What does research say?

WHAT IS TIME LAG?

Time lag in curriculum occurs when the curriculum content that children are learning in school today lags behind what they will be expected to know and do with that knowledge, and how they will engage in the world, when they grow up (the OECD Education 2030 Policy Questionnaire on Curriculum Redesign [PQC]). Curriculum therefore needs refining and improving to align with changes in society (Bude, 2000[1]).[1]

Four dimensions of time lag in curriculum redesign

Four dimensions have been proposed to identify and conceptualise the different types of time lag. They broadly reflect the different phases of curriculum redesign (See Box 1).

Box 1 **Four dimensions of time lag in curriculum redesign**

1. **Recognition time lag** occurs when the need for a curriculum change in response to social and demographic changes (e.g. digitalisation, globalisation and migration) is not quickly or clearly identified.

2. **Decision-making time lag** refers to the delay between when the need for a change is recognised and when an action plan for necessary changes is decided upon, including the time required for consensus-building on the need for the change.

3. **Implementation time lag** occurs when new goals or procedures in a revised curriculum are not quickly or thoroughly adopted in classroom practice, affected by factors that inhibit or foster their implementation.

4. **Impact time lag** refers to the time elapsed from the action taken until its impact has become visible, i.e. the time it takes for the impact of a curriculum change on students' outcomes to be observed.

Source: Adapted from Halinen (2017[2]) and van den Akker (2018[3]).

It is important to note that there is some overlap between the recognition and decision-making phases and the decision-making and implementation phases. Piloting changes often starts during the decision making phase and continues in the implementation phase, particularly when those who will be implementing the reform are involved in the decision-making process (NCCA, 2017[4]). In addition, the duration and significance of the time lag depends on the context and many other factors, including the nature, extent and depth of the changes and the size and governance structure of the country/jurisdiction.

RECOGNITION TIME LAG

Building a peaceful and sustainable future requires a range of competencies that go beyond being ready for jobs. In today's world, people need to have a great deal of social and environmental awareness, as well as the ability to co-operate, negotiate and find creative solutions to new and old problems. These realities are key drivers for change in transforming education for a better future (OECD, 2018[5]). Recognition time lag also implicitly refers to the ability of people working in education to look beyond the present reality and anticipate the future, in order to understand or imagine what kind of competences will be needed (Halinen, 2017[2]).

Demographic changes, such as migration, urbanisation, ageing and global population growth, raise questions on how limited resources can stretch to meet growing social demands. While science and technology develop at an unprecedented pace, the well-being of societies and individuals in many parts of the globe is threatened by growing inequalities in living standards, access to health care and social inclusion in diverse societies, as well as by violent conflict. Environmental challenges, such as climate change and the depletion of natural resources, also add to the range of global problems that affect communities.

Such societal changes put pressure on education systems to adapt and better support students to overcome their fear of unknown and thrive in a volatile, uncertain, complex and ambiguous world (Johansen, 2013[6]). It takes time for stakeholders to adapt to these changes in society, and that contributes to a recognition time lag before curriculum can be changed.

Speed of change accelerated by technology

Many of the economic, societal and environmental transformations are taking place very rapidly, but education systems are relatively slow to adapt and change – sometimes for the right reasons and other times for reasons unrelated to students' needs. This challenges the relevance of existing curricula and creates a real risk of ballooning time lag.

For example, education was a driver for technological advances following the industrial revolution, which led to a sustained period of prosperity. But during the digital revolution, technology has outgrown and outpaced changes in education (Figure 1). When the demands and development of technology exceed the education and skills of children and adults, there can be a gap in productivity and prosperity.

Depending on the nature of work being considered, technology has the capacity to either replace work or to supplement and support workers with augmentation. For example, robotics and automation might replace manufacturing work, but likewise new technologies, such as machine-learning can increase the productivity of software developers. Technology that supplements workers (e.g. by speeding up cognitive processes) can generate new investment and manufacturing opportunities (Morgan et al., 2019[7]).

New advancements, such as increased capabilities of medical technologies not only contribute to improved medical care for patients, but also create new skills and capacities for medical practitioners. These advancements in technology can help prepare students for autonomous, wholehearted engagement in their worlds to contribute to our human flourishing (Stevenson, 2020[8]). With a growing reliance on artificial intelligence, skills such as complex problem solving, critical thinking, creativity, people management, and emotional intelligence are increasingly viewed as some of those most reliant on intrinsic human values (World Economic Forum, 2016[9]).

Figure 1 **The race between technology and education**

Note: Inspired by The race between technology and education, Goldin & Katz (Harvard)

As we move forward, education can continue to lag behind technology, or it can catch up and take a lead position, boosting the prospects of increased prosperity. A persistent lag can only increase the level of social pain produced by the gap between technology and the shortage of competencies that can benefit from those technologies. No single change and no incremental changes in the system are likely to bring education up to speed, notably for children and students from disadvantaged backgrounds. The COVID-19 pandemic in 2020 shone a spotlight on the digital divide and equity gaps in education and has amplified them. Speedier and deeper transformational change is vital to shorten the period of social pain, particularly as related to equity.

The political and economic costs of introducing such transformational change are high, but so are the costs of inaction, which may have long-lasting negative impacts on society as a whole.

Such transformational digitalisation is not an end in itself, but should be viewed as one of the means to achieve the paradigm shift required to achieve a new normal in education (see Table 2).

Fear of the unknown and adhering to past successes

Keeping up with constant and rapid changes in the economy and in society can be challenging for education systems, which often tend to perpetuate approaches that have worked in the past. In some countries/jurisdictions, the term "industrial era schools" is often used to convey the time lag that some schools today still experience, with features that prepared students for jobs during the industrial era (i.e. mass production based on assembly lines and the division of labour). Mirroring this in education, "efficiency and mass education" were the norm, and the curriculum was designed to be static, linear, standardised and prescriptive, so that any teacher could teach the same level of content to meet the demands for factory workers.[2]

The organisation of work has changed significantly over time, from the 19th century model based on a strict division of labour, assembly lines and a highly hierarchical culture to the 21st century model of shared responsibility and team-work in flat, open, flexible and transparent organisations. However, in some countries/jurisdictions, this shift in education is not keeping up with the pace of change in society. This is partly due to fear of the unknown which can result in resistance to curriculum change and partly due to the difficulty in building consensus on the types of competencies required to meet future demands.

Resistance to change can also occur when people are overly attached to past solutions. Consistent with the Cognitive Behavioural Model of Panic, the human brain tends to revert to past heuristic models to manage uncertainty, even when those heuristics may now be outdated or even unhelpful (Salkovski, Clark and Gelder, 1996[10]). The relevance of schooling for current and future generations will depend on how promptly and effectively governments can recognise future needs and take action. A country/jurisdiction may have been a top performer in the industrial model of education, but that does not guarantee continued positive performance. Instead, educators must redefine past models of success and reconsider how to manage uncertainty with new solutions. These steps are critical to minimise the potential negative effects of increased time lag.

Difficulty in predicting and identifying future needs and competencies

Recognition time lag also occurs because it is very difficult to predict future changes and to gauge the time required to build consensus on the types of skills, knowledge, attitudes and values needed in our changing world. Part of the challenge lies in the ability to anticipate which competencies are likely to endure.

Job-related competencies for an uncertain future with accelerated technological changes

An estimated 65% of children entering primary school are expected to work in completely new jobs that did not exist at the time they started their schooling (World Economic Forum, 2016[9]).[3] Trends in the types of skills required have also shifted dramatically over the past 50 years. Routine manual and cognitive tasks were once the norm, but today's jobs require more non-routine analytic and interpersonal skills (Figure 2). The set of competencies required for some new and emerging jobs have been described as "fusion skills" (i.e. a combination of creative, entrepreneurial and technical skills). These positions, along with activities that require human care (e.g. empathy in the case of health care professionals), are less likely to be replaced by computers (OECD, 2015[11]). With a growing reliance on artificial intelligence (AI), such skills are increasingly viewed as those most reliant on intrinsic human values.

Citizenship in society and digital space

Technologies and jobs are not the only facets of rapid change in society. Traditional forms of civic and social engagement, such as voting and volunteering, have been in decline in many parts of the globe for decades. While voter turnout is influenced by many contextual and local factors, a downward trend has been observed in many countries (Figure 3). In response, an increasing number of countries have started to explicitly articulate citizenship, including global and digital citizenship, as part of educational goals. The aim is to prepare current and future generations to thrive in increasingly complex and diverse societies, which will require trust, tolerance and collaboration in both political and social processes (OECD, 2013[13]).

Figure 2 **Trends in types of tasks required for work**

Note: This figure shows how the composition of tasks performed by US workers has changed from 1960 to 2009.
Source: Autor and Price (2013) in Bialik and Fadel (2018, p. 7[12]).

Figure 3 **Fewer people engaged in their democracies**

Parliamentary voter turnout, in 1950, 1980 and 2010 (or nearest available year)

Note: Voter turnout is the total number of votes cast (valid or invalid) divided by the number of people registered to vote, expressed as a percentage. Where the data for countries were not consistently available in the same years, figures from the closest year are used. The year of each data point is available at: https://dx.doi.org/10.1787/888932758074
Source: International IDEA (2011), Voter Turnout Database

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The rise of the Internet and the popularity of social networking sites have the potential to shape new forms of political and social engagement. Some communities have already been tapping into those opportunities to increase the levels of interest and engagement in political activity, particularly among youth (Pew Research Center, 2013[14]). Relatively simple ways to mobilise people around issues that matter to all include, for example, live-streaming town-hall meetings, using platforms to crowdsource ideas and recruit volunteers, using social networks for increasing the reach of public events, etc.

The benefits of digital democracies are yet to be fully realised, and the risks (e.g. privacy, security and equality) are yet to be fully addressed (European Parliament, 2020[15]). However, increased civil involvement will remain a priority in a globally connected world, as the COVID-19 pandemic has dramatically demonstrated.

Environmental literacy for a sustainable future

Overpopulation and economic development put strenuous pressure on the planet. Greenhouse gas emissions, deforestation, disruption of wildlife and ocean life, and loss of biodiversity are among the top environmental concerns for current and future generations. As some types of environmental degradation are not immediately tangible, the perception that such threats are far out in nature and remote from our daily lives represents another threat to our ecosystem (Kollmuss and Agyeman, 2002[16]). And life on the planet – human and non-human – is deeply interconnected in many ways. Consumerism generates waste and pollution; traditional forms of electricity tap into limited natural resources; water and air pollution diminish the supply of fish, crops and potable water; and polluted air, water or food affect human health.

Younger people tend to be more worried about climate change than older people (Reinhart, 2018[17]). Although the research is heterogeneous, young people may have increased consciousness about climate change. They are also more likely to have misunderstandings related to scientific knowledge and often live lifestyles similar to older generations (Ojala and Lakew, 2017[18]). A change in the course and speed of environmental threats requires a shift in people's mindsets: from consumer to steward of nature, from utilitarianism to sustainability, from predatory behaviour to nurturing, restoring and rebuilding for a better future (OECD, 2020[19]).

Individual and collective well-being

Governments are increasingly recognising that inclusive growth cannot be limited to the material dimensions of well-being, but also needs to encompass the physical and emotional health of all, their safety (and perceptions thereof) and their levels of life satisfaction, as well as their sense of belonging in a community (OECD, 2018[5]). The OECD Well-being framework recognises the complexity of the concept of well-being by assessing not only material conditions but also quality of life factors that influence people's sense of well-being. Figure 4 demonstrates 11 key dimensions of well-being (OECD, 2020[20]).

One example of how the social, economic and individual dimensions are influential on well-being is reflected in the rise of the number of people living alone in many countries. Social and economic changes, such as increased job mobility, greater disposable income, higher rates of divorce and ageing, have given rise to a high number of people in many countries who live alone. The factors increase the risk of social isolation and fragmentation (Figure 5).

Countering the threats of social isolation in this hyper-connected world, young people will need to have life competencies, such as the ability to exercise empathy, to collaborate and learn from others, to negotiate and to positively influence their environment, and particularly to take action to improve their own lives and those of others.

Schools are in a privileged position to guide young people on how to make a difference in the real world. Service learning, for example, which links schools to local needs in their communities, can be an integral component of a curriculum that fosters authentic learning. It can help students to develop social responsibility and other competencies that are needed to fully participate and shape the world around them, for increased individual and societal well-being (David, 2009[21]).

Figure 4 **OECD Well-being framework**

Source: OECD (2020), *How's Life? 2020: Measuring Well-being*, OECD Publishing, Paris, https://doi.org/10.1787/9870c393-en.

Figure 5 **Home alone: The rise in single-person households**

Number of one-person households, in the early to mid-2000s and projected to 2025-2030

Note: A one-person household refers to a household in which a person makes provision for his or her own food or other essentials for living without combining with any other person to form part of a multi-person household.
Source: OECD (2011), *The Future of Families to 2030*, OECD Publishing, Paris, https://doi.org/10.1787/9789264168367-en.

OECD Learning Compass 2030

Recognising the importance of minimising the discrepancies between changes in the world and the type of education available to children, many countries worked together to develop the OECD Learning Compass for 2030, a new learning framework for the future (Figure 6). It was co-created as a globally shared vision for the types of competencies (knowledge, skills, attitudes and values) that will help children and youth not only to thrive but also to shape their own future in holistic, inclusive, and sustainable ways. The OECD Learning Compass represents shared aspirations among the countries/jurisdictions participating in Education 2030 project towards a type of education that is future-oriented, globally informed and locally contextualised, and centred on the notion of well-being at individual, societal and environmental levels (OECD, 2018[5]). For country-specific visions and competencies, please see the "Data" section below.

Anchored in the OECD Key Competency Framework (the DeSeCo project) (OECD, 2016[23]), the Learning Compass 2030 maintains solid theoretical underpinnings, but is at the same time practical and easy to apply. The metaphor of the "learning compass" is used to illustrate the types of competencies – the knowledge, skills, attitudes and values – that students need to reach the goal of well-being, just as a compass shows the points used to determine geographic direction and helps you reach your destination. A brief summary of the seven future-oriented competencies follows (for more detail, see the OECD Learning Compass 2030 Concept Note Series (OECD, 2019[22])).

Figure 6 **OECD Learning Compass 2030**

Source: OECD Learning Compass 2030. A series of Concept Notes (OECD, 2019[22])

1. **Student agency/co-agency**: Student agency for 2030 is rooted in the belief that students have the ability and the will to positively influence their own lives and the world around them. It is defined as the capacity to set a goal, reflect, and act responsibly to effect change. It is about acting rather than being acted upon, shaping rather than being shaped, and making responsible decisions and choices rather than accepting those determined by others. The concept of agency has resonance consequently not only for how young people engage in education, but what they take from their schooling as they navigate transitions into work. In education systems that encourage student agency, learning involves not only instruction and evaluation but also co-construction. The concept of co-agency recognises that students, teachers, parents and communities work together to help students progress towards their shared goals.

2. **Core foundations**: The OECD Learning Compass 2030 defines core foundations as the fundamental conditions and core skills, knowledge, and attitudes and values that are prerequisites for further learning across the entire curriculum. The core foundations provide a basis for developing student agency and transformative competencies. All students need this solid grounding in order to fulfil their potential to become responsible contributors to and healthy members of society. Besides basic literacy and numeracy, digital literacy and data literacy are increasingly recognised as fundamental conditions for students to thrive in the future. Core foundations also include social and emotional foundations as well as health foundations (physical and psychological).

3. **Transformative competencies**: To meet the challenges of the 21st century, students need to be empowered and feel that they can help shape a world where well-being and sustainability are achievable – for themselves, for others and for the planet. The OECD Learning Compass 2030 has identified three transformative competencies that students need in order to contribute to and thrive in our world and shape a better future: creating new value, reconciling tensions and dilemmas, and taking responsibility.

4. **Knowledge for 2030**: As part of the OECD Learning Compass 2030, knowledge includes theoretical concepts and ideas, in addition to practical understanding based on the experience of having performed certain tasks. The Education 2030 project recognises four different types of knowledge: disciplinary, interdisciplinary, epistemic and procedural.

5. **Skills for 2030**: Skills are the ability and capacity to carry out processes and be able to use one's knowledge in a responsible way to achieve a goal. The OECD Learning Compass 2030 distinguishes three different types of skills: cognitive and metacognitive; social and emotional; and practical and physical. Some of the key skills explored in the project's curriculum content mapping include: critical thinking, problem solving, learning-to-learn skills, co-operation/collaboration, self-regulation/self-control, adaptability and persistence/resilience.

6. **Attitudes and values for 2030**: Attitudes and values refer to the principles and beliefs that influence one's choices, judgements, behaviours and actions on the path towards individual, societal and environmental well-being. For example, strengthening and renewing trust in institutions and among communities require greater efforts to develop core shared values of citizenship in order to build more inclusive, fair, and sustainable economies and societies. Socially situated attitudes and often unspoken expectations also frame young people's career aspirations and their ability to relate schooling to long-term employment outcomes (Musset and Mytna Kurekova, 2018[24])

7. **Anticipation-Action-Reflection competency development cycle**: The Anticipation-Action-Reflection (AAR) cycle is an iterative learning process whereby learners continuously improve their thinking and act intentionally and responsibly. In the anticipation phase, learners become informed by considering how actions taken today might have consequences for the future. In the action phase, learners have the will and capacity to take action towards well-being. In the reflection phase, learners improve their thinking, which leads to better actions towards individual, societal and environmental well-being.

DECISION-MAKING TIME LAG

Decision-making time lag occurs because, due to various competing demands and concerns, making decisions on new goals, procedures and policies requires a long process that takes time (Halinen, 2017[2]). The decision-making phase typically includes the time required to draft the new curriculum following the recognition that it is time to act and change the curriculum. In some countries, the decision-making process may overlap with the recognition time lag. This is the intentional combining of the process of identifying the need for change as well as engaging in consensus-building with the process of decision-making.

Factors that can affect the length of decision-making time lag include: how frequently major curriculum reforms are designed, whether the curriculum renewal occurs on fixed cycle or an ad hoc basis; the scope and alignment of the reform; and the degree of centralisation or decentralisation in which the curriculum renewal is to take place.

Frequency of curriculum reforms

Countries/jurisdictions tend to distinguish between fixed or regular and ad hoc reforms. Regular reforms are defined as curriculum reforms conducted every set number of years. Ad hoc reforms refer to curriculum reforms conducted when the need arises, without a fixed interval.

Countries/jurisdictions often use fixed reform cycles as an opportunity to conduct comprehensive curriculum changes[4] (Table WEB 11[5]). The frequency of those comprehensive or major reforms varies considerably across countries/jurisdictions, from on an ongoing basis to every 20 years, or as necessary or appropriate as shown in Figure 7. Typically, a little less than half of the countries (15 out of 33) engage in major reforms as necessary or on an ongoing basis, and some by cycles of every 5-10 years (13 out of 33). A few countries/jurisdictions engage in shorter cycles, i.e. every 2-5 years (3 out of 33), or longer cycles, i.e. every 15-20 years (2 out of 33).

Figure 7 **Frequency of major curriculum reforms**

OECD: Czech Republic, Hungary
Partner: India[3]

OECD: Québec (Canada)[2]
Partner: Viet Nam

every
2 - 5
years

every
5 -10
years

every
15 - 20
years

as necessary/
when
appropriate

OECD: Australia, British Columbia (Canada), Chile[1], Estonia, Finland, Japan, Korea, Lithuania[1], Ontario (Canada)

Partner: China (People's Republic of), Costa Rica, Russian Federation, Singapore

OECD: Denmark, Ireland, Mexico, Netherlands, New Zealand, Northern Ireland (United Kingdom)[3], Norway, Poland, Portugal, Sweden, Turkey, United States[3]

Partner: Argentina, Hong Kong (China), South Africa

Note: As necessary/when appropriate: country/jurisdiction does not have a set timeframe for curricular reform and initiates curriculum redesign as necessary/when appropriate.
1. Chile conducts reforms every 6-12 years, Lithuania every 10-12 years.
2. With adjustments made as necessary/appropriate.
3. Responses for these countries/jurisdictions were submitted by independent researchers, not government administrations.
Source: Data from the PQC, item 2.1.1.

StatLink https://doi.org/10.1787/888934195017

There is no clear research evidence on the optimal frequency of curriculum reform as curriculum designers operate in different national contexts. Election cycles, for example, may affect whether or not a curriculum reform may take place or continue. These can vary in and among countries/jurisdictions.

Recognising that the frequency of reform cycles can affect how quickly education systems adapt their curriculum to current and future needs, countries/jurisdictions also use a combination of regular and ad hoc reforms to address the need for timelier curriculum renewal (See Table WEB 11[6]). A range of other factors, in addition to the frequency of reforms, can affect the extent and length of the four types of time lag identified in Box 1. They are discussed in the sequence.

Characteristics of fixed and ad hoc curriculum change

Decision-making time lag is associated with dilemmas and trade-offs between a quick response to emerging needs and the risk of a fragmented curriculum.

Countries/jurisdictions typically have built-in periodic curriculum renewal cycles to ensure continuity and efficiency (Sivesind and Westbury, 2016[25]; NCCA, 2017[4]; Pietarinen, Pyhältö and Soini, 2017[26]). However, this process may be more costly than other types of renewal, as more permanent staff are needed to run it (NCCA, 2017[4]). The downside of long-term fixed curriculum life cycles is that they make it difficult to respond to emerging societal needs or research findings in an agile way and thus could cause students to miss out on learning opportunities relevant to actual needs in our changing world.

Ad hoc curriculum reform processes typically involve modifying parts of a curriculum (e.g. adding a new subject, renewing subjects that scored low on international rankings or undertaking reform only at one level). Such ad hoc reforms can be either incremental or radical. They may cost less and require less time and allow more agility in adjusting curriculum, as they are generally only a partial renewal.

It is, however, important to note the risks of ad hoc partial curriculum changes. Various stakeholder groups may have vested interests in including new topics in the curriculum. Simply adding new topics and content without removing any content and without proper consideration of how such new topics fit the overall purpose and design of the curriculum often leads to overload or fragmentation (NCCA, 2017[4]) and may lead to incoherence across grades and learning areas (see (OECD, 2020[27])). Indeed, countries/jurisdictions report both difficulties and opportunities associated with fixed and non-fixed curriculum reform time frames, as well as with frequent or less-frequent reforms.

Scope and alignment of the reform

Most curriculum reforms comprise one or more of the following elements:

- a change in educational goals

- a change in instructional time

- subject renewal (adding new subjects, merging subjects, reorganising subjects into learning areas)

- content renewal (adding new content while reducing other content), either across the curriculum or in only a few grades, a single educational level or the entire grade span.

When changing **educational goals** in the past, it was considered faster to negotiate and plan within a limited set of stakeholders, rather than building support and co-ordinating planning. However, a more democratic approach is increasingly observed across OECD countries. Research shows that what motivates curriculum reform among all stakeholders is a shared sense of urgency on issues such as social, economic, and technological changes, concerns about current performance of the education system, and the desire to strengthen the sense of national identity (Barber, Chijioke and Mourshed, 2010[28]; Bolstad and Gilbert, 2012[29]; Curriculum Development Council, 2015[30]). For example, Scotland (United Kingdom) organised a national debate to discuss how the education system could equip young people for the future, which led to its Curriculum for Excellence (McAra, Broadley and McLauchlan, 2013[31]; Donaldson, 2014[32]). In People's Republic of China (hereafter "China"), one important goal of curriculum reform was to strengthen the national identity, with different stakeholders actively involved in the early consensus-building process (Law, 2014[33]).

There is significant variation in the time required to modify **instructional time** and to **renew subjects and content**, as these changes can apply to only a few grades, to a single educational level or to the entire grade span. In general, curriculum changes that are limited in scope (e.g. covering only a few learning areas, such as literacy and numeracy) or that target only a few grade levels tend to be shorter than extensive reform of an entire national curriculum. In all areas, such reforms can be subject to political pressures and competition among different subjects (OECD, 2020[27]).

Other types of change include **a structural review of the curriculum** (i.e. one that goes beyond modifying subjects). One example is the shift towards a concept-based competency-driven curriculum (OECD, 2020[27]). Structural curriculum reforms are often easier to plan than to actually implement, so it is important to consider how to minimise implementation time lag while the reform is being planned.

Substantive curriculum reform may include **changes in examinations,** as well as in **teacher education/certification requirements**. All of these have their own timetables and can add to the overall time lag in curriculum change. Therefore, intentionally aligning the different aspects of the reform to ensure coherence will result in a steadier, quicker and more sustainable curriculum reform[7] (OECD, Forthcoming[34]).

Governance and time needed to build consensus on the changes

Curriculum redesign requires time for consultation with many different stakeholders, in order to build consensus and ownership and to support development of a quality curriculum (Barnard, 2003[35]; McAra, Broadley and McLauchlan, 2013[31]; Law, 2014[33]; NCCA, 2017[4]). This also adds to the decision-making time lag.

Research on the association between governance models and time lag issues is inconclusive. Some research suggests that the time needed for a whole curriculum redesign tends to be shorter in countries/jurisdictions with centralised curriculum policy than in those with decentralised curriculum policy, given the consultation requirements and processes involved in building consensus (van den Akker, 2018[3]). Other research suggests that smaller reforms at the local level tend to proceed faster and more smoothly than extensive national reforms (NCCA, 2017[4]; Halinen, 2017[2]). The governance model is not the exclusive factor in time lag variations. Other factors such as the scope of the curriculum reform also play a role.

Although some researchers suggest that local/school decision-making can be quicker than national decision making, others point out that the needs of schools vary considerably and that some schools may need to prioritise literacy and numeracy over so-called 21st century skills. Further circumstances that may prolong time needed for local-level or decentralised system decision-making can also include considerations of teacher involvement. Teachers may not feel prepared to take on the role of curriculum designers, or may feel pressure to (include elements to) prepare students for high-stakes testing (Voogt, Nieveen and Klopping, 2017[36]).

The process will also depend on the role of involved stakeholders. Countries/jurisdictions have found different ways to involve teachers. In the redesign process, for example, approaches include: systematic consultation or communication throughout the

whole process; ensuring a key role for teachers in the design team, as in British Columbia (Canada) and the Netherlands, and encouraging active involvement of local levels in school curriculum development, as in Finland (van den Akker, 2018[3]).

Since the scope of curriculum reform varies considerably across countries/jurisdictions as seen earlier, time comparisons regarding curriculum change processes in different contexts need to be evaluated with caution. It is vital to consider the various factors that could play a role, such as the extent and depth of the changes, the role of stakeholders, the levels of co-ordination and buy-in among key stakeholders, and how the changes and the whole review process are designed.

IMPLEMENTATION TIME LAG

A time lag is often reported between the intended or written curriculum and the implemented or taught curriculum (see the Overview brochure of the Education 2030 series of thematic reports on curriculum redesign)[8]. Countries/jurisdictions report different phases involved in a reform, namely, planning, decision-making, preparation, implementation and monitoring:

1. **Planning**: Includes not only planning per se but also related activities, such as subsequent review of strategy and timeline, reviews of literature and national and international curricula, identification of stakeholders and their role, and discussions with stakeholders and experts.

2. **Decision-making**: Can include the time to finalise detailed specifications of the reform and where the curriculum may be redeveloped, based on those specifications.

3. **Preparation**: May encompass preparations for implementation, including dissemination of the new curriculum and guidelines, and preparation of teachers and school facilitators.

4. **Implementation**: Includes the work of implementing the curriculum across the system.

5. **Monitoring**: Includes the period when the curriculum is being monitored and there is time to conduct reviews, follow-ups and evaluations.

Of these phases, a considerable time lag can occur when moving from curriculum redesign to curriculum implementation, in particular, because of the time it takes to prepare schools and teachers to adopt new goals and procedures (Halinen, 2017[2]). Policy makers tend to underestimate the time needed for implementation because they often see it as a technical process.

Complexity of phasing a curriculum reform cycle

Countries/jurisdictions may choose different strategies to structure their major curriculum reform processes. There are complex curriculum design choices they can make:

- Planning a total duration of a reform with different phasing strategies (e.g. Table 1, Figure 9, Figure 10).

- Designing agility and stability through the use of major or ad hoc reforms or combination of both (e.g. Figure 10).

- Designing a scope of reforms, e.g. moving all aspects together or targeting some aspects in focus (e.g. Figure 11 for specific subjects).

These choices need to be considered, in particular, from the perspectives of process management of curriculum change to ensure these changes will bring meaningful change for students as well as to avoid reform fatigue among teachers.

Curriculum reform needs to be considered as serving public goods, not as a means for political or ideological debates. To this end, building more and stronger knowledge base is of critical importance to make informed decision about curriculum change for better student learning and well-being.

Total duration of major reform cycles

The total duration of a reform, including different phases, is defined as the interval between its start and its end year. In a study reviewing 11 jurisdictions, a full national curriculum reform may take 10 years or more (2 years, on average, for decision-making and 8 years, on average for implementation) (van den Akker, 2018[3]). The time elapsed from the official announcement of a curriculum redesign process to the first cohort using the new curriculum ranged from two years to eight years and averaged six years (van den Akker, 2018[3]). The average duration does not include preparatory activities such as awareness building. Nor does it cover the time needed to assess the effects of the reform on student learning outcomes, which depends on the scope of the reform (the grade levels and subjects involved).

Table 1 **Indicative duration of major secondary curriculum reforms and reform phases**

		Indicative duration of a reform	Indicative length of planning phase	Indicative length of decision-making phase	Indicative length of preparation phase	Indicative length of implementation phase	Indicative length of monitoring phase
OECD	Australia[2]	8.5	4.0	5.0	4.5	6.0	5.0
	Austria	8.1	1.0	1.0	1.0	5.5	5.0
	British Columbia (Canada)	7.7	2.0	3.5	4.0	2.7	(m)
	Denmark	3.2	(m)	1.0	(m)	1.0	5.0
	Estonia[2]	12.4	1.8	1.6	3.8	2.6	3.2
	Hungary[2]	3.8	1.4	1.2	1.6	1.2	2.6
	Japan	15.2	3.3	1.8	5.2	11.5	(m)
	Korea[2]	11.4	1.7	1.1	3.1	8.8	4.0
	Lithuania[2]	15.2	3.8	2.6	3.8	13.3	5.8
	Mexico[2]	3.3	1.8	1.3	1.8	1.5	4.0
	New Zealand[2]	11.5	3.5	4.0	2.0	4.0	4.0
	Northern Ireland (United Kingdom)	5.0	2.3	2.3	2.3	2.3	4.0
	Norway[2]	14.0	5.0	3.5	2.0	3.0	7.0
	Poland[2]	3.5	(m)	1.0	(m)	2.0	7.0
	Québec (Canada)	10.5	4.0	2.5	4.5	4.0	(m)
	Scotland (United Kingdom)	11.0	5.0	2.5	7.0	(m)	(m)
	Sweden[2]	8.7	6.0	6.0	5.0	4.7	8.5
	OECD-16 average	9.0	3.1	2.5	3.4	4.6	5.0
Partner	China (People's Republic of)	9.0	1.0	1.0	2.5	11.0	6.0
	Hong Kong (China)[3]	(m)	(m)	(m)	(m)	(m)	(m)
	Costa Rica[2]	8.7	1.0	1.0	1.8	6.3	1.6
	India[2]	12.3	3.7	2.0	3.3	8.3	9.5
	Kazakhstan[1]	10.0	2.0	3.0	4.0	7.0	2.0
	Russian Federation[2]	10.0	2.3	1.3	2.0	6.6	5.3
	Singapore[4]	6.0	(m)	(m)	(m)	(m)	(m)
	Viet Nam	19.0	3.3	1.0	5.8	3.5	15.0
	Global average[3]	9.5	2.9	2.2	3.4	5.3	5.5

Note: This table summarises countries'/jurisdictions' averages across all regular reform cycles reported at the secondary (lower and upper secondary) level. The length of each reform and reform phase is measured from their start year to their end year. It was only calculated when both, a clear start and a clear end year have been provided. The indicative length of each phase was computed by averaging the length of the respective phase across all reform cycles reported for which data were available. The indicative duration of a reform was computed by averaging the length of all reform cycles for which data were available (irrespective of phases). Missing (m) indicates that no sufficient data were available to compute an average.

1. These countries/jurisdictions reported only one major reform on secondary education.

2. These countries/jurisdictions reported at least one curricular regular/major reform cycle in secondary education simultaneously with upper secondary education.

3. Of the 8 partner countries/jurisdictions which submitted data for this comparison, only 7 are included in the Global average. Hong Kong (China) submitted renewals on an ongoing basis (and thus without a fixed interval) which were not included in these calculations.

4. Total length for several of the reform cycles submitted by Singapore was not available. Indicative duration of a reform was thus not calculated as an average of submitted reforms but was directly reported by the country. Singapore reports that a typical review cycle for subjects other than languages is a 6-year cycle. For languages a typical cycle is 10 years

Source: Data from the PQC, item 2.1.2 and the Curriculum Reform Cycle worksheet collected at the Education 2030 9th Informal Working Group meeting. For more details on the reforms see Table WEB 11.[9]

Recent data reported by 25 OECD and partner countries/jurisdictions reveal a similar average of regular curriculum reforms for secondary education, i.e. 9.5 years on average, much longer than typical political election cycle (Table 1). This suggests the importance of the purpose and direction of curriculum reform, which needs to be agreed at the societal level, not as an agenda proposed by one particular political party. The indicative duration and length in this is table needs to be interpreted with specific stages reported in Figure 8, Figure 9 and Figure 11.

When looking at the indicative duration of curriculum reform in various countries/jurisdictions in Table 1, it becomes evident that implementation along with monitoring (which can overlap) seem to take most time (i.e. 4.6 and 5 years, respectively, among participating OECD countries) among various phases of a reform. The predominance of the implementation phase in typical curriculum reform timeframes underlines how critical – and often complex – this phase is as it often involves many more schools' actors than those included in preparation stages, which requires intense levels of co-ordination.

That said, it is important to highlight that it would be misleading to compare the length of each phase itself across countries and jurisdictions; it needs to be interpreted in a wider context. For example, these phases may overlap, which can explain a shorter curriculum reform cycle as a whole. Also, the length of implementation may depend on who are involved in the decision-making and preparation phases; if teachers are already involved in the decision making phase, if they are already informed of the purpose and focus of the reform without waiting for the planning or implementation phase, then it would be logical that the length of such phases is shorter than those countries and jurisdictions where teachers are only informed of the direction of reform after the decision-making phase. For example, Figure 8 (for lower secondary education) and Figure 9 (for upper secondary education) show visually the duration of individual phases. At a glance, it becomes evident how variable the length of curriculum reforms as well as the length of phases are across countries and jurisdictions.

Intended overlaps of phasing

Some countries decide for instance to give an early start to the implementation phase, making it overlap with earlier planning phases in the process, most frequently with the decision-making or planning phases. By involving key stakeholders early on in the process (e.g. teachers and school leaders who will play a crucial role in bringing the new curriculum to the classroom) countries and jurisdictions might be paving the way for shortening the implementation phase.

This pattern is observed in some countries with short reform cycles in total. For instance Hungary and Northern Ireland (United Kingdom), with major lower and upper secondary reform cycles ranging from 1 to 7 years long, show an overlap of implementation with the earlier phases of the reform process (preparation, decision-making and planning). Similarly, their monitoring phase often starts as soon as the implementation of the new curriculum is rolled out (Figure 8, Figure 9). An early tracking of progress can help spot obstacles along the way and get a better understanding of challenges faced by schools and teachers so that timely support tailored to local needs can be provided.

In other cases, there is also overlap between implementation and the earlier phases of the reform process, but the monitoring phase only begins a few years after implementation has started. In the 11 year-long Australian lower secondary major education reform from the 2000s, there is considerable overlap between implementation, decision-making and preparation (Figure 8). Even if it might not affect the total duration of the cycle significantly, overlap between the early phases of the reform and implementation might contribute to a smoother transition from decision-making and planning to implementation, ensuring stronger consensus and buy-in from stakeholders along the process. Monitoring does not start in this reform cycle until the fourth year of implementation.

In some cases the overlap between implementation and monitoring is much more prominent than the overlap between the earlier phases of reform. A long period of monitoring concomitant with implementation might contribute to the effectiveness of the reform, by providing timely feedback from practitioners in the field on barriers to implementation.

For example, the long cycle of lower secondary reform in the early 2000s in China (13 years) shows short 1-year overlaps between the decision-making and planning phases, and a long 6-year overlap between implementation and monitoring. In this case, there is also an imbalance between the duration of the earlier and later reform phases: planning, decision-making and preparation are only between 1 and 2 years long, whereas implementation is 11 years long and monitoring is 6 years long (Figure 8).

Also in a lower secondary major reform in India started in the early 2000s, overlap between implementation and monitoring is much more prominent than between monitoring and the earlier phases of reform: implementation and monitoring have been ongoing in parallel since 2007 until 2020. Conversely, implementation overlaps with decision-making and preparation for only one year (Figure 8).

Intended sequencing of different phases

Some countries/jurisdictions show a more sequential pattern, with long cycles, little overlap between phases and long implementation and monitoring phases. This is the case for instance in Japan, with long reform cycles (over 17-year-long cycle in lower secondary and over 20-year-long cycle in upper secondary) with only one-year overlaps between phases and an implementation phase that exceeds half the total duration of the reform cycle (Figure 8, Figure 9). Similarly, in Québec, a considerably long lower secondary reform cycle (24 years) and upper secondary reform cycle (18 years) show little overlap across phases and have a monitoring phase half as long as the total cycle (Figure 8, Figure 9).

The contextual factors (including political, demographic, economic and cultural) are bound to lead to very different styles of reform in general, and varying lengths of the implementation phase, in particular. In fact, by looking at the reform data from various angles, further particularities of curriculum reform become more evident and nuanced. Lithuania tends to reform the lower secondary separately from the upper secondary curriculum in a cyclical fashion. Japan may plan and make decisions for both lower and upper secondary reform at the same time, but only roll out changes for one level at a time. The Russian Federation gravitates towards longer reform cycles while ensuring frequent reforms, to mention a few. Curriculum change, therefore, may require multiple reform cycles, as a single reform may not cover all aspects of necessary change.

It is also important to consider contextual factors that may explain some of the differences in the contrasting examples above, such as the size of the country/jurisdiction, the size of the student population, the number of schools and teachers (please see Contextual Information for Comparative Curriculum Analysis). Various aspects of the curriculum reform itself may impact the length of a curriculum reform. Those suggest, for example, the scope and extent of the changes involved, the frequency in which they occur, the level of stakeholder engagement and the choices countries make regarding sequencing and/or layering of different reform phases.

Major vs ad hoc reforms to keep up with new demands

Ad hoc reforms can help countries address specific emerging demands in an agile way. In most countries, ad hoc reforms are used in-between major reforms to fill in particular gaps. Among countries/jurisdictions ad hoc reforms typically introduced new content or new subject(s) (Figure 10). In this sense, it is usual for ad hoc reforms to have a narrower scope than major reforms.

However, when ad hoc reforms are sequenced, with a carefully-designed intentional alignment with a major reform, they can also introduce progressive and systemic curriculum change. This is the case in countries/jurisdictions such as Sweden.

Subject-specific major reforms

In some cases, major reforms target only specific subjects. Some examples of specific subjects reformed in major reforms over the past few decades are reported in Figure 11:

- Australia (2009-2013): mathematics, science, humanities (modern history, ancient history, geography)

- Mexico (1992-2000): social studies

- Mexico (2019): Civic and ethical training, healthy living

- Poland (2006-2007): Polish language

- Poland (2007-2008): Polish language, foreign language

- Poland (2008-2009): Polish language

- Sweden (2011-2019): vocational training

- Costa Rica (1987-1989): Computer science education

- Costa Rica (1994-1998): Civic education, musical education, plastic arts, physical education, education for daily life, affectivity and sexuality, industrial arts, Spanish, social studies.

- Costa Rica (2008): Spanish, civic education, music education, mathematics, plastic arts, physical education, education for daily life, affectivity and sexuality, industrial arts.

- Singapore (2008): Geography, history, additional mathematics, science, physics, chemistry, biology, literature in English, literature in mother tongue languages

- Singapore (2010a): Literature in English, mathematics, science

- Singapore (2012): English language, food & nutrition, music

- Singapore (2011b): Social studies, art, principles of accounting

- Singapore (2011a): Food and consumer education, character and citizenship education, history, geography, social studies, physical education, science NT

- Singapore (2013b): Physical education, nutrition and food science

- Singapore (2013a): Music

- Singapore (2014): Design & technology

- Singapore (2015): Computing

- Singapore (2018): Principles of accounts, elements of business skills

Figure 8 [1/6] **Major curriculum reform cycles lower secondary (all subjects) reported between 1980 and 2030**

Legend: Planning · Decision-making · Preparation · Implementation · Monitoring · Start or end date open/unclear

A. Change of education goals B. Change of instruction time C. Subject renewal D. Content renewal E. Other types of change

OECD

Country	All changes [Subjects]
Australia	A, C, D [all subjects]
Austria	A, B, C, D [all subjects]
Austria	A, C, D [all subjects]
British Columbia (Canada)	B, E [all subjects]
British Columbia (Canada)	A, C, D, E [all subjects]
Denmark	A, E [all subjects]
Denmark	A, E [all subjects]
Denmark	A, E [all subjects]
Denmark	A, B [all subjects]
Estonia	A, B, C, D [all subjects]¹
Estonia	D [all subjects]¹
Estonia	B, C, D, E [all subjects]
Hungary	A, B, D, E [all subjects]
Hungary	E [all subjects]¹
Hungary	A, B, E [all subjects]¹
Hungary	A, E [all subjects]
Hungary	A, B, D [all subjects]
Japan	A, B, C, D [all subjects]
Japan	A, B, C, D [all subjects]
Japan	A, D, E [all subjects]

Years: 1980–2004

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink https://doi.org/10.1787/888934195036

Figure 8 [2/6] **Major curriculum reform cycles lower secondary (all subjects) reported between 1980 and 2030**

Legend: Planning · Decision-making · Preparation · Implementation · Monitoring · Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink 🔗 https://doi.org/10.1787/888934195036

Figure 8 [3/6] **Major curriculum reform cycles lower secondary (all subjects) reported between 1980 and 2030**

Legend: Planning | Decision-making | Preparation | Implementation | Monitoring | Start or end date open/unclear

A. Change of education goals B. Change of instruction time C. Subject renewal D. Content renewal E. Other types of change

	All changes [Subjects]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
OECD Korea	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
Lithuania	A, B, C, D [all subjects]																									
	A, C, D [all subjects]																									
	A, B, C, D, E [all subjects][1]																									
Mexico	A, B, C, D, E [all subjects]																									
	A, D, E [all subjects][1]																									
	A, B, C, D, E [all subjects][1]																									
New Zealand	A, B, C, D [all subjects][1]																									
	A, C, D [all subjects][1]																									
Northern Ireland (United Kingdom)	B [all subjects]																									
	A, B, C, D [all subjects]																									
Norway	A, D, E [all subjects][1]																									
	A, D, E [all subjects][1]																									
Poland	A,B,C,D,E [all subjects][1]																									
Québec (Canada)	A, B, C, D, E [all subjects]																									
Scotland (United Kingdom)	A, B, C, D [all subjects][1]																									
Sweden	A, C, D [all subjects][1]																									
	A, D [all subjects][1]																									
	All changes [Subjects]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink https://doi.org/10.1787/888934195036

Figure 8 [4/6] **Major curriculum reform cycles lower secondary (all subjects) reported between 1980 and 2030**

Planning   Decision-making   Preparation   Implementation   Monitoring   Start or end date open/unclear

A. Change of education goals   **B. Change of instruction time**   **C. Subject renewal**   **D. Content renewal**   **E. Other types of change**

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink https://doi.org/10.1787/888934195036

Figure 8 [5/6] Major curriculum reform cycles lower secondary (all subjects) reported between 1980 and 2030

Legend: Planning | Decision-making | Preparation | Implementation | Monitoring | Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

Partners		All changes [Subjects]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	China (People's Republic of)	A, B, C, D [all subjects]																									
		A, B, C, D [all subjects]																									
	Costa Rica	A [all subjects][1]																									
		E [all subjects][1]																									
		E [all subjects][1]																									
	India	A, B [all subjects][1]																									
		A, B, C, E [all subjects]																									
		A, B, D, E [all subjects][1]																									
		A, B [all subjects][1]																									
	Kazakhstan	A, B, C, D, E [all subjects][1]																									
	Russian Federation	A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
	Viet Nam	A, B, C, D, E [all subjects]																									
		A, B, C, D, E [all subjects]																									
	All changes [Subjects]		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink https://doi.org/10.1787/888934195036

Figure 8 [6/6] **Major curriculum reform cycles lower secondary (all subjects) reported between 1980 and 2030**

		Planning		Decision-making		Preparation		Implementation		Monitoring		Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ᴍˢᴸ https://doi.org/10.1787/888934195036

Figure 9 [1/6] **Major curriculum reform cycles upper secondary (all subjects) reported between 1980 and 2030**

Legend:
- ▇ Planning
- ▇ Decision-making
- ▇ Preparation
- ▇ Implementation
- ▇ Monitoring
- ▇ Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

	All changes [Subjects]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
OECD — Austria	A, B, C, D [all subjects]																									
	A, C, D [all subjects]																									
	A, C, D [all subjects]																									
	A [all subjects]																									
	A [all subjects]																									
British Columbia (Canada)	A, C, D, E [all subjects]																									
Estonia	A, B, C, D [all subjects][1]																									
	D [all subjects][1]																									
	B, C, D, E [all subjects]																									
Hungary	E [all subjects][1]																									
	A, B, E [all subjects][1]																									
Japan	A, B, C, D [all subjects]																									
	A, C, D [all subjects]																									
	A, B, C, D, E [all subjects]																									
Korea	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
	A, B, C, D [all subjects][1]																									
Lithuania	A, B, C, D, E [all subjects]																									
	A, C, D, E [all subjects]																									
	A, B, C, D, E [all subjects][1]																									
	All changes [Subjects]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ⏴⏵ https://doi.org/10.1787/888934195055

Figure 9 [2/6] **Major curriculum reform cycles upper secondary (all subjects) reported between 1980 and 2030**

Legend:
- Planning
- Decision-making
- Preparation
- Implementation
- Monitoring
- Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

Country (OECD)	All changes [Subjects]
Austria	A, B, C, D [all subjects]
Austria	A, C, D [all subjects]
Austria	A, C, D [all subjects]
Austria	A [all subjects]
Austria	A [all subjects]
British Columbia (Canada)	A, C, D, E [all subjects]
Estonia	A, B, C, D [all subjects][1]
Estonia	D [all subjects][1]
Estonia	B, C, D, E [all subjects]
Hungary	E [all subjects][1]
Hungary	A, B, E [all subjects][1]
Japan	A, B, C, D [all subjects]
Japan	A, C, D [all subjects]
Japan	A, B, C, D, E [all subjects]
Korea	A, B, C, D [all subjects][1]
Korea	A, B, C, D [all subjects][1]
Korea	A, B, C, D [all subjects][1]
Korea	A, B, C, D [all subjects][1]
Korea	A, B, C, D [all subjects][1]
Korea	A, B, C, D [all subjects][1]
Korea	A, B, C, D [all subjects][1]
Lithuania	A, B, C, D, E [all subjects]
Lithuania	A, C, D, E [all subjects]
Lithuania	A, B, C, D, E [all subjects][1]

Timeline columns: 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink https://doi.org/10.1787/888934195055

Figure 9 [3/6] Major curriculum reform cycles upper secondary (all subjects) reported between 1980 and 2030

| ■ Planning | ■ Decision-making | ■ Preparation | ■ Implementation | ■ Monitoring | ■ Start or end date open/unclear |

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

OECD		All changes [Subjects]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	Mexico	A, D, E [all subjects][1]																									
		A, B, C, D, E [all subjects][1]																									
	New Zealand	A, B, C, D [all subjects][1]																				■	■	■	■	■
		A, C, D [all subjects][1]																				■	■	■		
	Northern Ireland (United Kingdom)	A,C, D [all subjects]																			■	■	■ ■	■ ■	■	■
	Norway	A, D, E [all subjects][1]																					■	■		
		A, D, E [all subjects][1]																								
	Poland	A,B,C,D,E [all subjects][1]																								
		A,B,C,D,E [all subjects]																								
	Québec (Canada)	A, B, C, D, E [all subjects]																						■	■	
	Scotland (United Kingdom)	A, B, C, D [all subjects][1]																						■	■	
		D [all subjects]																								■
	Sweden	A, C, D [all subjects][1]																								
		A, D [all subjects][1]																								
		All changes [Subjects]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ⬛⬛ https://doi.org/10.1787/888934195055

Figure 9 [4/6] **Major curriculum reform cycles upper secondary (all subjects) reported between 1980 and 2030**

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ⧉ https://doi.org/10.1787/888934195055

Figure 9 [5/6] **Major curriculum reform cycles upper secondary (all subjects) reported between 1980 and 2030**

Legend: ■ Planning ■ Decision-making ■ Preparation ■ Implementation ■ Monitoring ■ Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

Partners		All changes [Subjects]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	Costa Rica	A [all subjects][1]											■	■	■	■											
		E [all subjects][1]																						■	■	■	■
		E [all subjects][1]																									
	India	A, B [all subjects][1]																		■	■	■	■	■	■	■	■
		A, B, D, E [all subjects][1]																									
		A, B [all subjects][1]																									
	Kazakhstan	A, B, C, D, E [all subjects][1]																									
	Russian Federation	A, C, D, E [all subjects][1]											■	■	■	■											
		A, C, D, E [all subjects][1]													■	■	■	■									
		A, C, D, E [all subjects][1]																	■	■	■						
		A, C, D, E [all subjects][1]																					■	■	■	■	■
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects]																									
		A, C, D, E [all subjects][1]																									
		A, C, D, E [all subjects][1]																									
	Viet Nam	A, B, C, D, E [all subjects]																					■	■	■	■	■
		A, B, C, D, E [all subjects]																									

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ⟐ https://doi.org/10.1787/888934195055

Figure 9 [6/6] **Major curriculum reform cycles upper secondary (all subjects) reported between 1980 and 2030**

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ᵐ⁵ᴸ https://doi.org/10.1787/888934195055

Figure 10 [1/4] Ad hoc curriculum reform cycles reported between 1997 and 2030

Legend: ■ Planning ■ Decision-making ■ Preparation ■ Implementation ■ Monitoring ▢ Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

		Education Level	All changes [Subjects]	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
OECD	Austria	Lower secondary	B, C [all subjects]																
	Denmark	Lower secondary	E [all subjects]																
		Lower secondary	D, E [specific subjects]																
	Estonia	Lower secondary	E																
		Upper secondary	E																
		Lower secondary	D, E [all subjects][1]																
		Upper secondary	D, E [all subjects][1]																
	Japan	Lower secondary	E [all subjects]																
		Upper secondary	E [all subjects]																
		Lower secondary	D [specific subjects]																
	New Zealand	Lower secondary	C, D [specific subjects][1]																
		Upper secondary	C, D [specific subjects][1]																
	Norway	Lower secondary	A, C, D [specific subjects][1]																
		Upper secondary	A, C, D [specific subjects][1]																
	Scotland (United Kingdom)	Lower secondary	D [specific subjects]																
		Lower secondary	D [all subjects]																
		Education Level	All changes [Subjects]	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

2. Hong Kong (China) adopts an ongoing curriculum renewal approach for responding quickly to local and global changes. Some of these ongoing reforms can have a wide scope including, for example, updates on curriculum goals, contents or learning time.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ⋳⋿⋼⊒ https://doi.org/10.1787/888934195074

Figure 10 [2/4] **Ad hoc curriculum reform cycles reported between 1997 and 2030**

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

2. Hong Kong (China) adopts an ongoing curriculum renewal approach for responding quickly to local and global changes. Some of these ongoing reforms can have a wide scope including, for example, updates on curriculum goals, contents or learning time.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink https://doi.org/10.1787/888934195074

Figure 10 [3/4] **Ad hoc curriculum reform cycles reported between 1997 and 2030**

Legend: ■ Planning ■ Decision-making ■ Preparation ■ Implementation ■ Monitoring ☐ Start or end date open/unclear

A. Change of education goals B. Change of instruction time C. Subject renewal D. Content renewal E. Other types of change

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

2. Hong Kong (China) adopts an ongoing curriculum renewal approach for responding quickly to local and global changes. Some of these ongoing reforms can have a wide scope including, for example, updates on curriculum goals, contents or learning time.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ᐧᔑᔑᓬ https://doi.org/10.1787/888934195074

Figure 10 [4/4] **Ad hoc curriculum reform cycles reported between 1997 and 2030**

Legend: Planning | Decision-making | Preparation | Implementation | Monitoring | Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

2. Hong Kong (China) adopts an ongoing curriculum renewal approach for responding quickly to local and global changes. Some of these ongoing reforms can have a wide scope including, for example, updates on curriculum goals, contents or learning time.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ᘉᵻ᛫ https://doi.org/10.1787/888934195074

Figure 11 [1/4] **Major curriculum reform cycles (only specific subjects) reported between 1987 and 2030**

Planning Decision-making Preparation Implementation Monitoring Start or end date open/unclear

A. Change of education goals   **B.** Change of instruction time   **C.** Subject renewal   **D.** Content renewal   **E.** Other types of change

		Education Level	All changes [Subjects]	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
OECD	Australia	Upper secondary	C, D [specific subjects]																						
	Denmark	Lower secondary	A, E [specific subjects]																						
	Estonia	Lower secondary	A, B, C[1]																						
		Upper secondary	A, B, C1																						
	Mexico	Lower secondary	A, B, C, D, E [specific subjects][1]																						
		Upper secondary	A, B, C, D, E [specific subjects][1]																						
		Lower secondary	C, D, E [specific subjects]																						
	Poland	Lower secondary	C [specific subjects]																						
		Lower secondary	A, D [specific subjects][1]																						
		Upper secondary	A, D [specific subjects][1]																						
		Lower secondary	D [specific subjects][1]																						
		Upper secondary	D [specific subjects][1]																						
		Upper Secondary	C [specific subjects]																						
	Sweden	Upper secondary	A, B, E [specific subjects]																						
		Education Level	All changes [Subjects]	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

2. Singapore's typical review cycle for subjects other than languages is a 6-year cycle. For languages a typical cycle is 10 years.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink   https://doi.org/10.1787/888934195093

Figure 11 [2/4] **Major curriculum reform cycles (only specific subjects) reported between 1987 and 2030**

	All changes [Subjects]	Education Level		
	C, D [specific subjects]	Upper secondary	Australia	OECD
	A, E [specific subjects]	Lower secondary	Denmark	
	A, B, C[1]	Lower secondary	Estonia	
	A, B, C1	Upper secondary		
	A, B, C, D, E [specific subjects][1]	Lower secondary	Mexico	
	A, B, C, D, E [specific subjects][1]	Upper secondary		
	C, D, E [specific subjects]	Lower secondary		
	C [specific subjects]	Lower secondary	Poland	
	A, D [specific subjects][1]	Lower secondary		
	A, D [specific subjects][1]	Upper secondary		
	D [specific subjects][1]	Lower secondary		
	D [specific subjects][1]	Upper secondary		
	C [specific subjects]	Upper Secondary		
	A, B, E [specific subjects]	Upper secondary	Sweden	

Legend: Planning / Decision-making / Preparation / Implementation / Monitoring / Start or end date open/unclear

A. Change of education goals B. Change of instruction time C. Subject renewal D. Content renewal E. Other types of change

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

2. Singapore's typical review cycle for subjects other than languages is a 6-year cycle. For languages a typical cycle is 10 years.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink ⟨⟩ https://doi.org/10.1787/888934195093

Figure 11 [3/4] Major curriculum reform cycles (only specific subjects) reported between 1987 and 2030

Legend: Planning | Decision-making | Preparation | Implementation | Monitoring | Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

	Education Level	All changes [Subjects]	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Partners — Costa Rica	Lower secondary	C, D [specific subjects][1]	▣	■	■																			
	Upper secondary	C, D [specific subjects][1]	▣	■	■																			
	Lower secondary	A, D [specific subjects][1]								▣	■	■	■	■										
	Upper secondary	A, D [specific subjects][1]								▣	■	■	■	■										
	Lower secondary	C, D [specific subjects][1]																						▣
	Upper secondary	C, D [specific subjects][1]																						▣
Singapore[2]	Upper Secondary	D, E [specific subjects]																						
	Lower Secondary	B, D, E [specific subjects]																						
	Lower Secondary	D, E [specific subjects]																						
	Upper Secondary	B, D, E [specific subjects]																						
	Upper Secondary	D, E [specific subjects]																						
	Lower Secondary	D, E [specific subjects]																						
	Upper Secondary	D, E [specific subjects]																						
	Lower Secondary	D, E [specific subjects]																						
	Upper Secondary	D, E [specific subjects]																						
	Upper Secondary	D, E [specific subjects]																						

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

2. Singapore's typical review cycle for subjects other than languages is a 6-year cycle. For languages a typical cycle is 10 years.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink https://doi.org/10.1787/888934195093

Figure 11 [4/4] **Major curriculum reform cycles (only specific subjects) reported between 1987 and 2030**

Legend: ■ Planning ■ Decision-making ■ Preparation ■ Implementation ■ Monitoring ▢ Start or end date open/unclear

A. Change of education goals   B. Change of instruction time   C. Subject renewal   D. Content renewal   E. Other types of change

Years (2009–2030)	All changes [Subjects]	Education Level	
	C, D [specific subjects][1]	Lower secondary	**Partners**
	C, D [specific subjects][1]	Upper secondary	
	A, D [specific subjects][1]	Lower secondary	Costa Rica
	A, D [specific subjects][1]	Upper secondary	
	C, D [specific subjects][1]	Lower secondary	
	C, D [specific subjects][1]	Upper secondary	
	D, E [specific subjects]	Upper Secondary	
	B, D, E [specific subjects]	Lower Secondary	
	D, E [specific subjects]	Lower Secondary	
	B, D, E [specific subjects]	Upper Secondary	
	D, E [specific subjects]	Upper Secondary	
	D, E [specific subjects]	Lower Secondary	Singapore[2]
	D, E [specific subjects]	Upper Secondary	
	D, E [specific subjects]	Lower Secondary	
	D, E [specific subjects]	Upper Secondary	
	D, E [specific subjects]	Upper Secondary	

Note: 1. These reforms were reported as conducted at lower and upper secondary education simultaneously.

2. Singapore's typical review cycle for subjects other than languages is a 6-year cycle. For languages a typical cycle is 10 years.

Source: Data collected through the Curriculum Reform Cycle worksheet and PQC, item 2.1.2.

StatLink https://doi.org/10.1787/888934195093

Resistance to change among teachers

Teachers often have ambiguous feelings about curriculum change and the impact that reforms may have on themselves and their teaching. A possible consequence of not being involved in the decision-making process is a lack of sense of ownership of the new or revised curriculum. Other factors include lack of understanding and training, individuals' attitudes towards change and innovation, lack of agency, and/or fear of change, as revisions in the curriculum may require adding new subjects or removing existing subjects, with potential changes in job profiles or even loss of jobs (Harris and Graham, 2019[37]; Jenkins, 2020[38]; OECD, 2019[39]).

If teachers are reluctant to change and to adopt a more future-oriented curriculum that addresses new skills, competencies, and future jobs, students may miss out on opportunities to develop skills that could help them later in life (World Economic Forum, 2016[9]). In the short run, however, rapid changes may pose more direct challenges to teachers and their teaching than to students, as teachers may need to "unlearn and relearn". That is harder to do than to simply learn, especially if support and professional development are not provided (see "How do countries compare?").

Likewise, even highly motivated teachers can suffer from reform fatigue when they face rapid and continuous reforms, and they may find it difficult to cope with the changes. This may negatively impact teachers and cause them to lack enthusiasm in enacting the new curriculum (Dilkes, Cunningham and Gray, 2014[40]; Kennedy, 2013[41]). Finally, if teachers feel under-represented in the design process, they may develop resistance to the intended changes, which can cause further delays in the redesign phase (King, 2017[42]; van Schaik, Voogt and Nieveen, 2017[43]).

This resistance may have unintended consequences for students and principals. Data from the Programme for International Student Assessment (PISA) show that, on average across OECD countries, nearly 30% of 15-year-old students are in schools whose principals identify staff resistance to change as a factor that hinders students' learning (Figure 12). These results suggest that a curriculum reform on top of latent resistance may further impede the curriculum implementation process.

Teacher stress is one of the factors that can cause delay in implementation of curriculum changes. For teachers in many countries and jurisdictions, "keeping up with changing requirements from local, municipal/regional, state or national/federal authorities" is a predominant source of stress. Of 11 potential sources of teacher stress investigated in the 2018 Teaching and Learning International Survey (TALIS), keeping up with these changing requirements was the third most frequently cited source of stress (after "having too much administrative work to do" and "being held responsible for students' achievement"). On average across the OECD, 41% of teachers report that keeping up with changing requirements from education authorities is a source of stress, either "quite a bit" or "a lot", with considerable between-country variation (Figure 13).

Implementation is not straightforward, but rather a complex process of buy-in, communication and training (Fullan, 2007[44]). It should be planned as:

- purposeful (realising the overall goals of curriculum reform)

- multidirectional (because stakeholders may adapt the reform to their possibilities and perceptions)

- contextualised (because it is influenced by the political environment, institutional settings and the wider external context) (Viennet and Pont, 2017[45]).

In recent years, countries/jurisdictions are exploring an ecosystem approach to curriculum development and are inclined not to make a distinction between design and implementation. This is done by involving designers in implementation at the same time (OECD, Forthcoming[34]). The ecosystem approach is believed to address complex challenges such as the following (Fullan, 2007[44]).

Limits to parental agency to support their children's learning

Curriculum implementation may include additional involvement of parents, as changes may need at least parental understanding, if not support. A growing body of evidence shows that children and youth perform better at school when their parents support their learning at home. The long-term benefits for children are not limited to academic performance, but also include their social and emotional development, their attitudes towards learning, their enjoyment of learning and later integration in society (OECD, 2012[47]; OECD, 2013[48]).

Not all parents, however, have the time or feel prepared to support their children with school-related work. Many barriers may get in the way of their engagement, such as competing demands at work and at home, lack of understanding of what is required of their children at school, feelings of unpreparedness to help their children in specific subject areas, a belief that learning is the work of teachers, and even a lack of awareness that they can make a real difference in their children's learning. The disconnect between school life and home life can be exacerbated in disadvantaged or immigrant families, thus compromising full implementation of the curriculum among certain groups of students (Duncan, Magnuson and Vortuba-Drzal, 2017[49]).

Figure 12 **Percentage of students in schools whose principal reported that student learning is hindered "to some extent" or a "lot by staff" resisting change**

Source: OECD, PISA 2018 Database, Table III.B1.7.1, https://doi.org/10.1787/acd78851-en

StatLink https://doi.org/10.1787/888934195112

Figure 13 **Teachers' experience of stress relating to keeping up with changing requirements from education authorities**

Percentage of teachers for whom keeping up with changing requirements from local, municipal/regional, state or national/federal authorities is a source of stress "quite a bit" or "a lot"

Source: OECD, TALIS 2018 Database, Table II.2.43, https://doi.org/10.1787/19cf08df-en.

Information on data for Cyprus: https://oe.cd/cyprus-disclaimer

StatLink https://doi.org/10.1787/888934195131

Reducing the implementation time lag, therefore, includes restoring the links between schools and families and getting parents involved in their children's learning journey, as they too are part of the ecosystem in which students learn. They can actively support the well-being and learning experiences of their children, but they may need clear guidance from school leaders and teachers to see themselves as partners in the learning journey, rather than clients.

Simple ways in which parents can be encouraged to exercise agency and share the responsibility for their children's development include following their child's daily activities at home, accompanying their progress by talking to the child and teacher, asking the teacher how to best support learning at home, participating in school activities and volunteering (Lakind and Atkins, 2018[50]). Some parents may have the ability and desire to get involved by taking leadership roles in schools and communities, but it is important to ensure that the most vulnerable students do not go unheard (OECD, 2012[47]). Building in opportunities to encourage the voices of parents of disadvantaged students should also shorten the implementation time lag as adjustments may be executed as soon as needs are identified.

Effective implementation needs time to prepare well

Processes included in the implementation time lag include preparation of guiding materials and guidelines for school leaders and teachers, as well as teacher training (SLO, 2008[51]; McAra, Broadley and McLauchlan, 2013[31]; Mølstad, 2015[52]; NCCA, 2017[4]). Providing professional development opportunities is particularly relevant when adding new subject areas and 21st century competencies (Brown et al., 2014[53]; NCCA, 2017[4]; Sinnema, 2011[54]; McAra, Broadley and McLauchlan, 2013[31]).

Preparative steps are likely to take time, but they are important investments for successful implementation. Overlooking the alignment of textbooks, teacher guidance materials teacher training, and assessment and evaluation to the new curriculum is likely to create greater delays in implementation in the long run. School leaders and teachers may misunderstand the reform, which can lead to unintended outcomes or to further debate, both of which can extend the time lag. In the Czech Republic, for example, reforming the school-leaving examination took 14 years of debating and testing various versions and modes of implementation, even after the initial policy was passed (OECD, 2016[55]).

IMPACT TIME LAG

Impact time lag occurs because of the time it takes to realise and assess the impact of curricular changes within education systems and in society at large (Halinen, 2017[2]). The time it takes for teaching to change and for students to get the learning experiences intended by the new curriculum depends on the scope of the changes and the organisation of the curriculum design process. Far more time is needed for the change in students learning outcomes to be observed (Halinen, 2017[2]).

The time needed for the effect to be observable may be shorter for curriculum redesign with a specific and/or narrow focus. For instance, improvements in numeracy and literacy in international performance were achieved in six years or less in Chile, Latvia and Hong Kong (China), once policy makers and the public recognised the urgency for change and acted on a set of interventions with determination (Barber, Chijioke and Mourshed, 2010[28]).

Box 2 **The Japanese national curriculum standard**

Through the Japanese national curriculum standard (NCS), revised in 1998, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) created time for a new area of study and decreased instruction time and curriculum content compared to the previous curriculum. This curriculum was broadly criticised as so called Yutori education (a phrase used to criticise drops in scholastic ability), based on Japan's performance in reading literacy in PISA 2003. When MEXT revised the national curriculum standard in 2008, it increased both instruction time and curriculum content. The Central Council for Education in Japan has pointed out the following issues regarding the 1998 NCS: MEXT could not efficiently disseminate the purpose of curriculum redesign, reduced the curriculum content in a way that damaged the consistency of subjects, and could not properly co-ordinate integrative study and subjects. MEXT also did not include sufficient instruction time to acquire and utilise knowledge and skills in the subjects (Central Council for Education in Japan, 2008[57]).

Regarding integrated study, MEXT continued the policy so that students would engage in problem-solving learning and inquiry across subjects. Thus, the revision of the NCS in 2008 incorporated integrated study while reducing instruction time. In fact, National Assessment of Academic Ability surveys in Japan have revealed that the average correct answer rate for literacy and mathematics is higher for students who are actively engaged in integrated study (NIER, 2016[58]). In short, when considering a curriculum redesign, it is necessary to verify it from a long-term, rigorous perspective.

For national curriculum reforms, the time needed to see the effects on learning outcomes usually includes the time needed for the design process and the schooling time needed to integrate the reform. Identifying the effects of a complete curriculum redesign may take more than 15 years (SLO, 2008[51]; Desha, Hargroves and Smith, 2009[56]).

A new reform of the curriculum is often announced before the previous one has completely come into effect. This can pose a challenge for policy makers if the curriculum redesign process is heavily influenced by political cycles that may affect continuity of the reform. For the real impact of a curriculum change to be observed, continuity of curriculum reform is essential. If reforms swing from one direction to another, research to measure the real impact of the selected curriculum reform is not be possible. This can lead to a need for more research to make the curriculum design more systematic and also to gain trust and buy-in among key actors of the reform to help reduce the time lags in recognition, decision-making, implementation and therefore impact.

CURRICULUM INNOVATIONS AIMING TO ELIMINATE TIME LAGS FOR STUDENTS AND TEACHERS

To reap the full potential of eliminating time lags in education, countries/jurisdictions and schools can adjust their practices to reflect current needs and predict those of the future. Building on these future-oriented school practices, a new normal in education started to emerge (Table 2), which had been anticipated and delineated even before the COVID-19 crisis (OECD, 2019[22])

To put this new normal into action in classrooms, a growing number of countries and jurisdictions are adapting their curriculum, pedagogies, assessments, governance structure, educational management and the role of students in education. On the other hand, students are still being taught with traditional pedagogical techniques little changed since the 1900s (Schleicher, 2018[60]).

Table 2 **The new normal in education**

Features	Traditional education system	Education system embodying the new normal
Education system	Education system is **an independent entity**	Education system is **part of a larger ecosystem**
Responsibility and stakeholders engagement	**Decisions made based on a selected group of people** and thus they become accountable and responsible for the decisions made **Division of labour** (principals manage schools, teachers teach, students listen to teachers and learn)	**Decision-making and responsibilities shared among stakeholders**, including parents, employers, communities, and students **Shared responsibility** (everyone works together and assumes responsibility for a student's education, and students also learn to be responsible for their own learning)
Approach to effectiveness and to quality of school experience	**Outcomes most valued** (student performance, student achievements are valued as indicators to evaluate systems for accountability and for system improvement) **Focus on academic performance**	**Valuing not only "outcomes" but also "process"** (in addition to student performance and student achievements, students' learning experiences are in and of themselves recognised as having intrinsic value) **Focus not only on academic performance but also on holistic student well-being**
Approach to curriculum design and learning progression	**Linear and standardised progression** (the curriculum is developed based on a standardised, linear learning-progression model)	**Non-linear progression** (recognising that each student has his/her own learning path and is equipped with different prior knowledge, skills and attitudes when he/she starts school)
Focus of monitoring	**Valuing accountability and compliance**	**System accountability as well as system improvements** (e.g. continuous improvement through frequent feedback at all levels)
Student assessment	**Standardised testing**	**Different types of assessments used for different purposes**
Role of students	**Learning by listening** to directions of teachers with emerging student autonomy	Active participant with both **student agency and co-agency** in particular with teacher agency

Source: *OECD Learning Compass 2030: A Series of Concept Notes*, Table 2, p.14 (OECD, 2019[22]; OECD Education and Skills YouTube channel, 22 October 2019[59])

To close such time lags, some countries/jurisdictions and schools have made significant changes in curriculum in past decades. Such attempts can be categorised in four types of curriculum innovations:

1. **Digital curriculum** can include digital content or organisational features to implement curricular elements, online materials, tools, depositories, hardware, software and other applications. The definition varies across countries/jurisdictions and is evolving as schools experiment with a greater number of digital applications (Pepin et al., 2016[61]; Graesser, McNamara and VanLehn, 2005[62]; Papadakis, 2016[63]; OECD, Forthcoming[64]).

2. **Personalised, individualised, differentiated or tailored curriculum** is a curriculum that is tailored to students' individual needs, skills and interests (Pane et al., 2017[65]). Personalised learning has many definitions and connotations (Maguire, Ball and Braun, 2013[66]), but its main purpose is to improve learning by customising instruction to each learner (e.g. by considering one's prior knowledge, learning style, pace of learning). Personalised curriculum combined with technology, provides the opportunity for students to learn anywhere, anytime. For schools and teachers, a personalised curriculum enables an adaptation of the curriculum to the specific characteristics and needs of each learner (Peterson et al., 2018[67]).

3. **Cross-curricular content and competency-based curriculum** are built across disciplinary or subject boundaries in an effort to enable students to connect knowledge in a more holistic way to meet students' interests and serve society (Goodlad and Su, 1992[68]).

4. **Flexible curriculum** allows schools, teachers and local bodies to adapt, implement or modify curriculum by providing educators with freedom to craft learning content, goals, pedagogies and assessments (Jonker, März and Voogt, 2020[69]; Roumen et al., 2018[70]).

Some of these curriculum innovations are not new per se, but they have not yet become mainstream. Work-related learning is one that needs to be more deeply integrated to support future-ready students (department for children, 2009[71]). One of the main reasons is the high cost of implementation. Personalised and flexible curricula have existed for some time, but political and economic costs have been relatively high. To effectively implement these curriculum innovations would require a whole-system change that would include granting more local autonomy, enhancing teacher competencies and changing teacher training.

With such an ecosystemic approach to curriculum design, these curriculum innovations hold promise to support learning and improved outcomes for all students while reducing time lags. Details on each of these curriculum innovations follow.

Digital curriculum

Bridging the gap between future needs and current educational offerings has never been a straightforward task, notably in regard to digitalisation in education. However, such approaches may prove useful in various phases of curriculum redesign.

Creating space for digital literacy in curriculum

Table 3 shows that many countries/jurisdictions have made changes to the curriculum to integrate digitalisation and content related to information and communications technology (ICT), either by creating new subjects or by introducing new content, themes or competencies within the existing curriculum.

Several countries/jurisdictions have introduced (or are planning to introduce) one or more new ICT-related subjects in the curriculum, for example:

- Australia, Ireland, New Zealand, Portugal, India, Kazakhstan and Viet Nam propose **computer science, technology** or **information technology** as a separate subject.

- Norway, Argentina, and Costa Rica present **programming/coding** as a separate subject.

- Argentina and South Africa propose **robotics** as a separate subject.

Most countries/jurisdictions in Table 3 have introduced (or are planning to introduce) new digital and/or ICT-related content in existing subjects, such as **technology** or **science**, or through **cross-curricular themes or competencies** related to ICT:

- Australia, Chile, Estonia, Hungary, Ireland, Japan, the Netherlands, New Zealand, Scotland (United Kingdom) and Wales (United Kingdom), Brazil, and Kazakhstan report the introduction of ICT as cross-cutting content across multiple subjects or the entire curriculum.

- Chile, Japan, Norway, Québec (Canada), Sweden and Hong Kong (China) enhanced curriculum content on programming which could be infused in specific subjects or across subjects.

Table 3 **Strategies to change curriculum to enable digital learning**

Adding new ICT-related subject(s) to a curriculum		Introducing digital and/or ICT-related contents, themes or competencies within an existing curriculum	
OECD	Partner	OECD	Partner
Australia	Argentina	Australia	Brazil[1]
British Columbia (Canada)	Costa Rica	Chile	Hong Kong (China)
Denmark	India[1]	Denmark	India[1]
Ireland	Kazakhstan	Estonia	Kazakhstan
Japan	Singapore	Finland	Russian Federation
New Zealand	South Africa	Hungary	Singapore
Norway	Viet Nam	Ireland	South Africa
Portugal		Japan	Viet Nam
		Korea	
		Lithuania	
		Netherlands	
		New Zealand	
		Northern Ireland (United Kingdom)	
		Norway	
		Poland	
		Québec (Canada)	
		Scotland (United Kingdom)	
		Sweden	
		Wales (United Kingdom)	
		Turkey	

Note: Values displayed in this table include only countries with responses that could be clearly coded as yes/no.

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

Source: Data from the OECD Education 2030 Policy Questionnaire on Curriculum Redesign (PQC), item 2.5.3.

The content of the ICT curriculum often includes disciplinary knowledge on digital and ICT tools, such as computer hardware and software, and informatics and information technology, as well as interdisciplinary knowledge on society, science, ethics and the environment. Different cognitive and metacognitive skills, such as creativity, critical thinking and problem solving, computational thinking and applied programming, are cited by the majority of countries/jurisdictions, but some also cite social and emotional skills, such as communication. A few countries/jurisdictions also cite attitudes and values such as self-awareness in relation to ICT. In an age of the information society and post truth, these skills and attitudes are very relevant for students. (See Box 3 for more details on the content of selected ICT curricula.)

Box 3 **Learning objectives of the ICT curriculum**

Some countries/jurisdictions have introduced mandatory or elective subjects on ICT. The **Australian** curriculum includes a Digital Technologies learning area. It aims to develop knowledge, understanding and skills to ensure that, individually and collaboratively, students can design, create, manage and evaluate sustainable and innovative digital solutions to meet and redefine current and future needs. They are instructed in the use of computational thinking and the key concepts of abstraction, data collection, representation and interpretation.

Students learn to interpret and use specifications, algorithms and implementation to create digital solutions. One aim is for them to confidently use digital systems to efficiently and effectively automate the transformation of data into information and to creatively communicate ideas in a range of settings. They are taught to apply protocols and legal practices that support safe, ethical and respectful communications and collaboration with known and unknown audiences. They also learn how to apply systems thinking to monitor, analyse, predict and shape the

interactions within and between information systems and the impact of these systems on individuals, societies, economies and environments.

Some countries have introduced mandatory or elective subjects on ICT. **Estonia** proposes an elective Informatics subject which aims to direct students to develop the basic skills of learning and working with computers, primarily to search for information, process and analyse it and compile text documents and presentations. After completion, students understand and know how to avoid potential threats to health, security and personal data protection that are likely to occur when using ICT. Using ICT, they are taught to create a functioning and efficient learning environment, participate in virtual communities and use the online environment to publish digital materials in compliance with good practice in intellectual property protection.

In **Japan**, the approach to digitalisation is grounded in two main pillars: information literacy, which permeates the curriculum, and more specialised content on programming, information security, networks and databases. Japan considers information literacy as the foundational competency for learning and aims to develop it across subjects. In a society where it is difficult to predict the future, Japan recognises it is necessary to take the initiative in grasping information, thinking about what is important, collaborating with others while utilising the information, and taking on the challenge of creating new value. In elementary school, education on programming is compulsory from 2020. It is aimed to help students acquire logical thinking through programming in mathematics and science. In high school, there is a subject called "Information" where all students learn amongst others about programming, information security, networks, and databases.

The **Netherlands** has made its Information Sciences course, which was compulsory from 1993 to 2006, into an elective course. With only 30 minutes a week and only one year of instruction in the area, the original subject was not very prominent in the curriculum. It covered the use of standard software and some awareness of the effects of ICT on personal and societal life. After the core objectives were reconsidered, it was transformed into an elective subject in 2006. Today, some other subjects contain ICT-related content or use ICT tools. In art courses, for example, students have to report on their participation in artistic activities by visual or auditory means. This may give rise to some ICT-related activities, such as video editing.

Using technologies for a specific purpose in classrooms and schools

New educational technologies can offer the opportunity to support teachers in enhancing pedagogical practice in the classroom, school administration and system management (Figure 14). For example, social robots can be used as tutors or peers, particularly in primary school. At the classroom level, learning analytics has the potential to increase students' engagement with diversified strategies, provide personalised learning using adaptive technologies, classroom analytics by using data on behaviours, and the capacity to better serve students with special needs through assistive technologies.

At the school or system level, learning analytics, AI, and the Internet of Things might reduce dropout through early warning systems, provide improved or new system-level data for intervention or policy support, and help improve assessments by measuring not just students' knowledge but also how they think. Meanwhile, Blockchain technologies could help with stopping fake degrees or certificates, for example, and improving transfer of credentials. Closing this gap between the digital revolution and educational technologies should be considered in curriculum renewal.

In the context of curriculum design, digital transformation is still an evolving phenomenon, and thus the concept of "digital curriculum" is not well defined. It is often framed in terms of digital curriculum resources (or materials or programmes) because of the wide variety of materials and tools that teachers and students can access (Pepin et al., 2017[73]).

Figure 14 **Applications of technologies in education**

	Classroom	**School and system management**
Robotics	**Social robots in education**	
Learning analytics	Increasing students' engagement in learning	Improving assessment
Artificial intelligence	Personalising learning	Reducing dropout
Internet of things	Classroom analytics	Learning analytics for schools and systems
	Better serving students with special needs	
Blockchain		A new credentialing ecosystem

Source: (Bouckaert, 2020[72])

Box 4 **Technology in India's Curriculum**

More recently, some countries have been adding content on AI to their curriculum. India has revised its ICT curriculum. Artificial intelligence, digital literacy, coding and computational thinking are now introduced as core subjects in middle and secondary schools to be integrated across their curriculum.

There is also an increasing focus in Indian middle and secondary schools on AI-integrated interdisciplinary learning through project-related work. Artificial Intelligence is derived from disciplines such as science, mathematics, philosophy, sociology, computing, and others. By integrating AI into the core curriculum, India hopes to prepare youth to function in future-oriented environments and professions. This approach adopts a "skills-based" education as opposed to a "knowledge intensive education" to be ready for the future of AI.

Likewise, teachers are receiving additional training on how to use AI in the classroom, which includes materials such as curriculum resources supplements, lesson plans and instructional videos. The Central Board of Secondary Education (CBSE) aims to introduce AI as a multi-disciplinary pedagogical approach in Grades 6-12. Teachers are to be trained using an integrated approach and a "train-the-trainer" model to further be able to match relevant topics/themes from the curriculum with AI concepts.

Source: *Artificial Intelligence Integration Across Subjects*, Central Board of Secondary Education, India: http://cbseacademic.nic.in/web_material/Curriculum20/AI_Integration_Manual.pdf; and OECD Future of Education and Skills 2030 Social Partners – Dream a Dream, Vishal Talreja, Co-Founder and Trustee. Image reproduced with permission.

Countries/jurisdictions also define and interpret digital curriculum differently, often distinctly from the way researchers do. A common policy is to seize new and untapped opportunities of technological developments to design curriculum differently. The degree to which countries/jurisdictions digitalise their curriculum and the ways they do so vary considerably. In some, digital curriculum means posting curriculum documents online, such as in the form of PDF files. In others, there is an interactive and dynamic digital curriculum, integrating curriculum content and learning materials, as well as pedagogical and assessment functions. In New Zealand, for example, the digital curriculum is seen as a medium to invite learners to actively participate in designing and creating their own digital solutions to contemporary challenges (New Zealand Ministry of Education, 2017[74]).

Exploring new opportunities with a digital curriculum

Several mechanisms of digital delivery encompass digital curriculum. For example, interactive platforms typically not only give access to content in a non-linear way, they also allow users (e.g. teachers, local authorities) to design lessons, pedagogical activities and curricula. Navigation of curriculum content beyond the boundaries of individual subjects may spur collaboration between teachers who are expected to teach the same theme (e.g. sustainable development) within their own disciplines, thus promoting cross-curricular delivery. It may also help school leaders to spot opportunities to develop specific competencies in a systematic way by joining efforts across different subjects and levels.

The stages of digitalisation of curriculum are varied with almost half of the participating countries/jurisdictions (43%) report providing some digital version of the curriculum, some (16%) are on the way to implementing a fully interactive digital curriculum, and a few (14%) have already implemented an interactive digital curriculum (Table 4). The following are some approaches to implementation:

- **Digital curriculum documents**: In **New Zealand**, the curriculum is available as PDF, HTML and Word documents that can be manipulated. The curriculum is understood to set direction rather than provide detailed content to teachers, which is why it is assumed that teachers do not need to manipulate the text interactively.

- **Preparing an interactive digital curriculum**: Interactive digital curriculum enables the user to dynamically interact with the curriculum through hyperlinks or interactive tools. The e-curriculum web-service in **Finland** and the smart curriculum planner in **Hungary** both provide a platform for local authorities to create their own curricula. Similarly, the interactive platform envisaged by **Korea** aims to support teachers to manipulate and filter the curriculum and become designers of their own teaching. **Argentina** proposes an extensive plan that includes an integrated digital curriculum platform, as well as teacher training and financial aid, active roles for students and peer-to-peer learning.

- **Using an interactive digital curriculum**: The current **Norwegian** ministry's national curriculum is presented digitally. Online, teachers can filter what they need and find resources and guidelines on how to approach the curriculum in practice.

Table 4 **Stages of digitalisation of the curriculum**

Digital curriculum documents		Preparing an interactive digital curriculum		Using an interactive digital curriculum	
OECD	Partner	OECD	Partner	OECD	Partner
British Columbia (Canada)	Brazil[1]	Chile	Argentina	Australia	South Africa
Czech Republic	Hong Kong (China)	Finland		Estonia	
Ireland	Kazakhstan	Hungary		Norway	
Japan	Viet Nam	Korea		Poland	
Lithuania		Ontario (Canada)			
Mexico					
Netherlands					
New Zealand					
Portugal					
Québec (Canada)					
Scotland (United Kingdom)					
Sweden					

Note: Data displayed in this table include only countries/jurisdictions with responses that could be clearly coded as yes/no. Countries/jurisdictions are reported in mutually exclusive categories according to their reported stage of development of digital curriculum.

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

Source: Data from the PQC, item 2.5.1.

In summary, while there is no consensus on what a digital curriculum is, commonly emerging trends towards digital curriculum include the following:

- **Interactivity**: This refers to the use of a digital platform, which is the base of a digital curriculum, enabling dynamic interactions between groups of learners, such as students and teachers. For example, the eTwinning platform in Europe supports teacher collaboration across school networks (Papadakis, 2016[63]) (see Box 5).

- **End-user participation**: This involves the end-user in the ultimate design, given the choice and adaptability of the curriculum. It enhances participation and shifts the role of curriculum designer, as more choices are made by end-users. In this sense, teachers, students and programmers may all be considered designers. (See Box 5 and Box 6).

- **Integration**: This refers to integrating content, textbooks and tools for pedagogies and assessments into one platform. Such integration is gradually erasing the boundaries between curricula, pedagogies and assessment (see Box 6).

- **Cross-grade and cross-subject learning progressions**: A digital curriculum makes some conceptual learning progressions that cut across grades and disciplines more explicit and accessible. Students and teachers may have easier access and better understanding of prerequisite learning that may have been missed in earlier grades or that can be reinforced in other learning areas. This can help students fill in learning gaps (see Box 5 and Box 6).

Box 5 **Interactivity and end-user participation in a vocational school in Belgium**

GO! Technisch Atheneum Keerbergen (Belgium) is an official member of the Flemish UNESCO schools network engaged to address the UN Sustainable Developmental Goals. Innovation is being implemented on many levels throughout the curriculum, as a core value of the school. Its view is that innovation can never be seen on its own and always serves one or more specific needs in society. They like to express it as "innovation as a catalyst for sustainable development".

Due to the COVID-19 situation and school shutdowns, the project-based science, technology, engineering and mathematics (STEM) courses offered for 12-14 year-old students in the school's fablabs[1] were unable to continue. It is difficult to give students remote instruction for STEM, as students are mainly motivated and engaged by creating and doing. They need clear instruction and room for creativity. To tackle the problem of lack of material and equipment at students' homes, the school network decided to deliver do-it-yourself STEM packages[2] prepared in the fablab with laser cutting technology. That way, students could continue working at home with basic technical equipment (e.g. glue and a screwdriver). At the same time, earlier experiments were intensified with a digital virtual reality/360° platform that the school recently started to use. This allows students to discover learning concepts in a virtual way, bringing real examples closer to them and building motivation by involving them in real-life situations.

To merge the project-based STEM exercise with this opportunity to let students discover future learning concepts in virtual reality, the school decided to let students make their own VR goggles (also known as Google cardboard). To introduce students to this new way of virtual learning, instructions were developed on 360°[3] and 3D movies,[4] along with a step-by-step project-based manual. All instruction could be consulted on the website and the school's educational platform. After completing the VR goggles, students were not only able to discover more educational VR applications and 360° learning content,[5] but the whole school has also provided a virtual tour to facilitate study choice.[6] Due to COVID-19, most of the guidance embedded at school on study choices was unavailable. Using their VR goggles or normal desktop computer, students now could virtually explore from home which curriculum elements best suited their interests.

Another example of an interactive and a more student-centred remote learning approach was initiated by a partner school, GO! Atheneum Eureka. It launched a joint pilot exploring VR applications for education, in a government-funded framework to embed innovations in vocational education and training. The school was specifically looking for a solution to enhance students' motivation and interaction in mechanical courses for 14-16 year-olds that were mainly based on dry formulas and calculations. Due to a lack of digital support on classic learning content platforms, they started using a whiteboard application in virtual reality. By casting the VR experience of the teacher to the students' screens at home with real-time meeting solutions, students could follow all the actions that the teacher initiated, so they became even more involved in the course than they were in the classroom. On the whiteboard, the teacher could put his own notations, but also and more interestingly, he could add digital documents and pictures while making annotations and point out relations between them when applicable. Both students and teachers experienced this way of remote learning as very interactive and more student-centred.

Note: 1. A fablab (or makerspace) is an educational and creative environment with diverse basic to high-tech equipment.

2. STEM package: http://www.technischatheneumkeerbergen.be/vr-stem-pakket/

3. 360-degree video instruction: https://storage.net-fs.com/hosting/6237654/1/index.htm

4. 3D instruction video: http://www.technischatheneumkeerbergen.be/wp-content/uploads/2020/04/WhatsApp-Video-2020-03-28-at-21.52.44.mov

5. For example, the Mendeleev exercise on Thinglink platform: https://www.thinglink.com/scene/1296454650223919105

6. Virtual tour school: http://www.takeerbergen.be/virtualtour/

Source: The OECD Future of Education and Skills 2030 School Networks - GO! Technisch Atheneum Keerbergen, Steven Hendrickx, School Principal.

Box 6 **End-user participation and integration in digital curriculum: A lesson from Israel**

Lady Davis, a public high school in Tel Aviv, Israel (1 800 students, Grades 7-12) is characterised by a unique culture of change, with a focus on pedagogical autonomy for all teachers. Over the past three years, all humanities and social science subjects were integrated into a year-long interdisciplinary and interactive project-based learning programme, based on formative assessment processes, such as students' self- and peer- reflections and presentations. COVID-19 also propelled the teachers at the school to take advantage of even more innovative and interactive techniques to involve students.

Using multiple technological tools

Communication and interactions between teachers and students at Lady Davis are based on the multiple applications of Google Classroom. Teachers continuously introduce new ideas and practices to the interdisciplinary learning environment, exercising teacher agency and promoting both student agency and co-agency. The recent COVID-19 lockdown found Lady Davis relatively prepared for online learning, as most teachers simply enhanced the use of the Google Classroom infrastructure, including the school's quick subscription to Zoom for synchronous teaching. While no one was ready for school closures, as the prevailing culture is that of change, Lady Davis's teachers were able to adjust quickly. They started to develop innovative pedagogies focusing on two dimensions: setting up the framework for full online learning, which breaks down time and space limitations; and developing new pedagogical methods by integrating multiple technological tools. As one of the teachers said: "The closure forced us to jump into the water, which was full of technological tools and applications ready to innovate our pedagogy."

The framework for full online learning

Daily life under closure does not resemble routine school, and it was clear that a synchronous lesson in this new reality should last 25-30 minutes, with a 5-minute introduction and then 15-20 minutes of group learning on practical and interactive assignments (using Zoom's breakout rooms feature), moving towards a plenary discussion to close the session.

New pedagogical methods by integrating multiple technological tools

Teachers liked the intimacy of Zoom's breakout rooms, where they could mentor and guide the students. However, they still needed to deal with emotional dislocations during these synchronous sessions and found that conversations and discussions that promote empathy were the best solution. Teachers also increased the level of collaboration among themselves and started to teach online in teams, for example integrating literature and Bible studies in an interdisciplinary setting to focus on dilemmas and conflicts, and developing students' critical thinking, an essential 21st century skill.

Instead of sitting a quiz or a test, students' task was to develop creative digital videos in groups to present and interpret the dilemma or the conflict presented in the stories they learned. Hence, different types of assessments were used for different purposes, highlighting teamwork, peer evaluation and self-reflection. Teachers reported that the level of engagement and collaboration among students was higher than in a bricks-and-mortar setting.

Teachers also used WhatsApp as a pedagogical platform, for example in cinema studies. Students received messages via the class WhatsApp group to watch several film excerpts and met back in the group after one hour for a class discussion. As WhatsApp documents all conversations and messages, the content generated by students in the discussion provided the resources for research work assigned to them. According to the teacher, it was the first time he could use content generated during the students' discussion as pedagogical content.

Inventing a new normal towards a hybrid learning environment

The leadership at Lady Davis decided to take these experiences further and drew up a plan using design-thinking methods to develop a hybrid school targeting their first-circle stakeholders: teachers, students and parents. The first workshop was conducted with 15 prominent teachers to re-imagine the new normal. The workshop used Lean Canvas methodology, looking at the new pedagogical experiences resulting from the school closure and reassembling them into a hybrid learning environment.

The main teachers' recommendations that emerged from the workshop can be categorised in three dimensions. First was a new school organisation. For example, each grade level will go to the brick-and-mortar school three or four days a week, while they will learn on line from home on the remaining one or two days. This setting will promote choice, active learning and skills development (i.e. student agency). Second, teachers' learning time (continuous professional development) and collaboration will change dramatically and will play a key role in designing a learning environment that values agency. Third, reducing curriculum overload will allow for the development of social-emotional as well as communication competencies. As this is a work in progress, involving students and parents will be the focus of the next stage.

Source: The OECD Future of Education and Skills 2030 School Networks, Summary of the breakout group discussions at the First Global Forum on the Future of Education and Skills 2030, 19-20 May 2020

Diverse digital technologies can be incorporated into a curriculum with a well-defined scope and sequencing of curricular content (Pepin et al., 2017[73]; Choppin et al., 2014[75]). For example, curriculum content can be integrated into:

- **E-textbooks** (Pepin et al., 2016[61]):
    - Digitalised traditional textbooks with add-on digital material, such as embedded videos or inclusion of a QR code hyperlinked to such recorded videos.
    - Highly interactive e-textbooks that can easily be customised by teachers. These have dynamic sets of tools that can be used for learning, assessment or problem solving. E-textbooks can also function as dynamic rather than static documents that teachers can modify and tailor to their students' needs.

- **Curated online materials** (online materials organised in a curriculum sequence) with affiliated assessments.
- **Repositories of lesson materials** organised in a curriculum sequence according to requirements of a national curriculum, primarily focused on tasks and interactive activities for students.

When these components are integrated, teachers can use the digital curriculum dynamically to select lessons, videos, tasks and assessments in response to their students' needs. They adapt the tools to their unique classroom characteristics (Pepin et al., 2017[73]).

Box 7 **E-textbooks in Estonia**

The use of e-textbooks is becoming a growing and irreversible trend in Estonian schools. Rough estimates indicate a sharp increase in the number of students resorting to the use of digital textbooks since the beginning of the COVID-19 pandemic crisis: from 40 000 students/month to about 360 000/month, nearly a tenfold increase.

While the pandemic might have accelerated the need for teachers and students to tap into the affordances of digital technology for remote learning, the trend towards digitalisation of learning materials had been well on its way even prior to the crisis in the country.

Teachers in Estonia have access to a rich library of e-textbooks through an interactive learning platform called *Opiq.ee*[10] (Figure 15). The digital collection covers most subjects (languages, mathematics, science, history, geography, etc.) from first grade to high school and options are available in both Estonian and Russian language (the two official languages of instruction in the country). Most students in Grades 4-6 (73%) and in Grades 7-9 (81%) are active users of Opiq e-textbooks. The digital textbooks are fully funded by the government. Each school receives funding according to the number of students. Basic school licenses are made available for free to all schools.

Figure 15 **Opiq**

Source: Opiq website, www.opiq.ee

The digital textbooks are mirror images of the paper textbooks, but with a number of additional digital and interactive features.

Teachers and students:

- can look up linked content in other e-textbooks from different grades;
- can easily access rich content in multi-media format (e.g. a music lesson is accompanied by samples of recorded music illustrating various styles and periods); written text is also accompanied by the option of spoken text (more inclusive of students with special needs);

- link to definitions or further explanations of the selected text and/or images;

- access visual simulations of experiments that may be unpractical or too expensive to realise in a real school laboratory;

- work on tasks that vary in difficulty from basic comprehension to deeper understanding of the lesson by formulating and testing hypotheses for various phenomena;

- Teachers can also customise a lesson's content by creating links to other texts and/or online materials within a particular lesson or adding their own materials (by attaching files in text, audio or video format);

Figure 16 **Opiq e-textbook Student Interface**

Through the **e-diary** function of digital textbooks, teachers can:

- Hand in assignments to individual students, follow their submission and provide exclusive feedback;

- Manage classroom assignments as well as individual assignments and progress;

- Review students' work, provide targeted feedback to students and grade their assignment;

- Make students' grades available at the school level (with access limited to relevant users);

- Share students' progress with their parents;

- Share exceptional student work with the entire school community, all from a single tool.

The e-diary function has different levels of access and interfaces for various users: school leaders, teachers, students and parents.

Figure 17 **Opiq e-textbook Teacher Interface (Personalised Learning Environment)**

> The contents of textbooks in general, including e-textbooks, are reviewed by a team of experts. Publishers must follow the government's requirements for identifying reviewers and make all reviews public on a portal managed by the Ministry of Education and Research. Content items in each subject area and expected learning outcomes are required to be aligned with the national curricula. Teachers receive training from the publishing companies directly (e.g. online tutorials), through school-level professional development activities and/or through self-directed learning.
>
> **Source**: Ministry of Education and Research, Republic of Estonia.

Digitalising textbooks

A considerable body of research has shown that, in some countries/jurisdictions, teachers rely heavily on textbooks for teaching (Sikorova, 2012[76]). With the increasing availability of digital devices, such as personal computers, tablets and e-readers, and the flexible availability they give to students and teachers, digitised textbooks have become more and more common.

Most countries/jurisdictions (70%) have in place some sort of national approval process for digital textbooks or a policy to encourage their use (Table 5). Among these, 41% formally encourage the use of digital textbooks. About 24% of countries/jurisdictions have no formal policy for their encouragement but do have initiatives to start using digital textbooks. In Lithuania and the Russian Federation, there is an approval process for digital textbooks. The other OECD and partner countries have no formal national policy to encourage digital textbooks for diverse reasons, such as local authorities or schools having responsibility for textbooks.

Table 5 **Extent to which countries/jurisdictions encourage digitalisation of textbooks**

Formal encouragement of the use of digital textbooks		No formal policy to encourage digital textbooks but other measures in place			
		Initiatives to foster digital learning materials		National approval process for digital textbooks	
OECD	Partner	OECD	Partner	OECD	Partner
Chile	Argentina	Denmark	Costa Rica	Lithuania	Russian Federation
Czech Republic	Brazil[1]	Ireland			
Estonia	China	Lithuania			
Finland	Hong Kong (China)	Netherlands			
Hungary	India[1]	New Zealand			
Japan		Norway			
Korea		Scotland (United Kingdom)			
Mexico		Turkey			
Poland					
Portugal[2]					

Note: 1. Responses for these countries/jurisdictions were submitted by independent researchers, not government officials.
2. Pilot projects involving the use of digital textbooks are being carried out in several Portuguese schools, but wide expansion of these is not confirmed.
Source: Data from the PQC, item 1.7.6.

Empowering teacher agency to support student learning using technology

Closing the implementation time lag implies preparing teachers to not only deliver ICT-related curriculum contents, but also to integrate the use of ICT technologies in the classroom to support learning. When properly embedded into pedagogical practice, digital technologies can support active and engaged learning and illustrate creative uses of technology that students will be able to transfer to their life outside the school. However, for digital tools to support meaningful learning experiences, teachers need appropriate training and support that will enable them to gradually transform their teaching practices.

As a general trend, countries/economies with higher levels of teacher self-efficacy are also those where teachers more frequently allow students to use ICT in the classroom (Figure 18). For example, TALIS 2018 data show that Denmark is the country with the highest proportion of teachers reporting that they believe they can support student learning through digital technology "quite a bit" or "a lot" (88% of teachers), and it is also the country with the highest proportion of teachers indicating that they let students use ICT for projects or class work "frequently" or "always" (90%). Japan is the country with the lowest proportion of teachers who report confidence in their ability to support student learning through use of technology (35%) and also the lowest proportion of teachers reporting student use of ICT "frequently" or "always" (18%).

Despite this general trend, some countries/economies have considerable gaps between teachers' sense of efficacy in supporting student learning using technology and student use of ICT in the classroom. For example, 71% of teachers in Korea report confidence in supporting student learning through digital technology, yet only 30% report frequently letting students use ICT for project or class work. This pattern is evident in a number of OECD countries, including Belgium (Flemish community) and Italy, as well as in Shanghai (China) and Chinese Taipei (Figure 18). These large gaps between teacher efficacy and practice suggest that factors other than teacher confidence can be implicated in the frequency with which teachers facilitate students' use of technology in their classrooms.

Figure 18 **Teachers' self-efficacy for using digital technology to support student learning and frequency with which students are permitted to use ICT for projects or class work**

Notes: Results based on responses of lower secondary teachers. Countries and economies are ranked in descending order of the percentage of teachers who believe they can support student learning through the use of digital technology "quite a bit" or "a lot" (no data were available for Russian Federation on this variable).

Examples of digital technologies are computers, tablets and smart boards. ICT: Information and communication technology.

Information on data for Cyprus: https://oe.cd/cyprus-disclaimer

Source: TALIS 2018, Tables I.2.20 and I.2.1, https://doi.org/10.1787/19cf08df-en

StatLink 🔗 https://doi.org/10.1787/888934195150

Personalised curriculum

Personalised curriculum is not new. For many years, personalisation of curriculum has been used to support students with developmental disabilities, with the aim of providing an inclusive curriculum (Knowlton, 1998[77]). The term also goes back to early efforts to individualise instruction at the beginning of the 20th century (Boninger, Molnar and Salda, 2019[78]; Bloom, 1984[79]). The term personalised curriculum is often used interchangeably with personalised learning, individualised curriculum, individualised learning and differentiated learning (Alan Millward, 2002[80]; Tomlinson, 2005[81]).

The innovative aspect of personalised curriculum, combined with the use of technology, lies in the possibility for students to learn anywhere, anytime and any way. It includes ways to validate their prior knowledge and interests, build in individual learning styles and progressions, give them relevant and continuous feedback and accommodate different paces of learning. For schools and teachers, a personalised curriculum makes it possible to combine different practices in adapting the curriculum to the specific characteristics and needs of each learner (Peterson et al., 2018[67]).

Involving students as co-designers of curriculum

Recent literature points to the importance of students' views and voices on their education (Bron, Nieveen and Voogt, 2017[82]). As put by Alison Cook-Sather in her article about curriculum reform, "This way of thinking is premised on the following convictions: that young people have unique perspectives on learning, teaching, and schooling; that their insights warrant not only the attention but also the responses of adults; and that they should be afforded opportunities to actively shape their education." (OECD, 2018[5]; Cook-Sather, 2006, p. 359[83]). Taking students' voices into account in curriculum redesign can make the curriculum more relevant to their needs and learning experiences (Bron, 2014[84]). Recognising the needs, expectations and interests of students is only the first step in ensuring that their voices are considered and reflected in the curriculum redesign to make it more relevant and motivating to them.

In various countries, such as Australia, Canada, New Zealand, the United Kingdom and the United States, it has become increasingly important to include student voices on what and how they learn in the decision-making process (Bron, 2014[84]; Cook-Sather, 2006[83]; Sinnema and Aitken, 2013[85]). For example, students were actively involved during the recognition phase of curriculum redesign in the Netherlands (van Schaik, Voogt and Nieveen, 2017[43]) and Finland (Pietarinen, Pyhältö and Soini, 2017[26]). In the Netherlands, primary and secondary school students were asked to share their ideas about the new curriculum. Finland collects data on students' opinions of the existing curriculum to inform the upcoming renewal. Both Scotland (United Kingdom) and Wales (United Kingdom) undertook systematic engagement with stakeholders, including students, before beginning the design process itself.

By including students' perspectives in their decision-making process, these countries/jurisdictions acknowledge the valuable insights that students can offer by sharing their views on how they learn best and how they experience the changes in the curriculum. Their perspectives can be very different from those of their teachers and parents. Failing to recognise students' interests may lead to negative responses to curriculum change.

Involving students as owners of their own learning

Personalised curriculum should not only be used to motivate students based on their interest for new technologies but should also be made relevant by connecting students to the world in and outside schools (Kumpulainen, Mikkola and Rajala, 2018[86]). Students are generally prepared to do extra work if the learning expected in the curriculum is more adapted to their interests (Courtney and Anderson, 2010[87]; Stefl-Mabry, Radlick and Doane, 2010[88]).

Having students' voices recognised in curriculum redesign may add time to the process by increasing the recognition time lag. But it can save time later and shorten the implementation time lag while increasing students' satisfaction and commitment to learning in or out of school.

If students' voices and needs are already built into the curriculum at the design stages, classroom lessons, choices of content and activities are likely to be more attractive and relevant to students, which can boost their motivation and commitment to learning (Bron, 2014[84]; Cook-Sather, 2006[83]). Otherwise, students will need to rely more heavily on the discretion and ability of their teachers to listen, understand and adapt their teaching to their students' current needs and future interests.

National curricula that are revised under fixed renewal cycles (e.g. every five or ten years) certainly present advantages for both teachers and students. In principle, having a fixed cycle allows schools and teachers the time to familiarise themselves with the curriculum and perfect its implementation over a number of school years. This adds stability, efficiency and predictability in what is expected of both teachers and students, which can facilitate planning tasks for school leaders and teachers (Sivesind and Westbury, 2016[25]; NCCA, 2017[4]; Pietarinen, Pyhältö and Soini, 2017[26]).

Flexible curriculum

Curriculum flexibility is conceptualised as adaptability and accessibility of the curriculum for schools and teachers to respond to students' needs and capabilities, and it assumes autonomy of schools and teachers with regard to the curriculum or parts of it (Saarivirta and Kumpulainen, 2016[89]; Newton and da Costa, 2016[90]). It is a multidimensional concept that is understood differently by different stakeholders and in different countries and jurisdictions.

Building on the categorisations developed by researchers (Tucker and Morris, 2011[91]; Jonker, März and Voogt, 2020[69]), the four dimensions of flexibility are highly relevant to current policy discussions in many OECD countries:

1. Flexibility on learning content concerns the what of curriculum, including the goals, new subjects, prioritisation of concepts and interdisciplinary themes.

2. Flexibility on pedagogy concerns the how of curriculum, including instructional approaches, learning activities, grouping of students, and materials and resources.

3. Flexibility on assessment concerns the standards of the curriculum and how it is determined that they have been met.

4. Flexibility on learning time concerns the how much of learning: instruction time, and organisation of time.

A flexible curriculum can be conceived along a continuum between completely flexible and completely fixed (Tucker and Morris, 2011[91]). In reality, however, curriculum flexibility does not mean complete flexibility, because any curriculum has some degree of constraint set by government regulations, in the form of input factors (e.g. attainment goals and standards) and output factors (e.g. national exams, standardised tests and the inspecting bodies) (Kuiper and Berkvens, 2013[92]). Curriculum flexibility, therefore, allows the degree of freedom that schools and teachers have over the curriculum for site-specific curricular choices.

A key consideration for policy makers and curriculum designers is to carefully set the appropriate degrees of flexibility granted to local authorities, school leaders, teachers, and students in deciding what and how to teach and learn in any given learning area. An aspirational future vision for student profiles and education goals coherent with the vision can act as a general guide and empowerment tool for teachers and students.

A forthcoming volume will explore in greater depth the role of curriculum flexibility in curriculum redesign (OECD, Forthcoming[93]).

Cross-curricular content and competency-based curriculum

One growing challenge for schools lies in effectively preparing students for successful transitions into employment. While young people need to make more decisions about what and where they will study as they stay in education for longer, such investment decisions are becoming more difficult due to labour market turbulence. Recent OECD analysis has shown that young people's career aspirations tend to be narrow, optimistic and distorted by social circumstances (Musset and Mytna Kurekova, 2018[24]). Ongoing OECD work makes use of national longitudinal datasets to identify indicators of better than anticipated employment outcomes in adulthood (Mann, Denis and Percy, forthcoming, 2020[94]). Analysis shows that schools have important roles to play in broadening and enriching the career thinking of students, supporting their exploration of the labour market and facilitating first-hand experiences of workplaces. Effective provision develops student agency, enabling critical reflection on the relationship between educational experiences and labour market outcomes.

Countries and jurisdictions are increasingly making their curriculum relevant to real-world situations by articulating either cross-curricular competencies or cross-curricular themes. Cross-curricular competencies are those that are likely to transfer across learning areas, such as problem-solving skills, creativity and curiosity. Cross-curricular themes are likely to be understood when concepts from different disciplines are learned in an authentic and meaningful way, such as environmental sustainability, global citizenship and media literacy (see "How are demands for 21st century competencies and key concepts integrated into school curriculum?"). New jobs may require some of the skills promoted by learning material in a cross-curricular way (World Economic Forum, 2016[9]).

In the absence of effective support measures for teachers to implement such cross-curricular themes and competencies in the new written curriculum, students may be exposed to a vastly different experienced curriculum, as their learning will depend on teachers' individual interpretations of what this means in practice. The challenge appears to lie partly in the types of teaching education programmes that teachers have attended and the types of professional development activities that they have been engaged in, which matter for teacher preparedness.

Preparing teachers for teaching cross-curricular skills

Teaching cross-curricular materials requires unique skills that traditional training programmes may not emphasise. However, best integrating themes and 21st century competencies may require the ability to teach across the curriculum. Countries/jurisdictions report that teachers have these skills to varying extents.

Less than 50% of teachers in the Czech Republic, France and Slovenia report that teaching cross-curricular skills was included in their formal education or training (Figure 19). Furthermore, teachers in Finland, France and Japan report the lowest rates of perceived preparedness to teach cross-curricular skills (25% and below).

Figure 19 **Coverage of teaching cross-curricular skills in teacher education and sense of preparedness to teach cross-curricular skills**

Note: Results based on responses of lower secondary teachers. Countries and economies are ranked in descending order of the percentage of teachers for whom teaching cross-curricular skills was covered in their education. Examples of cross-curricular skills include creativity, critical thinking and problem-solving.
Source: TALIS 2018, Tables I.4.13 and I.4.20, https://doi.org/10.1787/1d0bc92a-en
Information on data for Cyprus: https://oe.cd/cyprus-disclaimer
StatLink 🔗 https://doi.org/10.1787/888934195169

The gap between what is included in formal education and the sense of preparedness is particularly high in Estonia and Japan, where there is a difference of more than 30 percentage points between teachers reporting that teaching cross-curricular skills was included and teachers reporting that they feel "well prepared" or "very well prepared". Only in Hungary, Lithuania, Slovenia, Brazil and Romania is the percentage of teachers who report that they feel at least "well prepared" in teaching cross-curricular skills at least the same or higher than the percentage of teachers who report that this was included in their formal education.

The promotion of play as a pedagogical tool helps to encourage creative thinking and ultimately builds cross-curricular competencies (Barnes, 2015[95]). However, play as a pedagogical tool can be integrated not only into student education but also into teacher education. Thus, one possible approach to prepare teachers for teaching cross-curricular skills is to train them to address students' interests and development as a part of student-centric curriculum in K-12 education, including encouraging student play when developmentally appropriate (Pane et al., 2017[96]). In addition, research into the effects and effectiveness of arts in teacher education to help new teachers discover their own areas of creativity to enhance their curricular confidence suggests that play and creativity are underutilised in teacher education (Barnes and Shirley, 2007[97]).

WHAT IS STILL UNKNOWN?

Peer-reviewed research on time lag is scarce, as this aspect of curriculum development is only recently receiving greater attention in education policy circles. One of the difficulties with studying time in curriculum renewal processes is that curriculum design and implementation are highly contextual. This makes it difficult for research findings to be generalised across different education systems and political contexts.

Nevertheless, both systematic impact studies as well as exploratory and case studies can shed more light on a number of questions and topics that remain underexplored. Some of these are described below:

- **Future needs**: In light of rapid social and technological developments affecting how we live and work in a global economy, it is not an easy task to try to forecast the future and prepare for it. Various countries/jurisdictions acknowledge the difficulties they face when designing curricula in trying to incorporate future needs without a clear vision of what the future will look like (see Table 7 in "Challenges and strategies" section). Uncertainties about the types of jobs that will survive digital developments in the fourth industrial revolution (the combination of cyber-physical systems, the Internet of Things, and the Internet of

Systems), or the types of jobs that will be created as a result of it, make it challenging for educators and curriculum designers to be specific about the types of competencies students will need in the future.

- **Inclusion of students' voices in curriculum renewal**: Research on this topic is still in its infancy, and not much is known regarding the impact of student involvement in curriculum redesign on time lag. Existing research on students' voices focuses mainly on how it emerges in the interaction between teachers and students in the classroom. Little is known about conditions that facilitate the inclusion of students' voices in curriculum redesign (i.e. how this can actually be done and how it would affect reduction of time lag, teachers' practices and students' outcomes).

- **Implications of different types of curriculum reform on time lag**: The time implications of reforming a knowledge-based curriculum may be very different than those of reforming a competency-based curriculum, and these distinctions still need further exploration.

- **Impact on students' outcomes (e.g. learning, participation levels, motivation and engagement)**: Not much is known on how much students are affected by time lag in curriculum reform processes, apart from the fact that if change is needed, delays in making those changes will be detrimental to successive cohorts of students. Research is needed on this, while acknowledging that it is a complex issue, as it takes time before the impact of renewal can be observed and any effect on students becomes apparent. Longitudinal and cohort studies are needed to study the impact of curriculum renewal in the long run. Policy makers need to consider how they can facilitate such studies by making use of existing databases.

- **Schools and community as curriculum designers**: Time lag may be partly addressed when national curricula allow for decentralised curriculum development at the local or school level. However, a better understanding is needed of how schools and communities can be prepared to develop a quality curriculum that is timely and future-oriented. Context matters, as the educational system and the political context may affect how decentralised curriculum design can best be organised.

- **Resistance to change from school staff, particularly teachers**: To better understand the impact of resistance from teachers and other stakeholders on time lag and on students' outcomes, further research is needed with a more granular examination of the reasons for such resistance.

- **Forward planning**: At the national level, the paucity of research on time lag is particularly acute for time lag in curriculum reform processes. Most research in this section is, therefore, based on research on curriculum design processes. Further research on time lag would benefit from a focus on forward planning.

Furthermore, research on curriculum innovations is often exploratory and fragmented. The review suggests that the following areas need further study:

- **Systematic stock-taking of existing definitions of curricular innovations**: Overall, the field of curriculum innovation lacks a coherent definition, notably across domains (research or practice).

- **Implications of curriculum innovations for teaching preparation and professional learning**: Building on the findings noted above, teachers need support and ongoing professional development to develop such competencies in their preparation. This will help ensure that they have the tools and skills to implement these curricular innovations.

- **Cost-effectiveness and cost-benefit analysis of adopting ICT tools in learning and teaching**: Innovative tools and practices require funding to develop and disseminate them and to train teachers and staff. It is unclear whether the benefits of these processes outweigh the costs.

- **Extent to which digital technology is being used to enhance personalised learning**: Learning analytics is an important component of a digital curriculum and a personalised curriculum. In order to use learning analytics to improve learning, research is needed to connect learning analytics with models of learning.

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Notes

1. A curriculum can be manifested differently across countries: e.g. syllabus, course of study, programme of studies, programme of study, educational programme.

2. For written source: https://www.oecd.org/education/2030-project/contact/OECD_Learning_Compass_2030_Concept_Note_Series.pdf; for visualisation:www.youtube.com/watch?v=mlXvQKUS-_Q

3. McLeod, Scott and Karl Fisch, "Shift Happens": https://youtu.be/SBwT_09boxE

4. The OECD Education 2030 Policy Questionnaire on Curriculum Redesign (PQC) provides data on the frequency of curriculum reform of 34 countries/jurisdictions (upper and lower secondary education).

5. Table WEB 11: Number and type of curriculum reforms reported between 1980 and 2030 by country/jurisdiction.
   StatLink: https://doi.org/10.1787/888934195663.

6. Table WEB 11: Number and type of curriculum reforms reported between 1980 and 2030 by country/jurisdiction.
   StatLink: https://doi.org/10.1787/888934195663.

7. An approach that considers curriculum change as part of a larger ecological change, for which managing the process requires a much more organic approach than top-down decision making. The ecosystem approach entails that multiple, nested systems in an individual's environment directly and indirectly impact a child's development throughout life:
   - The **microsystem** contains the groups and institutions with which a child directly interacts (e.g. school, family, peers, neighbourhood).
   - The **mesosystem** is the connection between the various groups and institutions within a child's microsystem, for example, the connection between a child's teacher and parents.
   - The **exosystem** is the larger societal structure that indirectly influences a child. Though the child may not directly interact with the exosystem, settings or institutions within the exosystem directly interact with someone in the child's microsystem. This could include the parents' workplace or government-mandated education reforms.
   - The **macrosystem** contains social and cultural policies and beliefs that affect the larger context in which the child operates.
   - The **chronosystem** addresses changes over time in the environments with which the child interacts

8. See (OECD, 2020), *Overview brochure of the Education 2030 series of thematic reports on curriculum redesign,* OECD Publishing, Paris.

9. Table WEB 11: Number and type of curriculum reforms reported between 1980 and 2030 by country/jurisdiction.
   StatLink: https://doi.org/10.1787/888934195663.

10. https://www.opiq.ee/

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