and facilities, human resources, social support and curricular enrichment activities, more adapted to the regional/local circumstances. Equity and inclusion of diversity in educational goals became central to all students, regardless of the reasons behind their disadvantaged situations. Leaving no one behind within compulsory education is a national priority and for that reason schools: i) are given the opportunity to manage up to 25% of the curriculum, fostering interdisciplinary and collaborative work, PBL methodologies and fostering deeper learning respecting every school specific context; ii) can, according to their autonomy and flexibility, manage more than 25 % of the curriculum aiming at the implementation of innovation plans to be validated by the Ministry of Education. Viet Nam guides localities and schools to be flexible and proactive in developing individual education plans, increasing the amount of education to ensure standard implementation for the disadvantaged students.

Notes

1. Examples reported in this section from Northern Ireland (United Kingdom), the United States, Brazil and India should not be considered the official views of the government since they were submitted by independent researchers, not government officials.
2. Proceedings from the Global Forum in May 2020 will be made available on https://www.oecd.org/education/2030-project/global-forum/previous-events/
3. This may include travelling people, i.e. those that are members of a community traditionally having an itinerant way of life (Oxford English Dictionary, n.d.[23]).
4. https://www.moe.gov.sg/parentkit
5. Including https://mhelp.kz/skachat-elektronnye-uchebniki-kazahstan/; bilimland.kz; opiq.kz, and others.
6. https://www.oktatas.hu/kozneveles/ajanlas_tantermen_kivuli_digitalis_munkarendhez.
7. Each speech provided a different angle on how to overcome the Covid-19 crisis. They are available on the following links: https://www.gov.sg/article/pm-lee-hsien-loong-overcoming-the-crisis-of-a-generation; https://www.gov.sg/article/minister-lawrence-wong-living-with-covid-19; https://www.gov.sg/article/senior-minister-teo-chee-hean-resilience-in-a-changing-external-environment; https://www.gov.sg/article/minister-chan-chun-sing---making-a-living-in-a-covid-19-world; https://www.gov.sg/article/senior-minister-tharman-shanmugaratnam-a-stronger-and-more-cohesive-society; https://www.gov.sg/article/dpm-heng-swee-keat-emerging-stronger-together.
8. https://www.dge.mec.pt/sites/default/files/roteiro_ead_vfinal.pdf
9. https://apoioescolas.dge.mec.pt/
10. Other terms for personalised curriculum used by countries/jurisdictions include differentiated curriculum and individualised curriculum.
11. As discussed in the What does research and international data say? section, special education needs (SEN) students include students with learning disabilities, physical impairments and mental health conditions.
12. A perspective which attributes failures such as lack of achievement, learning, or success in gaining employment to a personal lack of effort or deficiency in the individual, rather than to failures or limitations of the education and training system or to prevalent socio-economic trends (Wallace, 2015[22]).

References

Borgonovi, F., A. Ferrara and S. Maghnouj (2018), "The gender gap in educational outcomes in Norway", *OECD Education Working Papers,* No. 183, OECD Publishing, Paris, https://dx.doi.org/10.1787/f8ef1489-en. [10]

Bredtmann, J., S. Otten and C. Vonnahme (2018), *Linguistic diversity in the classroom, student achievement, and social integration*, http://dx.doi.org/10.4419/86788911. [9]

Donlan, J. (2016), "Splicing the divide: A review of research on the evolving digital divide among K–12 students", *Journal of Research on Technology in Education*, Vol. 48/1, pp. 16-37, https://doi.org/10.1080/15391523.2015.1103147. [20]

Duncan, G. et al. (2007), "School readiness and later achievment", Developmental Psychology, Vol. 43/6, pp. 1428-1440, https://doi.org/10.1037/0012-1649.43.6.1428. [2]

Dweck, C. (1983), "Motivational processes affecting learning", *American Psychologist*, Vol. 41, pp. 1040-1048. [5]

Estonian Parliament (Riigikogu) (2010), *Basic Schools and Upper Secondary Schools Act (Põhikooli- ja gümnaasiumiseadus), Riigi Teataja (State Gazette) RT I 2010, 41, 240*, https://www.riigiteataja.ee/en/eli/530062020003/consolide. [15]

Hosterman, S. and G. DuPaul (2008), "Teacher ratings of ADHD symptoms in ethnic minority students: Bias or behavioral difference?", *School Psychology Quarterly*, Vol. 23/3, p. 418, https://doi.org/10.1037/a0012668. [11]

Kavanagh, L., S. Weir and E. Moran (2017), *The evaluation of DEIS: The lives and learning of urban primary school pupils, 2007 to 2016,* http://www.erc.ie/wp-content/uploads/2017/06/DEIS-report-2017.pdf. [16]

Kozareva Veronika (2016), *Using Virtual Classroom in Support of Children in Hospitals*. [8]

Nordahl, T. (2018), *INKLUDERENDE FELLESSKAP FOR BARN OG UNGE*, Expert group for children and young people with Special Education Needs, Oslo, http://nettsteder.regjeringen.no/inkludering-barn-unge/files/2018/04/INKLUDERENDE-FELLESSKAP-FOR-BARN-OG-UNGE-til-publisering-04.04.18.pdf. [12]

OECD (2021), *The State of School Education: One Year into the COVID Pandemic*, OECD Publishing, Paris, https://doi.org/10.1787/201dde84-en. [1]

OECD (2020), *Curriculum Overload: A Way Forward*, OECD Publishing, Paris, https://dx.doi.org/10.1787/3081ceca-en. [18]

OECD (2020), *The impact of COVID-19 on student equity and inclusion,* http://www.oecd.org/education/strength-through-diversity/OECD%20COVID-19%20Brief%20Vulnerable%20Students.pdf. [3]

OECD (2020), *What Students Learn Matters: Towards a 21st Century Curriculum,* OECD Publishing, Paris, https://dx.doi.org/10.1787/d86d4d9a-en. [4]

OECD (2019), *PISA 2018 Results (Volume I): What Students Know and Can Do*, PISA, OECD Publishing, Paris, https://dx.doi.org/10.1787/5f07c754-en. [6]

OECD (forthcoming), *Values in the Curriculum* (title TBC). [19]

Oxford English Dictionary (n.d.), *"Travelling people", Oxford English Dictionary*, Oxford University Press, https://www.oed.com/ (accessed on 21 April 2021). [23]

Pegg, J. and D. Panizzon (2007), "Inequities in student achievement for literacy: Metropolitan versus rural comparisons", *The Australian Journal of Language and Literacy,* Vol. 30/3, pp. 177-190, https://search.informit.com.au/documentSummary;dn=772932320480156;res=IELHSS. [21]

Tenenbaum, H. and M. Ruck (2007), "Are teachers' expectations different for racial minority than for European American students? A meta-analysis.", *Journal of Educational Psychology,* Vol. 99/2, pp. 253-273, http://dx.doi.org/10.1037/0022-0663.99.2.253. [13]

Wallace, S. (2015), *A Dictionary of Education*, Oxford University Press, http://dx.doi.org/10.1093/acref/9780199679393.001.0001. [22]

Warikoo, N. et al. (2016), "Examining Racial Bias in Education", *Educational Researcher,* Vol. 45/9, pp. 508-514, http://dx.doi.org/10.3102/0013189x16683408. [14]

Weir, S. and L. Kavanagh (2018), *The evaluation of DEIS at post-primary level: Closing the achievement and attainment gaps*, http://www.erc.ie/wp-content/uploads/2019/01/Weir-Kavanagh-2018-DEIS-post-primary.pdf. [17]

Zhao, Y. and K. Frank (2003), "Factors affecting technology uses in schools: An ecological perspective", *American Education Research Journal,* Vol. 40/4, pp. 807-840, https://doi.org/10.3102%2F00028312040004807. [7]

Unintended consequences and lessons learned

The strategies introduced in the previous section can be options to ensure equity through curriculum innovation. While the strategies may be helpful, they may also have unintended consequences. Some countries/jurisdictions report outcomes that were not anticipated when designing these strategies, which adds further complexity to ensuring equity in the curriculum.

The following five key lessons are based on country experiences. These lessons can be used as a checklist to reflect on the current state of play and avoid similar unintended consequences that peer countries and jurisdictions have experienced.

Key lessons learned from unintended consequences on ensuring equity through curriculum innovations

1. Use Universal Design for Learning as checklist.
2. Change the paradigm of "learning and assessment" to favour the whole child and person development.
3. Expect both untapped opportunities and new risks in public-private partnership.
4. Avoid stigmatising personalised and cross-curricular content and competency-based curricula.
5. Do not underestimate the resources required to close observable and non-observable equity gaps.

1. USE UNIVERSAL DESIGN FOR LEARNING AS CHECKLIST

The Universal Design for Learning (UDL) framework has existed for years, but its concepts of inclusion are still far from reality in curriculum design. The innovations explored in this chapter – digital curriculum, personalised curriculum, cross curricular content and competency-based curriculum, and flexible curriculum – present opportunities to put the UDL framework into action.

It is important to distinguish between "digitalisation of a curriculum" and "digital transformation in curriculum". For example, a digital curriculum should not mean simply turning a paper curriculum into a PDF and posting it on a website, or solely hosting all recorded content and drilling exercises on a digital platform. It should be understood as a means to fundamentally change the way students and teachers perceive learning and teaching by clearly aligning student learning and well-being as goals of the curriculum with appropriate methods, materials, and assessment.

Including untapped opportunities, a digital curriculum has the potential to integrate content, pedagogies, and assessment into one coherent plan, thereby addressing the Why, the What and the How of learning in a way that is adaptable to diverse learners (see the Research section of this report and the CAST website (CAST, 2020[1])). In doing so, articulating, reiterating, and reinforcing human intrinsic values and student well-being, as part of the broader goals of education is important. This can often be undermined, in particular, when aligning curriculum with assessment.

For students to develop a true sense of ownership of their own learning, they need to feel a sense of purpose, curiosity, and intrinsic motivation. This can vary from student to student. Therefore, a safe space is important for each student to share reflections on their learning and well-being at school (i.e. experienced curriculum), as well as their aspirations for future learning. Rooted in the intrinsic value of learning, all students should be given an opportunity to experience and be empowered to co-construct their curriculum reality, together with their peers, teachers, school leaders, and others in school, as well as with families and others in the communities outside school. Not only students, but also teachers should benefit from using a digital curriculum, not being deprived of opportunities or space to exercise their own agency.

When this happens, learners are recognised as co designers of a curriculum that will be most relevant for them, building on their engagement and motivation (see the Lessons learned section in the Ecosystem Report (OECD, forthcoming[2])).

The questions below (Box 11) can be used as a checklist to explore to what extent an existing curriculum has considered the key UDL principles, and anticipate what changes can make the curriculum more inclusive and dynamic in the future.

Box 11 Exploratory questions for self-reflection on the universality of curriculum design

1. Affective Networks: Why do we learn?

To stimulate interest, engagement, and motivation for learning, to what extent does your curriculum:

- connect content knowledge with real-world issues/significance (knowing how to think and act like a practitioner) for students to recognise the relevance and purpose of their learning
- embrace and celebrate diversity (social, cultural, racial, gender, etc.) in a way that allows students to identify their identity in the curriculum
- build in the right level of challenge for learners at different proficiency levels
- connect content, pedagogies and assessment with a coherent focus on student learning through other material (e.g. simulations, videos, photos)
- offer ongoing support for one-to-one learning in person (e.g. teachers available during office hours, online chat or by phone) and/or machine tutoring (e.g. AI enabled tutoring programmes)
- build in plenty of opportunities for ongoing self-assessment and reflection.

2. Recognition networks: What do we learn?

To present curriculum content in different ways, to what extent does your curriculum:

- clearly describe the objectives of target content and expectations of students in accessible language
- highlight "big ideas" or "key concepts", such as patterns and relationships in each subject and across different subjects
- use multimedia to cater to different learning needs
- consider options for learners whose language of instruction differs from their mother tongue
- avoid presenting content in ways that create a perception of "curriculum overload" and "homework overload".

3. Strategic Networks: How do we learn?

To differentiate the ways for students to present what they know, to what extent does your curriculum:

- assume that students can learn the designed content through various means (such as face to face or online, or in a hybrid model) in accordance with their needs
- allow learners to plan and organise their own learning, as well as learn from each other and in groups (e.g. scaffolding, peer learning and community learning)
- assume that students can demonstrate attainment of curriculum objectives through multiple means (e.g. essays, interviews, projects, plays, speeches) and ensure that assessments involve not only "assessment of learning" but also "assessment for learning" and "assessment as learning"

- consider developmentally appropriate paces of learning, as well as different learning progressions to allow different entry points for students to build on what they know and what they want to learn
- remove physical barriers that may be introduced by the motor demands of a task (e.g. accommodate requirements for responses at different rates and range through various means, including motion technology, voice recognition and alternatives to mouse control).

Source: OECD, adapted from (CAST, 2020[1])

2. CHANGE THE PARADIGM OF "LEARNING AND ASSESSMENT" TO FAVOUR THE WHOLE CHILD AND PERSON DEVELOPMENT

Many spheres of society identify closing equity gaps as an explicit goal of the global agenda, such as in the UN Sustainable Development Goals (SDGs). For example, SDG 4 indicators concern education and, with regard to curriculum, 4.7.1 sets the following goal:

"By 2030 ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development".[1]

More precisely, the indicators are constructed around the extent to which education for global citizenship and sustainable development are mainstreamed into 1) national education policies, 2) curricula, 3) teacher education, and 4) student assessment.[2]

Students develop competencies for global citizenship and literacy for sustainable development through various learning experiences, including formal, non-formal, and informal learning. Therefore, the types of curriculum innovation discussed in this report, which promote various aspects of student competencies, should be considered opportunities and means to achieve the global agenda. However, these curriculum innovations do not scale.

One of the main reasons is difficulty in assessing types of competencies gained through such innovations. For example, digital learning[3] provides alternative pathways to disadvantaged students (e.g. full online courses for students who have dropped out of school or are bound to prolonged stays at the hospital for health reasons). While this opens new opportunities to not leave anyone behind, the recognition of qualifications acquired through digital curricula may be limited. Resistance to recognising competency-based qualifications may come from established institutions, such as formal public schools that deliver traditional qualifications based on what is taught by teachers and the number of hours taken as credits, or may reflect the value universities and general public place on mainstream qualifications.

Furthermore, mindsets and assessment should, therefore, shift to value learning processes as well as competencies and achievements gained from those processes. Assessment for learning, for instance, regards assessment as an opportunity to provide feedback that will advance students' learning. From the equity perspective, high-stakes assessment, such as university entrance exams should consider system change, for example, shifting from emphasis on competitive entry points towards valuing rigorous efforts at the exit point in order to maximise learning gains and contribute to the diversity and inclusion of universities.

The COVID-19 pandemic in 2020 pushed deeper thinking about equity issues in curriculum and assessment. Students with disabilities long experienced challenges, like access to testing accommodations, and the pandemic further exacerbated these obstacles. Recognising that, while all students had access to testing disrupted by the pandemic, students with disabilities faced greater barriers, a state court in California, United States, issued a preliminary injunction barring University of California campuses from considering SAT or ACT scores in admissions or financial aid decisions, noting that the pandemic has restricted the ability of students to take the exams.

On the technical side, the educational technology industry started to invest in numerous initiatives to develop digital tools, offering an array of benefits for students in terms of equity and democratisation. Blockchain technology, for example, enables the creation of learning records that are permanent, transparent and give direct access to users, allowing them to document their lifelong learning path (Jirgensons and Kapenieks, 2018[3]). Thus, blockchain can be used in the education sector and offer new ways to recognise and validate

a range of learning outcomes or competencies students already had or learned (see the Research section of this report). This suggests that students can be recognised for any type of learning – anytime, anywhere – and for their gains across different spheres of learning, including formal, non formal, and informal, with concrete value-added for the labour market. As another example, migrant students could be given credits for native language proficiency as part of their prior knowledge, and students who dropped out of school could still be given credits for their prior learning and/or experiential learning in the community or at home if this led to achieving the intended goals of the curriculum. Thus, this tool has the potential to make lifelong and life-wide learning more visible in a legitimate way.

If blockchain technology can be further explored, the legitimacy of competencies that students gain through project-based learning, for example, could be assessed by people directly involved in their projects and who observe the learning processes and outcomes in addition to their teachers. This could embed transparency in the assessment process for high-stakes university entrance requirements or e portfolios, and avoid fake reporting or fraudulent statements about such learning activities and attainments. This will require a more rigorous approach to assessment, refining the purpose, scope, and measures for assessing competencies, along with a change in mindsets, expectations, and values about assessments and qualifications. Such potential is challenged by unconscious biases among teachers and school leaders about students' ability, as well as by parents' limited expectations and awareness of the potential for every student to succeed. In turn, these biases, and limited expectations and awareness are often fed by high-stakes exams themselves, which exert pressure limiting the benefits of curriculum innovation (see "Lessons Learned" section in the forthcoming Ecosystem report – What gets measured gets treasured (OECD, forthcoming[2])).

3. EXPECT BOTH UNTAPPED OPPORTUNITIES AND NEW RISKS IN PUBLIC-PRIVATE PARTNERSHIP

The transition to a fully interactive digital curriculum is still at the development stage in many countries, and new technologies are rapidly evolving. Under these circumstances, it is important to keep an open mind and make conscious efforts to continuously monitor both opportunities and risks.

A list of such opportunities and risks should be constantly updated. This should be done not only by policy makers and researchers but also, though involvement of all stakeholders in curriculum development, recognising that curriculum innovations are increasingly explored at the local level (see the forthcoming Ecosystem report (OECD, forthcoming[2])).

Examples shared by participating countries/jurisdictions at the time of writing include, for example, opportunities with new types of public-private partnerships. In some countries, the vocational education and training (VET) sector has long-standing partnership with the private sector (e.g. co-designing a VET curriculum with rigorous apprenticeship). In the schooling sector, however, the nature of public-private partnerships is based more on a business relationship (i.e. companies consider schools as market opportunities for educational services and goods).

In recent years, however, a growing body of companies started to articulate a mission and interests that potentially align with educational needs, through adjusted corporate behaviours manifested as corporate social responsibility (CSR). These companies set up CSR sections within the company itself or through an affiliated organisation such as a foundation to use the company's profits to contribute to education (which responds to United Nations Sustainable Development Goals). Some companies involve a wider range of stakeholders in designing a project or programme, shifting the core mission from CSR to "creating shared value" (CSV) (Porter and Kramer, 2011[4]), seeking "collective impact" (Kania and Kramer, 2011[5]) .

In some countries, the private sector is therefore becoming recognised as an important stakeholder in curriculum reform processes. It is well aware of the changing market in education, especially opportunities to provide solutions for curriculum innovation. To that end, new types of private sector engagement are important for schools, teachers, and students, as it can bring tailored resources to attain maximum and mutual benefit from the range of curriculum innovations (especially digital, personalised, and flexible).

This said, public-private partnerships should be handled with caution and managed carefully to prevent the risks of commercialisation and privatisation enlarging educational inequalities. Some countries/jurisdictions report unanticipated challenges in engaging with private sector actors when their interests are not aligned with the intents of the school sector. Schools were approached under the umbrella of corporate social responsibility, but confronted with companies either simply trying to sell their products or reaching out for marketing purposes,

rather than working towards a common purpose through constructive dialogue and co-creation. Schools also faced unanticipated obligations, as when companies proposed textbooks or trials of digital solutions free at first, but expected a fee in the future.

Another potential risk for equity issues is personalised curricula: without careful design, these can increase inequalities instead of closing them, and can quickly shift towards education consumerism. That is particularly true when personalised learning is based solely on potentially subjective or self-interested parental and student choices (see the Lessons Learned section of the forthcoming report on flexibility (OECD, forthcoming[6])), exercised more often by advantaged students than disadvantaged ones. Personalised curricula also often rely on technology for delivery (see the Research section of this report), which widens the equity gap in the absence of proper support for access to a digital device, connectivity, and quality content.

Tailoring and customisation of curricula turns students and parents into consumers rather than co-creators sharing responsibility for effective implementation. This can lead to an imbalance of power in decisions on what is to be learned and how, with the risk of "customers know best" taking precedence over advice from academic experts (Bragg, 2014[7]) or the needs of students, the primary agents of learning.

4. AVOID STIGMATISING PERSONALISED CROSS-CURRICULAR CONTENT AND COMPETENCY-BASED CURRICULA

Curriculum innovation may fail by not managing the expectations of everyone who has a say in the curriculum design and implementation, including students, teachers, school leaders, parents, textbook publishers, communities, and other social partners. They should all recognise that their agency contributes to the success or hindering factors. Curriculum innovations face multiple layers of realities and perceptions as to what they can provide.

Therefore, first, it is important to manage expectations when introducing new ideas or innovations to curricula. For example, a cross-curricular and competency-based curriculum underlines the importance of disciplinary learning, basic foundations such as literacy and numeracy. But it is important to overcome the false dichotomies of "knowledge vs. competencies", "basics vs, creativity", etc. While a competency is a holistic concept, covering knowledge, skills, attitudes and values, basic literacies are the foundations for developing competencies like creativity and other so-called 21st Century competencies (OECD, 2019[8]).[4] To manage expectations, British Columbia (Canada), uses the term "concept-based, competency-driven curriculum", so as to highlight that the knowledge (concepts) are also indispensable to the curriculum.

Second, more closely linked to equity issues, is avoiding stigmatising personalised or cross-curricular content and competency-based curriculum as an equity measure for only a certain group of students. It should support all students to thrive, rooted in key concepts in disciplinary learning. For example, parents may not welcome a personalised curriculum on the assumption that the standards are being lowered for their children; similarly, teachers' bias may inadvertently cast a shadow of low expectations for what students can achieve.

Third, updating all relevant aspects of the ecosystem is critical, e.g. a personalised curriculum or a cross-curricular content and competency-based curriculum should transform the structure, content, and delivery of pedagogies, assessments, digital textbooks, guidance materials and teacher education, parental expectations, behaviours of private educational service providers, etc. It requires a whole-of-society approach, to mainstream curriculum innovations so that all children and students benefit from such innovations.

5. DO NOT UNDERESTIMATE THE RESOURCES REQUIRED TO CLOSE OBSERVABLE AND NON-OBSERVABLE EQUITY GAPS

Policy makers examine how curriculum innovations close those gaps. Keeping students engaged and motivated to learn is as much a priority as ensuring a level playing field in accessibility to content and facilities, in order to make an innovative curriculum available for all learners. Curriculum innovations, especially digital, personalised, and flexible curricula, require thorough planning and budgeting of resources. This includes not only technological equipment, but also non-technological means to ensure that no student is left behind. As highlighted by the United Nations' Convention on the Rights of the Child, particularly with respect to Article 12, listening to student voices is critical to capturing the complex realities experienced by children and students, so as to consolidate facts about non-observable equity gaps.

The importance of non-observable equity gaps was revealed by the COVID-19 crisis that began in 2020. Simply focusing on closing observable discrepancies in access to a digital curriculum (e.g. devices, Internet connectivity, learning materials) can lead to unintended consequences. If digitalisation simply means putting learning content or recorded teacher lessons on school websites, it may reduce students' engagement and their motivation to learn.

Indeed, inequalities are further observed across regions, with variations in the degree to which devices and connectivity are available to households. Some students started to "drop out" or "fade out" from online courses. The COVID-19 experience gave deeper insights into how students learn. When expenses for effective implementation of curriculum innovations are not included in the national or local budget, students in general, but vulnerable students in particular, easily lag behind in their learning, lose motivation and engagement, and risk their well-being. This can further exacerbate vulnerability for students in disadvantaged communities at a time of crisis.

Furthermore, it is critical to keep in mind the pace of eco-systemic change from the beginning. This determines how quickly narrow equity gaps can be closed. It is essential to expedite the process of accumulating, disseminating, and circulating the knowledge and experiences of early adaptors of curriculum innovations so that the knowledge gaps can be filled as quickly as possible.

Countries/jurisdictions have a record of underestimating or not getting buy-in for the costs to properly implement curriculum innovations. Effective implementation of curriculum innovations requires investment in not only "hard" infrastructure but also "soft" infrastructure, for example skills to maintain and use technologies, or personalised support for enhanced student learning, engagement and well-being. The concept of "resources" needs to be understood in a wider scope, including not only financial resources (economic capital) but also talents from all spheres of society (human capital), networks and relationships (social capital), and our living environment (natural capital) that), which can all be used to close the equity gaps.

Notes

1. Sustainable Development Solutions Network, https://indicators.report/targets/4-7/
2. Global Alliance to Monitor Learning, UNESCO Institute for Statistics, http://gaml.uis.unesco.org/dashboard/
3. Without digital devices, distance learning or remote learning experienced similar societal valorisations as digital learning.
4. Although "creativity" has always been valued even in historic times, it is often used to represent so-called 21st century skills, e.g. the OECD Learning Compass 2030 includes "creating new value" as part of the transformative competencies needed for students to thrive and shaper a better future; the Partnership for 21st Century Learning defines 'Four Cs of 21st century learning – collaboration, communication, critical thinking and creativity.

References

Bragg, S. (2014), "Education, "consumerism" and "personalisation"", *British Journal of Sociology of Education*, Vol. 35/2, pp. 308-315, https://doi.org/10.1080/01425692.2014.881054. [7]

CAST (2020), *About Universal Design for Learning*, http://www.cast.org/our-work/about-udl.html#.X048BaYUkuW (accessed on 21 April 2021). [1]

Jirgensons, M. and J. Kapenieks (2018), "Blockchain and the Future of Digital Learning Credential Assessment and Management", *Journal of Teacher Education for Sustainability*, Vol. 20/1, pp. 145-156, https://doi.org/10.2478/jtes-2018-0009. [3]

Kania, J. and M. Kramer (2011), "Collective Impact", *Stanford Social Innovation Review*, Vol. Winter, https://ssir.org/articles/entry/collective_impact#. [5]

OECD (2019), *OECD Future of Education and Skills 2030: Conceptual learning framework. A series of concept notes*, https://www.oecd.org/education/2030-project/teaching-and-learning/learning/learning-compass-2030/OECD_Learning_Compass_2030_concept_note.pdf. [8]

OECD (forthcoming), *An Ecosystem Approach to Curriculum Redesign and Implementation* (title TBC), OECD Publishing, Paris. [2]

OECD (forthcoming), *Curriculum Flexibility and Autonomy* (title TBC), OECD Publishing, Paris. [6]

Porter, M. and M. Kramer (2011), "Creating Shared Value: How to reinvent capitalism - and unleash a wave of innovation and growth", *Harvard Business Review January-February 2011*, https://hbr.org/2011/01/the-big-idea-creating-shared-value. [4]

Contributors list

NATIONAL CO-ORDINATORS AND CONTRIBUTORS FROM OECD COUNTRIES AND JURISDICTIONS FOR THE OECD FUTURE OF EDUCATION AND SKILLS 2030 PROJECT

Australia: Danielle Cavanagh (Australian Curriculum Assessment and Reporting Authority [ACARA]), Patrick Donaldson (Permanent Delegation of Australia to the OECD), Janet Davy (ACARA), Hilary Dixon (ACARA), Mark McAndrew (ACARA), Fiona Mueller (ACARA), Robert Randall (ACARA)

Belgium: Dominique Denis (Ministère de la Fédération Wallonie-Bruxelles), Marie-Anne Persoons (Flemish Department of Education and Training), Kirsten Bulteen (Flemish Community of Belgium)

Canada: **Council of Ministers of Education Canada - CMEC**: Marianne Roaldi, Marie Macauley; **Ontario**: Richard Franz (formerly of the Ontario Ministry of Education), Angela Hinton (Ontario Ministry of Education), Cathy Montreuil (formerly of the Ontario Ministry of Education), Shirley Kendrick (formerly of the Ontario Ministry of Education), Safa Zaki (Ontario Ministry of Education), Lori Stryker (formerly of the Ontario Ministry of Education), Cresencia Fong (formerly of the Ontario Ministry of Education), Catherine Mahler (Ontario Ministry of Education); **Québec**: Geneviève LeBlanc (Ministère de l'Éducation); **Manitoba**: Carolee Buckler (Manitoba Education and Advanced Learning), Dallas Morrow (Manitoba Department of Education and Training); **British Columbia**: Keith Godin (Ministry of Education of British Columbia), Angie Calleberg (Ministry of Education of British Columbia), Nick Poeschek (Ministry of Education of British Columbia), Nancy Walt (Ministry of Education of British Columbia); **Saskatchewan**: Susan Nedelcov-Anderson (Ministry of Education of Saskatchewan)

Chile: Eliana Chamizo Álvarez (Ministry of Education), Francisca Müller (Permanent Delegation of Chile to the OECD), Ana Labra Welden (Ministry of Education), Alejandra Arratia Martínez (Ministry of Education), María Isabel Baeza Errázuriz (Ministry of Education), Ismini Sahli Anastassiou (Ministry of Education), María Soledad Seguel Bunster (Ministry of Education), María de los Ángeles Vial Cosmelli (Ministry of Education).

Czech Republic: Hana Novotná (Ministry of Education)

Denmark: Rasmus Biering-Sorensen (Danish Ministry of Education), Jens Rasmussen (Aarhus University), Christian Lamhauge Rasmussen (Danish Ministry of Education), Pernille Skou Bronner Andersen (Danish Ministry of Education)

Estonia: Heli Aru-Chabilan (Education and Youth Board), Imbi Henno (Ministry of Education and Research), Eve Kikas (Tallinn University), Maie Kitsing (Ministry of Education and Research), Pille Liblik (Ministry of Education and Research), Kärt-Katrin Pere (Education and Youth Board), Katrin Rein (Permanent Representation of Estonia to the OECD and UNESCO).

Finland: Aleksi Kalenius (Permanent Delegation of Finland to the OECD), Aki Tornberg (Ministry of Education and Culture), Anneli Rautiainen (Finnish National Agency for Education), Erja Vitikka (Finnish National Agency for Education)

France: Claudio Cimelli (Ministère de l'Education Nationale), Mireille Lamouroux (Ministère de l'Education Nationale), Pascale Montrol-Amouroux (Ministère de l'Education Nationale), Daniel Schlosser (Permanent Delegation of France to the OECD)

Germany: Jutta Illichmann (Bundesministerium für Bildung und Forschung), Elfriede Ohrnberger (Bayerisches Staatsministerium für Bildung und Kultus, Wissenschaft und Kunst), Jens Fischer-Kottenstede (Hessisches Kultusministerium), Birgitta Ryberg (Secretariat of the Standing Conference of the Ministers of Education and Cultural Affairs of the Laender in the Federal Republic of Germany)

Greece: Katerina Zizel Kantali (Permanent Delegation of Greece to the OECD), Aikaterini Trimi Kyrou (Ministry of National Education and Religious Affairs)

Hungary: Andras Hlacs (Permanent Delegation of Hungary to the OECD), László Limbacher (Ministry of Human Capacities), Nora Katona (Eszterházy Károly Egyetem O2030), Valéria Csépe (MTA RCNS Brain Imaging Centre & Eszterházy Károly Egyetem O2030)

Iceland: Ásgerdur Kjartansdóttir (Ministry of Education, Science and Culture), Óskar H. Níelsson (Ministry of Education, Science and Culture)

Ireland: Suzanne Dillon (Department of Education and Skills), Breda Naughton (Department of Education and Skills), Linda Neary (Department of Education and Skills), Orlaith O'Connor (Department of Education and Skills)

Israel: Sivan Kfir Katz (Permanent Delegation of Israel to the OECD), Meirav Zarviv (Israeli Ministry of Education)

Italy: Donatella Solda Kutzmann (Ministry of Education)

Japan: Jun Aoki (Ministry of Education, Culture, Sports, Science and Technology [MEXT]), Kazuo Akiyama (MEXT), Hajime Furusaka (MEXT), Eri Hata (MEXT), Hiroshi Itakura (MEXT), Tetsuya Kashihara (Permanent Delegation of Japan to the OECD), Takashi Kiryu (MEXT), Hideaki Matsugi (MEXT), Yuiko Minami (MEXT), Shun Shirai (MEXT), Kan Hiroshi Suzuki (The University of Tokyo), Daiki Ujishi (MEXT)

Korea: Moonhee Kim (Deputy Minister, Planning and Coordination Office, Ministry of Education), Ji Yun Kim (Permanent Delegation of Korea to the OECD), Hyoung Kwon Ko (Permanent Delegation of the Republic of Korea to the OECD), Eun Young Kim (Korean Educational Development Institute), Su-Jin Choi (Korean Educational Development Institute), Sangeun Lee (Korean Educational Development Institute), Mee-Kyeong Lee (Korea Institute for Curriculum and Evaluation), Keun Ho Lee (Korea Institute for Curriculum and Evaluation), Inseon Choi (Korea Institute for Curriculum and Evaluation), Hwasoon Bae (Korea Institute for Curriculum and Evaluation), Kumbok Ryu (Korea Institute for Curriculum and Evaluation), Jong-Yun Kim (Korea Institute for Curriculum and Evaluation)

Latvia: Laura Treimane (Permanent Delegation of the Republic of Latvia to the OECD and UNESCO), Zane Olina (Competency Based Curriculum Project, National Centre for Education)

Lithuania: Irena Raudienė (Ministry of Education and Science)

Luxembourg: Luc Weis (Ministère de l'Éducation Nationale, de l'Enfance et de la Jeunesse)

Mexico: Blanca Villalón Lozano (Permanent Delegation of Mexico to the OECD), Camila Jensen Casco (Permanent Delegation of Mexico to the OECD), José Luis Gutiérrez Espíndola (Secretaría de Educación Pública)

Netherlands Jeroen Postma (Ministry of Education, Culture and Science), Marc van Zanten (Netherlands Institute for Curriculum Development SLO), Tessa van Dorp (Ministry of Education, Culture and Science), Daniëlle Ooteman (Ministry of Education, Culture and Science), Rien Rouw (Ministry of Education, Culture and Science)

New Zealand: Pauline Cleaver (Ministry of Education)

Norway: Elisabeth Buk-Berge (Ministry of Education and Research), Reidunn Aarre Matthiessen (Norwegian Directorate for Education and Training), Bente Heian (Norwegian Directorate for Education and Training), Siv Hilde Lindstrøm (Permanent Delegation of Norway to the OECD and UNESCO)

Poland: Rafal Lew-Starowicz (Ministry of National Education), Danuta Pusek (Ministry of National Education), Witold Zakrzewski (Ministry of National Education)

Portugal: Eulália Alexandre (Ministry of Education), Duarte Bué Alves (Permanent Delegation of Portugal to the OECD), Alexandre Amorim (Permanent Delegation of Portugal to the OECD), João Costa (Ministry of Education), Ines Gonçalves (Permanent Delegation of Portugal to the OECD), Elma Pereira (Permanent Delegation of Portugal to the OECD), Luisa Ucha-Silva (Ministry of Education)

Spain: Carmen Tovar Sánchez (Ministry of Education, Culture and Sport), Jaime Vaquero (Ministry of Education, Culture and Sport), María Saladich (Délégations Permanentes de l'Espagne auprès de l'OCDE, l'UNESCO et le Conseil de l'Europe)

Sweden: Anna Westerholm (Swedish National Agency for Education), Katalin Bellaagh (Swedish National Agency for Education), Johan Börjesson (Swedish National Agency for Education), Ann-Christin Hartman (Swedish National Agency for Education), Helena Karis (Swedish National Agency for Education), Jenny Lindblom (Swedish National Agency for Education)

United Kingdom, Scotland: Joan Mackay (Education Scotland), Elaine Kelley (Scottish Government), Judith Tracey (Scottish Government), Kit Wyeth (Scottish Government), Jonathan Wright (Scottish Government); **Wales**: Steve Davies (Education and Public Service Group), Kevin Mark Palmer (Education Achievement Service for South East Wales), Debbie Lewis (Central South Consortium, Wales), Ruth Thackray (GwE Representing Welsh Government)

United States: Mary Coleman (U.S. Department of Education)

NATIONAL CO-ORDINATORS AND CONTRIBUTORS FROM PARTNER COUNTRIES AND ECONOMIES FOR THE OECD FUTURE OF EDUCATION AND SKILLS 2030 PROJECT

Argentina: Inés Cruzalegui (Ministerio de Educación Nacional), Mercedes Miguel (Ministerio de Educación Nacional)

China (People's Republic of): Huisheng Tian (National Center for School Curriculum and Textbook Development, Ministry of Education of China), Shanshan Wang (National Center for School Curriculum and Textbook Development, Ministry of Education of China)

Costa Rica: Alicia Vargas (Ministerio de Educación Pública), Rosa Carranza (Ministerio de Educación Pública)

Hong Kong (China): Vincent Siu-chuen Chan (Education Bureau), Chi-kong Chau (Education Bureau), Ashley Pak-wai Leung (Education Bureau), Winnie Wing-man Leung (Education Bureau), Annie Hing-yee Wong (Education Bureau)

Indonesia: Taufik Hanafi (Ministry of Education and Culture)

Kazakhstan: Zhanar Abdildina (Nazarbayev Intellectual Schools AEO), Dina Shaikhina (Nazarbayev Intellectual Schools AEO)

Lebanon: Rana Abdallah (Center for Educational Research and Development)

Russian Federation: Kirill Bykov (Ambassade de Russie en France), Ilya Denisenko (Federal Institute for Evaluation of Education Quality), Evgeniy Noskov (Moscow Centre for Quality of Education), Sergey Stanchenko (Federal Institute for Evaluation of Education Quality), Elena Zozulya (Moscow Centre for Quality of Education).

Saudi Arabia: Nayyaf Aljabri (Ministry of Education), Lama Al-Qarawi (Ministry of Education), Meetb Al-Humaidan (Ministry of Education), Abdulrahman Alsayari (Ministry of Education), Hissah Bin-Zuayer (Ministry of Education)

Singapore: Oon Seng Tan (National Institute of Education, Nanyang Technological University), Low Ee Ling (National Institute of Education, Nanyang Technological University), Lim Kek Joo (National Institute of Education, Nanyang Technological University)

Slovenia: Ksenija Bregar-Golobic (Ministry of Education, Science and Sport)

South Africa: Suren P Govender (Ministry of Education) and Hleki Mabunda (Ministry of Education)

United Arab Emirates: Tareq Mana S. Al Otaiba (Abu Dhabi Crown Prince Court)

Viet Nam: Tran Cong Phong (Vietnam Institute of Educational Sciences), Do Duc Lan (Vietnam Institute of Educational Sciences), Anh Nguyen Ngoc (Vietnam Institute of Educational Sciences), Luong Viet Thai (Vietnam Institute of Educational Sciences), Le Anh Vinh (Vietnam Institute of Educational Sciences)

NATIONAL CO-ORDINATORS, CONTRIBUTORS AND CONTACT PERSONS FOR THE POLICY QUESTIONNAIRE ON CURRICULUM REDESIGN (PQC)

Australia: Hilary Dixon (Australian Curriculum Assessment and Reporting Authority [ACARA]), Robert Randall (ACARA)

Argentina: Mercedes Miguel (Ministerio de Educación Nacional)

Canada, British Columbia: Angie Calleberg (British Columbia, Ministry of Education), Nick Poeschek (British Columbia, Ministry of Education) and Nancy Walt (British Columbia, Ministry of Education); **Ontario**: Martyn Beckett (formerly of the Ontario Ministry of Education), Shirley Kendrick (formerly of the Ontario Ministry of Education), Cathy Montreuil (formerly of the Ontario Ministry of Education), Yael Ginsler (Ontario Ministry of Education); **Québec**: Geneviève LeBlanc (Ministère de l'Éducation)

Chile: María Jesús Honorato (Ministry of Education) and Ruth Cortez (Ministry of Education)

China (People's Republic of): Huisheng Tian (National Center for School Curriculum and Textbook Development, Ministry of Education of China), Shanshan Wang (National Center for School Curriculum and Textbook Development, Ministry of Education of China)

Costa Rica: Rosa Carranza (Ministerio de Educación Pública), Alicia Vargas (Ministerio de Educación Pública)

Czech Republic: Hana Novotná (Czech School Inspectorate)

Denmark: Christian Rasmussen (Ministry of Education), Pernille Skou Brønner Andersen (Ministry of Education)

Estonia: Pille Liblik (Ministry of Education and Research), Imbi Henno (Ministry of Education and Research)

Finland: Aki Tornberg (Ministry of Education and Culture), Erja Vitikka (Finnish National Agency for Education)

Hong Kong (China): Ashley Pak-wai Leung (Education Bureau), Winnie Wing-man Leung (Education Bureau)

Hungary: Valéria Csépe (Eszterházy Károly University), Nora Katona (Eszterházy Károly University)

Ireland: Linda Neary (Department of Education and Skills)

Japan: Takanori Bando (Ministry of Education, Culture, Sports, Science and Technology [MEXT]), Hiroshi Itakura (MEXT), Yoichi Kiyohara (MEXT), Shun Shirai (MEXT), Aya Yamamoto (MEXT)

Kazakhstan: Zhanar Abdildina (Nazarbayev Intellectual Schools AEO), Dina Shaikhina (Nazarbayev Intellectual Schools AEO)

Korea: Eun Young Kim (Korean Educational Development Institute), Mee-Kyeong Lee (Korea Institute for Curriculum and Evaluation)

Mexico: Elisa Bonilla Rius (Secretaría de Educación Pública)

Netherlands: Jeanne van Loon (Dutch Ministry of Education, Culture and Science)

New Zealand: Pauline Cleaver (Ministry of Education)

Norway: Elisabeth Buk-Berge (Ministry of Education and Research), Bente Heian (Norwegian Directorate for Education and Training)

Poland: Danuta Pusek (Ministry of National Education)

Portugal: Eulália Alexandre (Ministry of Education)

Russian Federation: Maria Dobryakova (National Research University Higher School of Economics), Tatiana Meshkova (National Research University Higher School of Economics), Elena Sabelnikova (National Research University Higher School of Economics)

Singapore: Low Ee Ling (National Institute of Education, Nanyang Technological University)

South Africa: Cheryl Weston (Department of Basic Education), Siyalo Qanya (Department of Basic Education), Keitumetse Modiba (Department of Basic Education)

Sweden: Johan Börjesson (Swedish National Agency for Education)

United Kingdom, Scotland: Jonathan Wright (Education Analysis); **Wales**: Rhiannon Davies (Education and Public Services Group)

Viet Nam: Luong Viet Thai (Vietnam Institute of Education Sciences)

Researchers contributing to the Policy Questionnaire on Curriculum Resign (PQC) for their countries:

Brazil: Claudia Costin (Center for Innovation and Excellence in Educational Policies), Allan Michel Jales Coutinho (Center for Innovation and Excellence in Educational Policies)

India: Monal Jayaram Poduval (Piramal Foundation for Education Leadership), Lopa Gandhi (Gandhi Fellowship), Shrestha Ganguly (Piramal Foundation for Education Leadership), Shobhana Panikar (Kaivalya Education Foundation)

United Kingdom, Northern Ireland: Carmel Gallagher (International Bureau for Education)

United States: William Schmidt (Michigan State University), Leland Cogan (Michigan State University), Jennifer Cady (Michigan State University)

MEMBERS OF THE EDUCATION POLICY COMMITTEE/EDUCATION COUNSELLORS

Members of the OECD's Education Policy Committee and education counsellors also provided valuable contributions by making relevant interventions during the discussions at the Committee meetings and/or by reviewing the draft report prior to publication.

CURRICULUM EXPERTS

Carolina Belalcazar (Independent Researcher, France), Marius R. Busemeyer (University of Konstanz, Germany), Irmeli Halinen (Metodix Oy (Ltd), Finland), Phil Lambert (Phil Lambert Consulting, Australia), Rose Luckin (University College London, United Kingdom), Nienke Nieveen (Eindhoven University of Technology & Netherlands Institute for Curriculum Development, Netherlands), Claire Sinnema (University of Auckland, New Zealand), Annette Thijis (Netherlands Institute for Curriculum Development, Netherlands), Joke Voogt (University of Amsterdam and Windesheim University, Netherlands), Liat Zwirn (Concept, Israel)

STUDENT CONTRIBUTORS

Maxime Zwartjes

OECD SECRETARIAT

Management group

Andreas Schleicher (Director for Education and Skills), Dirk Van Damme (Senior Counsellor), Yuri Belfali (Head of Division)

OECD Future of Education and Skills 2030 team and communication team who produced this report

Miho Taguma (Project Manager, Senior Analyst), Esther Carvalhaes (Analyst), Meritxell Fernández Barrera (Analyst), Fumitaka Suzuki (Analyst), Kevin Gillespie (Assistant), Kelly Makowiecki (Consultant), Susan Copeland (Editor), Misha Pinkhasov (Editor), Sophie Limoges (Design), Della Shin (Design)

OECD former Secretariat members who worked on part of the drafts or data used in the report and/or instrument development

Alena Frid (Analyst), Lauren Kavanagh (Analyst), Natalie Laechelt (Analyst), Nathan Roberson (Analyst), Soumaya Maghnouj (Analyst), Makito Yurita (Analyst), Kristina Sonmark (Analyst), Eva Feron (Analyst), Shun Shirai (Analyst), Masafumi Ishikawa (Analyst), Manon Costinot (Statistician), Sara Anderson (Thomas J. Alexander Fellow), Joaquin Carceles Martinez (Consultant), Connie Chung (Consultant), Alison Burke (Consultant), Najung Kim (Consultant), Meow Hwee Lim (Consultant), Yubai Wu (Consultant), Leslie Greenhow (Assistant), Carrie Richardson (Assistant), Hanna Varkki (Assistant), Misuk Kim (Secondee), Yeasong Kim (Intern)

EXPERT REVIEWERS

Tadahiko Abiko (Professor Emeritus, Nagoya University), Kiyomi Akita (Professor, Faculty of Letters, Gakushuin University, and Visiting Professor, Graduate School of Education, The University of Tokyo), Mathias Bouckaert (Analyst, OECD), Tracey Burns (Senior Analyst, OECD), Lucie Cerna (Analyst, OECD), Christopher Dede (Timothy E. Wirth Professor in Learning Technologies, Harvard Graduate School of Education), Marc Fuster Rabella (Analyst, OECD), Francesca Gottschalk (Consultant, OECD), Phil Lambert (Phil Lambert Consulting, Australia), Janet Looney (European Institute of Education and Social Policy – EIESP), Lynn Paine (Associate Dean and Professor, Teacher Education, Michigan State University), Mario Piacentini (Analyst, OECD), Beatriz Pont (Senior Analyst, OECD), Reyer Der Van Vlies (Analyst, OECD), Romane Viennet (Consultant, OECD), Stephan Vincent-Lancrin (Senior Analyst, OECD), Joke Voogt (Professor, University of Amsterdam)

Adapting Curriculum to Bridge Equity Gaps

TOWARDS AN INCLUSIVE CURRICULUM

For the first time, the OECD Future of Education and Skills 2030 project conducted comprehensive curriculum analyses through the co-creation of new knowledge with a wide range of stakeholders including policy makers, academic experts, school leaders, teachers, NGOs, other social partners and, most importantly, students. This report is one of six presenting the first-ever comparative analyses on curriculum, summarising existing literature, listing challenges and strategies countries reported, and suggesting lessons learned from unintended consequences countries experienced with their curriculum reforms.

Major trends in curriculum innovations towards a "21st century curriculum" have emerged as four types: digital curriculum, personalised curriculum, cross-curricular content and competency-based curriculum, and flexible curriculum. While these innovations hold the promise to enhance student learning and well-being, and to make learning more relevant for their social and future life, countries and schools also face the complex realities of equity gaps among students. This report takes a pragmatic look at equality, equity and inclusion in curriculum. It examines how curriculum can be adapted to meet specific needs of diverse learners, particularly vulnerable students. It also features a range of strategies which countries use to design curriculum, so that no student will be left behind.

PRINT ISBN 978-92-64-35395-4
PDF ISBN 978-92-64-80496-8

9 789264 353954