

How international collaboration can help build the future of education

Introduction

1. For over 50 years, the OECD has supported member and partner countries in developing and improving their education systems through comparative evidence, data, analysis and policy advice. This work has acquired wide acclaim for its quality and impact. It is fair to say that the OECD has achieved a global leadership role in education, as countries and stakeholders have acknowledged in formal reviews and evaluations.
2. After 50 years, it is time to identify the next challenges and take a bold look at the **future of education**. This paper develops a strategic vision for international collaboration in the field of education.
3. This paper is developed in line with OECD's broader strategic orientations and priorities in responding to current policy challenges and pursuing multilateral approaches for achieving inclusive and sustainable growth. The paper has been drafted to stimulate reflection within the OECD Directorate for Education and Skills. It reflects solely the views of the OECD Secretariat.

A changing environment

4. Education comes out of a period of massive expansion, with an unseen growth of participation and attainment levels. Over the past 200 years, modern education systems have developed into major engines of economic growth and prosperity, state and community building, and social progress. By developing the knowledge and skills that societies need, forging social cohesion and preparing people to become competent workers and active citizens, education has contributed enormously to the world we live in today. The expansion of education, and the increased supply of skilled workers and citizens, have fostered democracy and the transformation to innovation-oriented knowledge societies. Emerging and developing countries have often followed similar routes in expanding their formal education systems, but many have done so in much less time than developed countries; in some, the quality and equity of education are now greater than in OECD countries.
5. Because of the long time horizon involved in transmitting the heritage of humankind to new generations and preparing young people for a lifetime, education does not react quickly to emerging needs. Indeed, many policy makers complain about the slowness and inherent conservatism of education systems. At the same time, however, education is society's most important system for anticipating, preparing for and building the future. What young children learn in early childhood education today will affect their health behaviour and the cost of social security when they reach old age. Such tension between past and future is typical for education.
6. It is often said that **the future** is unpredictable. The acronym VUCA – volatility, uncertainty, complexity, ambiguity – is often used to suggest that we live in a time and a world where the future is intrinsically unknown territory. To educators and education policy makers, this is a troubling message. How can they possibly construct the future through the children for whom they are responsible? Yet while change is fast and can take unexpected directions, we are already aware of many broad trends that are

shaping our futures. More importantly, we are not the victims of change or its powerless spectators; we constantly shape the future ourselves. The future is always in the making, and it is our work.

7. Education is very much at a crossroads. In intellectual conversations and policy debates, there is much confusion and little consensus on which direction to take. Some feel overwhelmed by the disruptive powers of technology, and see no clear future for educational institutions as they have existed for thousands of years. Others claim that previous innovation in education has failed, and advocate a U-turn toward discipline, memorisation and other recipes that prevailed in the past. Moreover, many believe that education has failed in keeping its promises regarding fairness, equity and social mobility. Since education is about investing (and therefore believing) in the future, despair and pessimism are its worst enemies. However, as with other mega-problems that face humanity today, such as migration, climate change or global taxation, human ingenuity is key. Through research, through building on both evidence and the wisdom of practitioners in the field, and by nurturing our **collective intelligence, imagination and vision**, we can face the challenges ahead and create a better future.

8. **Technological change** has repeatedly challenged education throughout history, giving rise to new opportunities and changing demands. Education systems have not rapidly adapted to these changes. To do so requires tremendous vision, boldness and courage from leaders and policy makers, as well as capacity on the ground. Artificial intelligence, cloud computing, big data, the Internet of Things, virtual reality and many other forms of digitalisation are fundamentally reshaping our world. Today, we face the reality of “hyper-digital” futures in just ten to 15 years – futures with universal connectivity, disruptive digital business models, mostly automated physical production, increasingly virtual work and digitised global trade. All this will transform businesses and markets, the nature of work and the demand for skills, as well as the way we participate in physical or virtual communities and engage in personal relationships. Digitalisation will affect not only security and privacy, but also health and well-being, particularly among children. It will also have a huge impact on social relationships, social cohesion and the functioning of democracy. Yet while digital technologies and globalisation can have disruptive implications for our economic and social structure, such implications are not predetermined. The nature of our collective response to these disruptions will determine their outcomes – the continuous interplay between the technological frontier and the cultural, social, institutional and economic contexts and agents that we mobilise, including education.

9. Digital technologies also bring important changes and opportunities to **the way education is delivered**. Technology enables educators and learners to access knowledge in multiple formats, and in ways that bridge time and space. It can also support new ways of teaching that focus on learners as active participants. There are many examples of technology enhancing experiential learning by supporting project- and enquiry-based teaching methods, facilitating hands-on activities and co-operative learning, and delivering formative real-time assessments. There are also interesting examples of technology supporting learning with interactive, non-linear courseware based on state-of-the-art instructional design, sophisticated software for experimentation and simulation, social media, and educational games. These are precisely the learning tools that are necessary to develop 21st century knowledge and skills. Today, one teacher can educate and inspire millions of learners, and communicate their ideas to the entire world.

10. Perhaps the most distinguishing feature of digital technologies is that they not only serve individual learners and educators, but can also build an **ecosystem of learning** predicated on collaboration. Technology can build communities of learners that make learning more collaborative, thereby enhancing goal orientation, motivation, persistence and the development of effective learning strategies. Similarly, technology can build communities in which teachers can share and enrich teaching resources and practices, and collaborate on professional growth and the institutionalisation of professional practice. It can also help system leaders and governments develop and share best practice around curriculum design, policy and pedagogy.

11. Many other trends are constantly reshaping the environment in which education evolves. Globalisation, climate change, growing inequality, social fragmentation and demographic transitions are among the megatrends that are changing the world and redefining the role of education. They reshape the worlds, preoccupations and belief systems of children, young people, families and communities that education serves; they redefine our expectations of education in terms of knowledge, skills, attitudes and values; and they affect the reality in which teachers work through redesigning the ways in which education is delivered.

12. For example, changes in social stratification and the social fabric have a deep impact on how different social groups integrate education in their strategic behaviour. For many years, education provided the most important route to improving one's life and those of one's children through upward **social mobility**. In several OECD countries, upward social mobility has become more difficult to achieve, and the fear of downward social mobility is becoming more widespread among lower middle classes. Labour market polarisation is "squeezing" out the middle classes, and makes upward mobility much more difficult. Demographic trends such as ageing and the growth of single-parent families, which are especially vulnerable, create additional risks for poverty and social exclusion. Large parts of the population seem to believe that the social contract of the 20th century welfare state, of which public education is an important component, has ended or no longer serves their interests. The meritocratic ideal that through education, talent and effort, one can secure a better life than that of their parents was crucial to the expansion of education systems in the second half of the 20th century. When the engine of social mobility starts to sputter, trust in school systems falters and young people from vulnerable backgrounds no longer take school very serious.

13. Yet for many, school is still the main institution that keeps societies together. It is through education that societies aim to overcome social fragmentation and build **social cohesion** by integrating new generations and newcomers into the social fabric. By instilling a common canon of knowledge, shared behaviours and collective social values, education develops shared identities and a sense of belonging. It also aims to ensure a good start for every young person, by securing a level of foundational skills and competences that guarantee successful entry into the labour market. Educational institutions face increasing pressure to fulfil these functions and promises, but failing to do so would result in a huge social cost. For societies, the long-term cost of low skills is significant and often underestimated, as are the risks of decreasing interpersonal trust and social cohesion.

14. Today more than ever, our changing environment is pushing us to question and redefine **the purposes of education**. Unlike previous stages of technological change, digitalisation and especially artificial intelligence promise to open up unknown possibilities that dovetail with education's core purposes. Digital technologies will not merely disrupt our jobs, communities and life-worlds, but will also enhance our capabilities, as smart machines and biotech make people smarter. Emerging technologies – mainly in biology, drugs and neurology – will combine with digital devices to increase our cognitive and sensory capabilities, with the potential to radically improve our quality of life. At the same time, humans are in danger of losing their economic value, as biological and computer engineering make many forms of human activity redundant and decouple intelligence from consciousness. This has profound consequences for the purpose of education. In the past, when one could still assume that what they learn in school will last for a lifetime, memorising content knowledge and exercising routine cognitive skills were naturally at the centre of education. As technology allows people to search and access more knowledge, deep understanding and the ability to navigate ambiguity become more important. Fundamentally, understanding involves integrating and applying knowledge and information, concepts and ideas, practical skills and intuitions. Tomorrow's educational institutions need to help learners think for themselves and join others in work and citizenship. They need to help learners develop a strong sense of right and wrong, as well as sensitivity to the claims that others make. At work, at home and in the community, people will need a deep understanding of how others think, whether as scientists or artists, and how others live, in different cultures and traditions. Whatever tasks machines may be taking over from humans at work, the

demands on our capabilities to contribute meaningfully to social and civic life will always keep rising. Digital technologies do not oblige us to enter an impossible war with machines, but invite us to reconsider what it means to be ‘human’.

15. Although the challenges facing education today may seem daunting, many resources can be mobilised to overcome them. **Knowledge** is turning into the most valuable resource for education, and education’s professionals – teachers – are becoming knowledge workers. Indeed, the growth in science and research is also enhancing the transformative capacity of education systems. New knowledge is created at a very rapid pace, renewing the knowledge base on which education thrives, but also making old knowledge obsolete. For a long time, education combined partial scientific knowledge with experiential knowledge transmitted in the teaching profession, complemented by personal ingenuity and imagination. From Rousseau to Montessori and contemporary social-constructivism, innovations were driven more by ideas about children’s curiosity, for example, than by hard scientific research into cognition and brain development. This is changing, however, due to progress in various scientific disciplines that are relevant to education. A new “science of learning” is emerging, composed of building blocks from cognitive psychology, neuroscience, brain research and social psychology. This offers opportunities for education systems to not only drastically improve efficiency, but also to strengthen teacher professionalism and overall social trust in education.

Imagining the future of education and learning

16. If anything can be said about the future, it is that learning will be key. Our prosperity and well-being are produced through individual and collective ways of knowing, understanding and changing the conditions in which we live together. Overcoming challenges will be critically important, as they are today. Technology is enhancing human capabilities, while man-made obstacles to sustainable well-being challenge human civilisation’s ingenuity. Increasing interdependence is connecting our fates across the globe. Above all, human learning is about enhancing potential and opportunities. In the future, learning will enable individuals, communities, organisations and societies to free themselves from dependence on external conditions, and to translate opportunities into an active sense of agency that is necessary to ensure a good life for all. Learning is about enabling individuals and societies to acquire agency and act for the common good. Today more than ever before, **learning holds the key to a better life**.

17. Learning as a fundamental human activity is not bound by time, but the **institutional settings** in which it takes place continue to evolve. Human history has created institutions, such as schools and universities, with the mission of offering rich conditions for effective learning. Over the centuries, these institutions have changed from meeting the learning needs of the few to catering to the many, if not all. At the same time, they have formalised and professionalised. In modern societies, formal education has become the primary system for socialising and qualifying individuals, building communities and constructing societies. It serves as the main conduit for the socialisation of new generations, the effective allocation of individuals to jobs and social positions in an increasingly high-skilled workforce, the promotion of social mobility and social progress, and the development of identity and citizenship. Schools are also entrusted with responsibilities with regard to non-cognitive, behavioural and ethical development.

18. For the foreseeable future, institutionalised settings will remain important in providing space and opportunity for learning; but they may lose their monopoly, and may have to interact and collaborate with many other channels and modes of learning. Families and private social relations – which are themselves under constant transformation – remain very important learning settings with which schools have to negotiate and collaborate. Social institutions such as the health and welfare systems, politics or religion, traditional and new social media, and many other aspects of modern society can be expected to play an ever more important role in socialising people and providing spaces for human communication and learning. The distinction between acquiring knowledge and skills (in schools) and applying them (at

workplaces) is gradually eroding, with components of learning, assessing and qualification being renegotiated between both spheres. Employers will become more important in not only providing training and informal learning at the workplace, but also in engaging in the social dialogue about the purpose, relevance and substance of education. It will be increasingly difficult to keep young people motivated to learn in schools when the outside world offers so much inspiration.

19. Technology will also create new, alternative channels for human learning outside of institutional frameworks. Isolated time and space for learning was necessary when teachers and resources were scarce, but the ubiquity of opportunities will allow learning to move beyond its institutional confinement. Enhanced by technology, learning will gradually flow over into various informal contexts, and it will move beyond its age-defined limitations. Countries will have to consider moving from educational, qualification-oriented attainment in the first part of the lifetime, to a new distribution of learning and skills development over the entire lifespan. Technology can support **lifelong learning**. Moving learning out of its institutional and age-related barriers will create important public policy challenges, requiring the development of new partnerships to support learning with innovative arrangements on both the supply and demand side.

20. Formal, institutionalised education as we know it today will still have a future as long as the richness of its learning experiences offers significant benefits to learners; but it will have to open itself up to the world, as well. Building partnerships between schools and local community organisations, between universities and local businesses, and bridging the different worlds where people learn will be key for the future of institutionalised education. From a pragmatic and policy-relevant point of view, this paper will focus primarily on institutional education in schools and universities, but it is important to remember that these institutions will struggle to survive in a world with an abundance of other learning opportunities.

Strategic perspectives for international work in education

21. The **governance** of early 21st century education systems is taking shape at multiple levels. Educational institutions and practices are interacting with their local environments to produce learning experiences. Education systems are also part of national histories, language and cultures, which they transmit to new generations and newcomers in order to develop shared identities and a sense of belonging. Local, regional and national contexts are powerful in constructing educational policies and practices. Yet the international, comparative level has always been present in the development of modern education systems. Education systems have interacted with one another, students and teachers have travelled, and educational concepts, theories and practices have crossed borders. Education practices and institutions – schools, teachers and students – are universal realities across many cultures. One could say that modern education is one of the most globalised ideas the world has seen.

22. In the early 20th century, an institutional framework emerged to provide opportunities for countries to engage in **international dialogue and mutual learning**. Since World War II, the world has constructed a number of multilateral intergovernmental organisations to bring nations together for a common cause of peace and economic prosperity, founded on the idea that collaboration and mutual understanding can make the world a better place. Multilateral organisations are sometimes accused of lauding the triumphs of free trade, the mobility of capital and labour, and open borders, while neglecting the fate of the economically and politically disenfranchised, and tolerating the democratic deficit of globalisation. As inequality continues to grow in most OECD countries, globalisation is perceived to protect the interests of the elites and the affluent. Growing resistance to globalisation culminated in a series of political events in 2016, which have given way to more nationalistic and even protectionist policies. In today's climate, the added value of multilateralism must be demonstrated more convincingly.

23. Today, the international level is a very important component of the governance architecture in education. Its function is not to replace jurisdictions that have lawful and legitimate power to rule over

education, but to provide a space for comparing, collaborating and learning. Tapping the best knowledge available, learning about what works in education, confronting ideas and engaging in **peer learning**, all help jurisdictions to perform better. International organisations can also mobilise the comparative evidence, research knowledge and insights from peer review to provide policy advice to countries, incorporating aspects of education policy implementation and education policy evaluation. Comparative metrics used for benchmarking systems are now powerful tools for policy development. The OECD is an important actor in this regard.

24. International **collaboration** does not provide all answers to the challenges that policy makers and practitioners face. Countries respond to challenges in different ways. However, policy makers and practitioners are unlikely to find all answers in their own settings, either. Collaboration is the key to finding solutions on complicated problems, and education is no exception. Through collaboration, people can build the collective intelligence necessary to address the world's complex problems. International collaboration enables countries and decision makers to connect and come together to learn from each other, find common answers and work for the common good.

25. As formulated in the strategic mission of the OECD's work in education, the fundamental rationale for international intergovernmental collaboration in education is to **support jurisdictions in their efforts to achieve high quality lifelong learning for all, which contributes to personal development, sustainable economic growth and social cohesion.**

26. This rationale can be further explicated by the following four **purposes**:

- Learners have the opportunity and agency to learn in formal, non-formal and informal environments;
- Learners are supported by capable and professional teachers;
- Educational institutions provide learning opportunities in high-quality, equitable, cost-effective and innovation-friendly ways, in partnership with other learning environments and stakeholders;
- Education systems are delivering on the economic and social outcomes and are capable of adapting themselves to new challenges.

27. The goal of education is to **empower learners**, both individually and collectively. As societies continue to change, education systems need to adapt to help people develop the knowledge, skills, attitudes and values that enable them to realise their potential throughout their lives – from early childhood to older age. This also means that learners need to take ownership over their own learning. Learners who thrive in a changing world need to nurture **agency and co-agency**. They need to develop a sense of responsibility to actively participate in building societies, and the ability to define purpose and take actions to achieve goals, including realising their own learning. Developing agency over one's life and learning does not happen overnight, but is itself the outcome of learning. Learners will have to design their own learning trajectories through combinations of institutionalised formal and non-formal education with self-directed, autonomous and informal learning. This puts the development of broader, transversal skills, as well as attitudes, values and meta-cognitive skills, front and centre. However, learners will also need guidance and support to fully exercise agency in shaping their learning biography. They will need to be confident that institutional learning environments will recognise their prior learning through accreditation that enables them to seamlessly reconnect with institutional learning.

28. Although autonomous, self-directed, technology-supported learning will become far more prevalent in the future, learning is a social experience that happens through interactions between the learner and other people, including teachers. **Teachers** are professionals who design and engineer learning environments and learning processes, and support learning through a variety of professional interventions. They have a deep knowledge and understanding of learning, and know how to support it through

instruction, facilitation and coaching. Teachers also constitute the workforce of education, and embody a massive amount of academic and experiential knowledge. Developing teachers as a profession is an important public policy objective. This includes recruiting and retaining teachers; providing them with initial education and professional development; offering induction and mentoring when entering the profession; ensuring appropriate financial compensation; regulating working conditions; designing career development; and safeguarding the attractiveness and reputation of, and the social trust in the teaching profession.

29. Modern societies rely heavily on specific institutional environments, **schools** (including early childhood education centres, universities, vocational education centres, adult education centres, etc.) to provide the space and time for learning. Maintaining and improving the institutional framework in education is an important task for public authorities, but they do not necessarily provide or own schools themselves. Together with many other actors and stakeholders, public authorities are responsible for ensuring high-quality and equitable learning environments in a cost-effective and innovation-friendly way. Thus, **improving quality, equity, efficiency and innovation in education** remain critically important strategic objectives, though many countries face mounting obstacles and challenges. Outdated physical infrastructure, originating from the early days of educational expansion, constrains modern forms of learning and must be renovated and reconstructed. Cost-efficiency becomes a major issue for systems that struggle to improve productivity, leading to rising costs per learner. At the same time, education systems are increasingly challenged to improve equality of opportunity, foster social inclusion and integrate students with an immigrant background. In modern society, education is the main system for enabling social mobility and ensuring that every individual has the opportunity to develop their talents, regardless of social background or origin. It is also the main system for ensuring social inclusion and social cohesion, and fostering inclusive growth. Education systems that fail on equity allow talent to be wasted at a time when all countries are transitioning to knowledge-intensive economies and societies.

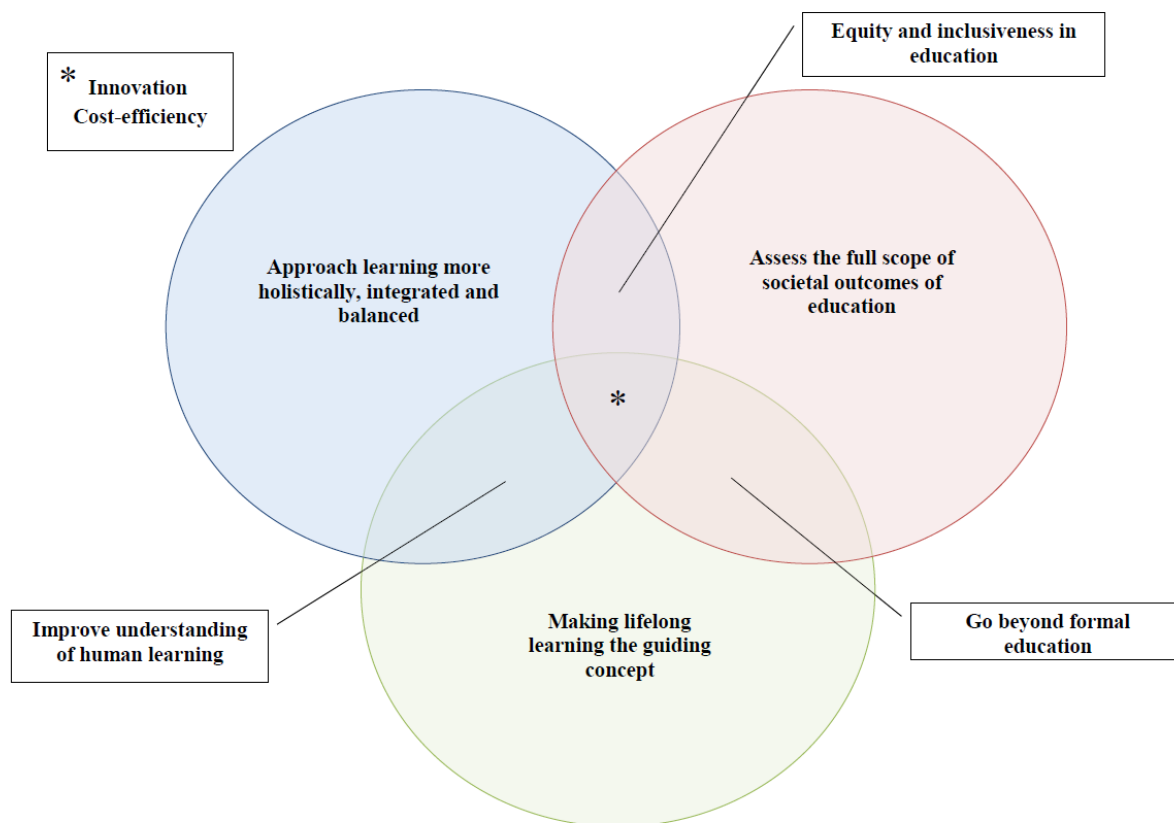
30. Education is a **system**; it is more than the sum of individual schools, teachers and learners, and is dependent on the quality of its inputs, processes, knowledge streams, outputs and feedback loops. Education is held accountable as a system through its **inputs, throughputs, outputs and outcomes**. Policy makers monitor the outputs (qualifications, educational attainment, learning outcomes, skills) and the economic and social outcomes on a variety of relevant indicators (employment, income, health, political participation, social trust, citizenship, etc.). Trustworthy comparative data and indicators, produced by the OECD and others, are rapidly becoming a very important resource for governments to assess and benchmark education systems against those of other countries. Many education policies now target the system level, underscoring the importance of steering education systems as a policy imperative.

Possible avenues for international collaboration

31. Over the course of its history, the OECD has assumed a leadership role in the field of international collaboration in education through the wealth and quality of its comparative data, its assessment programmes and surveys, and its analytical and policy work. The OECD operates alongside many other agencies and organisations in this space, making the data and knowledge environment richer and more diversified. Each organisation needs to focus on its **competitive strengths and advantages**. For the OECD, these are its multilateral frameworks for comparative data collection and analysis, peer learning and peer review, and for convening dialogue among policy actors and a wide range of stakeholders.

32. Ultimately, the OECD's competitive advantage in the field of education will depend on its power to develop **innovative ideas and approaches** that can inform the international debate, inspire policy processes and shape the future of education. The following sections discuss some mid- and long-term possibilities for international collaboration in education. First, three critically important imperatives for future thinking in education are discussed. Next, three intersecting ideas that connect the spaces are

considered. Finally, two central policy approaches are presented. The following graphic depicts the interrelationships among the eight ideas.



Approach learning in a more holistic, integrated and balanced way

33. The concept of formal education is closely connected to ideas of cognitive development and knowledge transfer. For a long time, these functions seemed to constitute the essence of schooling, but this idea has come under severe pressure in the last couple of decades, with the advent of constructivist pedagogies and the shift to competency-based education. It is not abstract knowledge, as such, but what learners can do with it that is now seen as essential. The success of the Programme for International Student Assessment (PISA) and the Programme for the International Assessment of Adult Competencies (PIAAC) is largely due to their analytical and assessment frameworks, which put the real-world competency in applying and using cognitive learning front and centre. Work on adult learning and skills development across the life course has further reinforced the idea that learning should be relevant to work, social participation and real life. **Finding the right balance between knowledge and skills** is going to be an important challenge for education, and there is much to gain from sharing experiences with curriculum design and implementation internationally.

34. In recent years, the OECD has contributed to expanding assessments of learning outcomes beyond mere cognitive domains. Thanks in part to the OECD's pioneering work on this topic, the idea that **social and emotional learning** is as important as cognitive domains is now gaining solid traction. The development of social and emotional skills is a shared responsibility of families, communities, peer networks, and for good reason also of schools. The move to social and emotional learning is a fundamentally important development, with consequences that we have yet to fully grasp. We do not yet

understand how social and emotional learning evolves in developing well-balanced people who can live and work together. This is an important and strategic area of work for the near and mid-term future.

35. Yet knowledge, skills and character do not constitute the full, holistic universe of human learning. Ethical development through the integration of **values and moral norms** is a very important dimension of learning. This is still largely uncharted territory in our understanding of human learning – and how formal and informal learning environments influence it – even though some countries have given values significant space in curriculum design. Ultimately, all learning results in actual behavioural change, and that is when learning becomes socially relevant – when knowledge, skills, character, attitudes and values are mobilised in real-life conditions. This process does not happen automatically. The phenomenon of cognitive dissonance, for example, is well documented, but there are many other instances in which people do not translate what they acquire internally into behavioural change when faced with real challenges.

36. A holistic, integrated and balanced understanding of learning is not merely an interesting academic exercise. It is rapidly becoming a critically important challenge because of the growing importance of **artificial intelligence** (AI) and the debate around its impact on education. AI is forcing us to redefine what is actually human about human learning and development. AI will take over some domains of learning, and computers and robots will soon be able to execute certain cognitive tasks and skills more effectively and efficiently than humans. It is important for the OECD to closely monitor and assess this development, and to put forward a vision on how human learning will remain important for securing future growth, prosperity, social progress and the overall quality of life.

Make lifelong learning the guiding concept

37. In an age where the volume of knowledge is growing exponentially, some knowledge quickly becomes obsolete and needs to be replaced with new knowledge. And as the demand for skills rapidly changes, the old idea that what one learns at school can last a lifetime becomes a dangerous myth. The concept of **lifelong learning** is not new, having been developed more than half a century ago, but it became mired in rhetoric, with little effective policy implementation. This will probably change due to the pressures that digitalisation will exert on the workplace, on the nature of tasks and on the continuously changing demand for skills. Implementing lifelong learning will require more than expanding opportunities for adult learning; it will push systems to fundamentally rethink the timing of education and skills development over the life course, including the earliest stages of learning, which frame learner engagement in subsequent stages. Learning trajectories will become more complex for people of all ages, requiring more sophisticated support arrangements.

38. The concept of lifelong learning urges us to critically rethink learning biographies and the appropriate architecture of educational systems. Some very critical learning needs to happen early in the life course. Work on early childhood education has convincingly demonstrated that early investments have many positive effects later in life, and that limiting learning opportunities can cause irreversible damage. For learning to be effective later in life, it must rest on a solid foundation acquired early in life. However, laying the foundation for lifelong learning does not imply concentrating all learning in the first quarter of a lifetime. Front-loaded educational biographies will need to be augmented by **more complex and more diversified learning trajectories throughout life**, with learning integrated into work and other dimensions of life. The standard learning biography is being gradually replaced by a variety of ways through which people develop their learning over the life course and alternate learning with work, family responsibilities and leisure. However, employment policies, compensation systems and social security arrangements still very much rely on the standard learning biography. The idea that credentials hold a lifetime will need to be substituted by an approach under which they require constant updating. Many more fundamental ideas behind the way we organise education deserve an overhaul, as well.

39. Qualifications and **credentials** are an important feature of modern education systems. In the industrial age, they functioned as adequate gatekeepers of successful educational trajectories, entry points

to the labour market and access to professions. They also served as indicators of educational attainment, markers of social mobility and providers of guaranteed, lifetime access to specific economic privileges and social status. In tomorrow's knowledge economies, where digitalisation and AI will drive constant professional mobility and changing skill demand, certification at the end of initial education will gradually lose its relevance. Today, close to 40% of workers in OECD countries already work in a field other than their field of study. There are significant signs that employers are starting to devalue qualifications in favour of direct assessments of the skills they see as important. The fragmentation of standard educational trajectories, the spread of modularisation, the increase in part-time learning and dual learning experiences, and the emergence of new forms of certification (microcredentials, nano-degrees, digital badges, etc.) all point in the same direction. These important transformations call fundamental characteristics of today's educational systems into question.

40. Assessing learning outcomes is a major component of the OECD's work in education and an important generator of data, comparative indicators, analysis and policy advice. The design and planning of learning outcomes assessments should be based on a **comprehensive and integrated approach of the learning biography**. Currently, OECD data collections concentrate on the end of compulsory schooling (15 years old in PISA) and the entire adulthood (16-64 years old in PIAAC). Work is underway to assess the learning of young children in early childhood education and care (ECEC) environments, as well as the learning of social and emotional skills of 10-year-olds. The vast age composition and the limited size of the survey sample in PIAAC make it difficult to deliver detailed assessments of learning outcomes at critical stages in the learning trajectory beyond the age of 15. The end of tertiary education and the first years in the labour market are a very important stage, and assessing higher education learning outcomes (AHELO) remains an important ambition. What happens in primary school remains a blank page, as well.

41. All countries are increasingly confronted with these challenges and questions. To overcome them, they will need to redesign their education systems around the concept of lifelong learning by introducing more flexibility in learning trajectories, new assessment and credentialing arrangements, and by tearing down barriers between the worlds of working and learning. Funding arrangements will have to be reconsidered, accounting for both private investments and the equitable rights of citizens to publicly funded volumes of education. The similarity and complexity of these challenges provide a space for multilateral collaboration, exchange of policy experiences and international monitoring of policy outcomes.

Assess the full scope of societal outcomes of learning

42. The OECD's work in education has been fuelled by the idea that education is a worthwhile investment that pays dividends over time. This idea has also driven educational expansion over the past decades. Analyses of economic and social returns to education, in both employability and earnings, lend important support to the narrative on education and learning. However, signs that the standard human capital theory argument is reaching its limits should be taken seriously. There will be a growing need to **critically reassess the economic outcomes of education**. Education's economic benefits are measured as relative benefits, but remain significant – mainly because the benefits for the comparison category of upper secondary graduates are decreasing, in absolute terms, due to polarisation trends on labour markets. In several OECD countries, saturation of graduate employment, over-qualification, substituting effects and qualification mismatch signal a fundamental change in the relationship between education and economic outcomes. Amid these trends, the standard human capital theory fails to offer sufficient analytical and explanatory power.

43. Massive educational expansion, increasing inputs of qualifications and skills in the workforce and the economy, and technological progress can be expected to have a stimulating effect on **productivity**. In most OECD countries, however, productivity growth is low and, in some cases, stalling. A possible explanation is that the increasing number of tertiary-qualified people is not matched by equivalent growth in skills. Indeed, comparisons across the International Adult Literacy Survey (IALS), the Adult Literacy

and Life-skills Survey (ALL) and PIAAC data suggest that in most countries, average literacy and numeracy skills in the workforce have not increased, while the share of people with advanced qualifications has grown significantly. Over-qualification, degree inflation and skills mismatch can offer a partial explanation for stalling productivity growth. Finding the right argument on the economic outcomes and benefits of education is a very important strategic challenge. If policy makers and, more importantly, learners, families and employers start to question the economic benefits of education, public trust and investment in education will erode.

44. In recent years, the OECD has put the **social outcomes of education and learning** on the map, marking one of its significant achievements in education. The positive association of educational attainment with health, political participation, volunteering, interpersonal trust and other social outcomes has been amply demonstrated and is widely accepted. Similar positive correlations are found in many other areas of OECD work, as well. Education is now appropriately seen as the main mechanism through which all kinds of social opportunities and benefits are distributed. The other side of the coin is that education is also understood as contributing to the unequal distribution of social opportunities in health, social participation and many other relevant dimensions of quality of life. Unequal levels of social outcomes across the population are an indicator of inequality. At the macro level, it is now widely accepted that education positively contributes to overall social cohesion, while also reinforcing trends of social segregation and fragmentation. The data collection, analysis and policy advice on the social outcomes and benefits of education, as well as its contradictory effects on the unequal distribution of these outcomes, remain a strategically important area of work.

45. Broadening beyond the economic outcomes of education has been a major achievement, but social outcomes do not encompass **all outcomes** of education that are relevant to social progress and overall quality of life. For example, environmentally sustainable behaviour, citizenship, empathy and various other desirable outcomes of education – to which the UN Sustainable Development Goal Target 4.7 refers – are high on the policy agenda, but have so far attracted little empirical research. In many countries, other purposes of education such as nation building, identity development and the cultural assimilation of migrant populations are becoming important, as well. Yet there is no conceptual framework to adequately map and classify the desired outcomes of education, which would allow for the development of an empirical research strategy.

Improve the understanding of human learning

46. Compared with other public policy domains, such as health, education has been slow in developing into a fully evidence-informed system. Some of the knowledge base used by teachers, school leaders and policy makers is outdated; educational research is limited in quantity and quality; and adequate mechanisms of knowledge transfer, dissemination and translation into policy and practice are underdeveloped. This has important consequences for the quality and efficiency of learning experiences, and for the productivity of educational investments. In past decades, education systems expanded without the understanding of human learning needed to design the best possible architecture. Only recently have economists and psychologists come to understand the importance of supporting early learning with proper institutional pedagogical learning environments. Other areas include the science of language learning or the development of numerical concepts. Age-old didactical approaches have come under scrutiny with better understanding of human learning processes. Mobilising the best available research knowledge and evidence on learning, and translating it into policy-relevant insights and formats, is important to improving and innovating education.

47. Recent technical advances in non-invasive brain research and new developments in neuroscience have opened up a completely new field of empirical research into the process of learning, one that is often completely removed from traditional spheres of education science. A new **science of learning** is emerging, based on the interdisciplinary integration of research in neuroscience, cognitive psychology and many

related scientific disciplines, including AI. Fascinating findings are emerging from this field, and many are attempting to translate them into educational policy and practice. However, some experts have warned against making quick and easy translations. We are only beginning to discover what happens in the brain when people learn, and as with every other new scientific discipline, the science of learning will likely take a long and bumpy road to full maturity. Yet there is no doubt that the science of learning will progressively alter and improve our understanding of human learning, as well as our institutional approaches to learning in classrooms and schools.

48. Going forward, we can expect the science of learning to inspire new **design principles** of effective learning environments. Future learning environments will focus on developing learner agency, and will redefine the roles of teachers and educators. The science of learning can certainly stir collective reflection on this. Curricula redesign will also benefit from new insights into human learning, including insights into the building blocks and sensitive periods of cognitive development. As in other scientific fields, there is a clear role for international collaboration to leverage this emerging knowledge.

Go beyond formal education

49. Formal education in professionalised institutional settings is and probably will remain an important space for human learning. The reasons that human civilisations isolated learning environments in time and space have not disappeared. To a large degree, learning is more effective when it is concentrated and focused, with strong support from teachers and the right kinds of institutions. However, the prevalence of formal education should not blind us to the fact that most human learning happens outside formal settings. Most initial learning, for example, happens in families and communities. The power of social background in explaining learning outcomes at the age of 15 is actually a partial measure of the richness of prior learning within and beyond school. Meaningful experiences outside formal settings reinforce and complement what students learn at school. Experiential learning makes formal learning real and imbues it with meaning. Does a child develop spatial thinking through learning geometry at school, through games played at home, or by simply walking to school and navigating the complexity of the city they live in?

50. Making sense of non-formal and informal learning is far from easy, and requires revising data-collection and analytical instruments, as well as conceptual frameworks. Work on vocational education and training (VET) is making progress in examining the ways in which workplace training and informal learning is related to formal education. Work on ECEC focuses on learning environments that do not really fit the distinction between formal and non-formal. Ongoing work on the assessment of social and emotional skills aims to disentangle the roles of families, community life and schools in fostering those skills. International collaboration needs to go further in this. Concepts such as learner agency, learning biographies and, of course, lifelong learning suggest that learners develop knowledge, skills, attitudes and values through integrating experiences from a wide range of life settings.

51. **Informal learning** is a vast but largely uncharted territory. We know little about the ways through which people learn, and even less about how to make improving informal learning a target for public policy. However, there are some promising advances in this sphere. We know that the quality of work and workplaces has a positive impact on learning and skills development at work. Collaborative cultures and working conditions that reward collaboration allow people to learn from one another. Other examples of the importance of informal learning come from the field of architecture and urban planning. Interacting with physical environments, moving around, navigating complex environments and travelling to other destinations, all have an effect on cognitive and non-cognitive development. We know, for example, that certain housing conditions, urban environments and physical landscapes trigger problematic behaviour, while others have a more positive effect. There is also significant research on the impact of media, digital devices and social media in the private sphere on learning. Turning this knowledge into policy advice on fostering desirable informal learning is not easy, but it remains a promising domain of future work. Insights from behavioural economics on nudging specific behaviours can provide interesting ideas, as well. Since

investments in infrastructure are rare, it is often difficult for jurisdictions to build systematic experience, underscoring the importance of international knowledge sharing.

Develop a new approach to equity and inclusiveness in education

52. **Equity** in education and learning is very high on the policy agenda in almost all countries, and for good reason. Although educational expansion has made education systems less elitist and opened up vastly higher levels of opportunities, school systems still select and sort, discriminate and segregate. Family background affects educational trajectories, success and failure, and the final allocation of individuals in the social hierarchy. This reality contrasts with one of the basic tenets of educational expansion: the belief that talent, effort and merit lead to upward social mobility. Education has not fully switched from a selection-oriented system to an inclusive system that accomplishes success for all. In a knowledge-driven economy, the macro-social cost of educational exclusion is likely to be very high, because of wasted talent and the future cost of educational failure in social welfare and protection systems.

53. So far, discussions around equity in education have predominantly focused on the impact of socio-economic and cultural background (e.g., ESCS in PISA) or parental educational status (e.g., PIAAC) on educational achievement or learning outcomes. The underlying argument is that the economic, social, cultural and educational resources that parents or peers are able to mobilise exert an important influence on a child's opportunities to benefit from learning at school, thereby determining their learning outcomes. However, social background is not the only driver of inequity in contemporary societies. Gender is an important variable, and migration status and ethnic diversity are now included in the picture, as well. It would be beneficial to further broaden and **diversify the equity debate** to include more dimensions, such as the location and geography of educational opportunity. As educational opportunities increasingly concentrate in specific locations, spatial segregation plays an important role in driving educational opportunities. Beyond the obvious urban/rural divide, however, we actually know very little about the role that location and geography play, and how these factors interact with dimensions such as socio-economic status and migration status.

54. Furthermore, some experts argue that perceived inequity in education is not the outcome of attributes of the educational system, but the consequence of divergent strategic behaviour of social groups (e.g., opportunity hoarding among the middle class). Another important criticism of analyses of inequality in educational outcomes argues that there is no control for cognitive ability or intelligence. The axiom that individual variation in intelligence levels out on the aggregate level is increasingly challenged by scientific research that details the impact of genetics and very early (even prenatal) conditions on cognitive abilities. Research has found a significant correlation between socio-economic family background and intelligence, raising questions around what drives the impact of social background on learning outcomes. Nevertheless, the fact that the impact of social background varies so widely across education systems and over time suggests that there is significant scope for peer learning across education systems. This emerging academic debate has important policy implications. There is no country-level trade-off between excellence and equity, according to PISA, and some countries have seen important progress in both raising performance and levelling the playing field. But underperformance and inequality have been persistent in other countries, despite considerable policy action. We should therefore prepare for a more complex debate on equity and inclusion.

Provide advice on how to improve cost-efficiency in education

55. The budgetary problems that countries increasingly face today will not go away. Public expenses in education and other domains are fuelled by increasing levels of public debt, which tax future generations. Demographic shifts will push governments to spend more on health, ageing and welfare, while ecological and climate change-related challenges will require higher levels of public spending, as well. Pressures to **increase value-for-money and cost-efficiency** in education will only amplify, and education systems are

not properly equipped to respond. On the contrary, costs appear to be inflating. Most OECD countries have increased their educational expenditure significantly over the past 20 years or so, but without any perceivable increase in outcomes or quality. Some of the additional expenditure has gone to initiatives, such as lowering class size, that have no demonstrable effect on quality. Whereas other public policy domains have increased productivity, mostly through the targeted use of technology, the technology-driven increase in educational productivity has yet to materialise.

56. The cocktail of inflating costs, flat productivity gains, stalling or decreasing quality, questionable economic returns on investment, and external pressures for cost-efficiency risks creating a significant challenge for education systems. Countries do not know which buttons to press to increase cost-efficiency. Improving cost-efficiency is therefore an important area of policy-relevant work, where multilateral collaboration can provide the space for analysis, peer learning and policy dialogue.

Focus resolutely on innovation of education

57. When education systems come under increased pressure, they tend to provide less space for experimentation and innovation. Instead, they tend to go back to what worked in the past. However, the case for innovation in education is clear. By doing things differently, education systems can improve outcomes, cost-efficiency and equity. The case for innovation needs to be made more vigorously and convincingly. We must then better define what falls under the label “innovation”, as not every change can be considered innovative. The direction of change matters, as well as the overall purpose with which it is implemented. Being more rigorous about innovation is extremely important, not least because of the many mistakes that have been made under the banner of innovation. Many systems experience innovation fatigue, and there is growing resistance among teachers against innovations that are implemented in a top-down fashion. As has become clear, the implementation of reform and innovation requires great care.

58. **Technology** has great potential to drive innovation in education, as it does in other systems. So far, however, the implementation of digital technologies in education and learning has not been a straightforward success story. There are several reasons for this: simplistic approaches, an absence of scientific pedagogical input in the design of soft- and courseware, disempowering teachers, unfulfilled primary conditions, etc.. Yet the potential of technology is still waiting to be unlocked, making it a promising area for international work.

59. We can be confident that the direction of change inherent to innovation will be toward building systems and practices that are better tuned to learners’ needs, instead of fitting learners into a predefined, almost “industrial” model of education. Education systems are already moving toward more flexibility and differentiation, and this trend will only amplify in the future. There are also excesses, of course; contemporary research literature shows that excessive personalisation and individualisation of education can have counterproductive effects. Yet education will surely move towards fitting institutional environments to the needs of learners, rather than the other way round.

60. We need a more sophisticated perspective on the ways in which innovation arises in education. The idea that policy makers and legislators generate innovation through top-down interventions has repeatedly proven to be false. Successful innovations depend on a collaborative effort from all actors and stakeholders in the system, united by a convincing narrative and sense of purpose. The professionals at the frontline of educational delivery – the **teachers** – are critically important to the success of innovations. Innovations are often unsuccessful due to mechanisms that implicitly or explicitly disempower teachers. Successful innovations in education often rely on stronger horizontal professional collaboration and accountability within the profession. Again, this seems an important space for multilateral collaboration.

61. Effective innovation will rely on the capacity of systems to experiment in an intelligent way and to learn from **experimentation**, including both successes and failures. A powerful knowledge system

informed by scientific research, and driven by data and analysis, will be needed not only to develop the evidence base for policy, but to drive innovation and experimentation, as well.