High Performing Systems for Tomorrow

Dialogues about the Future of Education Systems in a Changing World

May 2022

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Forward

In 2017, NCEE met with the OECD's Andreas Schleicher and Michael Stevenson and representatives from a small set of the highest-performing jurisdictions on PISA to ponder a conundrum. These jurisdictions had been the world's highest performers for years. But their scores had hit a ceiling even as others had rapidly improved. They were facing deep challenges educating their students to navigate the fast changing digital world, population decline, civic unrest, and economic upheaval. More than anything, the advance of AI and digital technologies, a globalizing economy and other worldwide trends were transforming the future faster than any single jurisdiction could keep up with. Even as the rest of the world was looking to them for guidance on how to improve to match the performance of the best, they felt they had much to learn – both from one another and from futures thinking outside the field of education.

The proposition on the table was to bring these high-performing jurisdictions together, facilitated by OECD and NCEE, to think together about what these changes might mean for their education systems and how they might think about responding to best serve the students in their jurisdictions. What could they learn from each other and what could they learn together? What challenges did they face and what were the different ways each was responding? In some sense, this conversation became one about how to redefine high performance in the context of a fast changing future. It was clear from early on that no system had a concrete roadmap forward. It was also clear that they each would chart a slightly different course, given their very different histories, politics, approaches to policymaking, priorities and resources. That said, there were many common areas of agreement between the jurisdictions about how to frame the challenges they faced and the necessary policy responses.

What has resulted had been a fascinating journey. It has not only enabled the leaders of the partner systems to take a step back and think about where their systems are and where they are going with a small group of peers, it has enabled NCEE to hear and shape their thinking and now, in this report, pull some of the ideas and policy directions together to share with a wider audience of policymakers in other countries who are facing the same future. We hope that this report of these conversations provides much stimulus and inspiration for a wide audience of policymakers, practitioners, researchers and others considering the challenges and opportunities we face in an uncertain future.

Anthony Mackay
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I. Introduction

The High Performing Systems for Tomorrow (HPST) was a three-year partnership among the Organization for Economic Cooperation and Development (OECD), the National Center on Education and the Economy (NCEE), and a select group of education leaders, including Directors-General, Deputy Ministers, senior advisors, and others, from among a group of jurisdictions with education systems that performed at the top of the OECD's Programme for International Student Assessment (PISA). These jurisdictions were British Columbia, Canada; Estonia; Finland; Hong Kong; and Singapore. The goal of the project was to consider the impact of digitalization and other global trends on the future of work and civil society; explore what this means for what students should learn and how they should learn it; and consider how this might change the role of educators and the design of public education systems.

The work was organized around a series of semi-annual policy dialogues among OECD, NCEE and the leaders of the jurisdiction education systems to explore these themes. Over the course of six policy dialogues, the group considered:

- The Impact of AI and Related Technologies on the Labor Market and Civil Society
- What a Changing Future Means for What Students Should Learn
- What a Changing Future Means for the Design of Education Systems
- What a Changing Future Means for the Design of Innovative Learning Environments
- What a Changing Future Means for the Teaching Profession
- Getting from Here to There: How to Move Forward to Build New Systems

NCEE and OECD designed and organized the meetings, structuring agendas, selecting pre-readings, annotating additional reading lists, and securing speakers. Each policy dialogue included sessions led by NCEE and OECD staff, as well as presentations from host countries on recent reforms they had undertaken and guest speakers, designed to stimulate discussion of the issues and challenges associated with large-scale change.

NCEE's CEO and Board Co-Chair Anthony Mackay served as the facilitator for each dialogue.

This paper serves as a report of those discussions. In general, there was much in common in the group's analysis of the thorny challenges confronting education systems: globalization, the rise of artificial intelligence, widening inequality, simmering civic unrest, challenges to democratic norms and institutions, and, of course, a global pandemic. There was also broad agreement about what those challenges could and should mean for what and how students should learn to be best prepared to survive, earn, contribute, and thrive in an increasingly complex global economy and society. But there were considerable differences in the pace, sequencing and design of the strategies being shaped in each jurisdiction. These differences at times led to respectful and productive debates and revealed that there are many paths forward.

The coronavirus pandemic emerged midway through the project, and its impact cannot be ignored. Our conversations moved online, just as our school systems did. But the crisis did more than change how we conducted this project: it provided a window into the uncertainty and fast-paced nature of change that had been the subject of our dialogues. We talked about the future "as it was happening," which gave the group a unique opportunity to test our thinking and planning in real time.

This report will summarize the conversations from October 2018 in Canada to May 2021 on Zoom. But it is not the only artifact from the HPST project. In addition to preserving a narrative of the conversations that highlights common themes and describes differences of opinion, several appendices in the report provide:

- a summary of each jurisdiction's official plans for the immediate future as they embark on the next phase of the work;
- a bibliography of references used as prereading and additional works consulted;
- a compilation of discussion papers and other summary materials developed for the HPST group, such as papers from NCEE's Founding President and Senior Fellow Marc Tucker and OECD's Senior Advisor Michael Stevenson; and
- a list of the participating jurisdiction members, the OECD and NCEE project staff, and expert guests who joined the discussions.

Finally, NCEE, in partnership with the Australian Council for Educational Research (ACER), is leading a related strand of the work that analyzes the learning systems — defined as the goals, curriculum, assessments and supports for students and teachers — in a subset of the HPST jurisdictions. Jurisdiction cases focus on understanding how

each system developed, how each is operating now, and how each is being reimagined for the future. Geoff Masters, CEO of ACER, is writing a cross-case analysis that will identify common characteristics of the systems and trends and differences in the direction of their reform. The analysis and jurisdiction cases will be published separately.

This report was prepared by staff at NCEE. We hope it will serve several purposes. For the participants in the HPST partnership, it should preserve a record of the discussions and readings, allowing them to reflect on what they accomplished as they move forward into a next phase of the work. For educators and policymakers in other jurisdictions who are interested in adapting their systems to meet the needs of a changing future, it draws out insights and debates that might be useful as they think about their own contexts. And for anyone interested in the literature on artificial intelligence and related technologies, the learning sciences, and the changes in the global economy and societies, it should serve as a useful reference point of how several of the world's leading education systems were positioning these issues in the last few years.

II. The Policy Dialogues

First Policy Dialogue:
The Impact of AI and Related Technologies on the Labor Market and Civil Society
Toronto, Canada, October 2018

In the first policy dialogue, held in Toronto, Canada in October 2018, participants reviewed NCEE's research on trends in the highest-performing jurisdictions and began to discuss artificial intelligence (AI) and its effects on the labor market and civil society. NCEE led an initial session on emerging principles for global best practice, organized by NCEE's distillation of what it had observed over 30 years of international benchmarking of high-performing education systems. Participants gave feedback on how this information was organized and how it could be made more useful for an audience of global top performers.

Following reflections on NCEE's research, host jurisdiction Canada led a session on recent changes to British Columbia's graduation assessments. Nancy Walt, Director of Curriculum and Assessment for the British Columbia Ministry of Education, described how the province had changed its secondary curriculum to meet the needs of the future. Students now have approximately 30 percent more courses than previously offered to choose among, including additional required career and technical education courses with applied capstone projects. Across the full K-12 curriculum, the province had identified key competencies that should be embedded across the curriculum and pared down the content of each subject area to give teachers space to focus on the core ideas. In addition, Indigenous perspectives were integrated into all subjects and grades. As a result, the province's graduation requirements had shifted from a series of course-based exams to one foundational exam of literacy and numeracy across the core curriculum. Walt noted that the reforms were iterative and medium-term, rather than revolutionary. But the goal was to build in a three-year planning process to keep the curriculum regularly evolving.

Participants later took part in a discussion structured around NCEE Founding President and Senior Fellow Marc Tucker's research into what advances in AI and related technologies mean for the labor market and civil society. Tucker described how literature, from McKinsey & Company, Levy and Murnane, Frey and Osborne and others, had accurately predicted that AI would displace the jobs of many doing routine work, but actually under-estimated AI's capability to recognize patterns, replicate senses, and learn autonomously in order to drive cars, write music, win at chess and Go, and diagnose diseases. And yet, AI has no ethical sense or empathy. Tucker's prediction was

that a large fraction of the jobs in modern high-wage economies could be wiped out by the machines, producing economic pain on a large scale. In the future, Tucker said that many workers at every skill level will be members of the gig economy, juggling jobs, and the nature of the skills needed will change, demanding the capacity to learn quickly. The machines will take over a good deal of the lower-level cognitive content of a lot of jobs, putting a premium on the development of higher-level cognitive skills and the "human" side for workers. It is not the case that we can leave the thinking to the machines and turn our attention to the social and emotional aspects of human functioning. The challenge we are facing is how to help students gain a much deeper grasp of the concepts underlying the subjects they study, the way those subjects relate to the real world around them and the way they relate to other people. We have to up our whole game.

Based on Tucker's reflections, participants agreed on a general roadmap forward for the HPST partnership. All agreed that further exploring the development of AI and related technologies, different policy responses to that challenge, and opportunities and challenges for both short- and long-term education system redesign, would be fruitful avenues for the group. There was no consensus about whether the changes would prove to be transformational or iterative, as well as whether the education system responses could or should be incremental or revolutionary. But all agreed that change was coming, or already here.

Second Policy Dialogue: What a Changing Future Means for What Students Should Learn Helsinki, April 2019

The second policy dialogue was hosted by Finland and held in Helsinki in April 2019. The meeting was organized around three broad discussions, augmented by several presentations from guest speakers, including Michael Reiss, Professor of Science Education at University College London; a panel of tech industry entrepreneurs from Estonia; Pekka Ala-Pietilä, Chair of the EU's High-Level Expert Group on Artificial Intelligence and of Finland's AI Program; and Kai Fong Chng, Managing Director of the Singapore Economic Development Board (EDB). The discussion topics were:

1. What does the advance of AI and related technologies mean for how we live our lives, the future of work, the skills needed for the future workforce and the goals of education?
2. What do AI and related technologies mean for what our students should learn?
3. What do AI and related technologies mean for teaching, learning and assessment?

The OECD's Michael Stevenson introduced Michael Reiss who led a framing conversation for the meeting. Reiss said that it is very hard for society to see the ways that AI has already transformed our world, because the definition of AI is constantly in flux. Once something that is initially thought of as "intelligence" becomes commonplace, people no longer think of it as AI. For example, the traffic light, which was once seen as an intelligent adaptive machine, now governs movement across our world without being given a second thought.

Reiss sees a goal of education as enabling humanity to retain and deepen its capacity to think critically and play a constructive role in society. As a result, good education systems need to ensure that people flourish according to their talents and eventually develop deep expertise. Getting learners on the path to this kind of mastery will require us to very broadly reconceptualize the purpose of education.

Following Reiss, host country Finland led a presentation on the country's cross-agency AI strategy which aims to anticipate citizen needs and to help them help themselves. Finland has an existing high-quality infrastructure for data. This gives the country the ability to look at citizens' "well-being" across a set of dimensions, including education outcomes, physical and mental health, access to health and social services, uptake on lifelong learning opportunities, and other indicators. These wellbeing indicators allow data systems to create maps of services that government and other sectors can provide to tailor needed support to citizens. This process is leading to a digital transformation of social services from being efficiently administered to being citizen-oriented, proactive and able to interact nimbly with all citizens. For example, a new tool called "Digital Me," involves a digital avatar that enables youth and their families to imagine their potential future paths and see the results of possible choices they could make.

Following this opening framing, the bulk of the remainder of the meeting was focused on the three discussion questions.

Discussion 1: What does AI mean for how we live our lives, the future of work and the goals of education?

In leading this discussion, Finland argued we are transitioning out of the knowledge age, and that the new era will be the "Interaction Age" because what makes us human, and what machines can never replace, is how we interact. What is increasingly important for education systems to develop in such a society are general competencies such as empathy and social emotional skills. But in response, Estonia cautioned that digitalization could create important competitive advantages for privileged groups and ultimately

increase inequality, which will lead to more of the polarization we are already seeing around the world.

Singapore recognized that the changes caused by AI would be both evolutionary and revolutionary. In Singapore's view, the pace of change would vary by sector, with education at the evolutionary side of the spectrum. Increasingly, the goal for education should be for young people to understand what it means to be human and make wise decisions as to how to integrate AI into their lives.

Kai Fong Chng, Managing Director of the Economic Development Board, Singapore's agency responsible for attracting foreign investments and growing the economy, joined the conversation and made five major points. First, the potential of AI that we should harness is its ability to transform jobs, not to create or destroy them. Skills that are increasingly important in the newly transformed labor market are data science, data analytics and skills associated with automating processes. Unfortunately, many education systems are not focusing on these skills, instead emphasizing only coding. Second, skills should be prioritized by their ability to contribute to economic development and other sectors of society. In particular, governments have to be concerned with lifelong learning. Third, attempting to fire one's way to a more competitive workforce is unsustainable as a business model or a strategy for a more stable society. Instead, companies must invest in transforming their existing workforces. Fourth, education systems should focus on developing the skills that humans do better than intelligent machines, including creative thinking, collaboration, and synthesis. Focusing on the humanities is key to developing these skills. And fifth, education has a role to play in emphasizing collectivity and the importance of community.

NCEE's Marc Tucker concluded the discussion by urging participants to recognize that the political and education-related threads of the discussions were interwoven. In Tucker's view, people around the world are being left behind by advancing technology and by global elites who are reaping the benefits of policies that are making them very rich at the expense of everyone else. The question, he said, is what education can do to equip those being left behind with the education they need so that all boats, not just those of a small elite, can rise with advancing technology.

Discussion 2: What does AI and related technologies mean for what our students should learn?

Hong Kong started this discussion by describing how it has transitioned from a focus on narrow subjects to broader learning areas. This has enabled more integration of applied learning experiences, and lifelong learning experiences. But it has proved challenging to

integrate and align this new organization of secondary education with traditional higher education. British Columbia outlined its goals, which include developing healthy, happy members of society who can exercise social responsibility. The province recognized that AI makes the tasks of educators more urgent. Structures that incentivize teachers and learners to do their best work will be essential. Finland noted that how the purposes of learning are conceived is evolving. Students will need to explore and define problems and choose which ones they want to solve. In this challenging new stage, helping teachers to reach a shared understanding of what form education will take will be key.

Discussion 3: What does AI mean for teaching, learning and assessment?

Singapore asserted that the central question should not be whether AI can or will make humans obsolete, but instead whether AI could augment the skills of humans to produce much better results than either could do alone. This applies to teachers, who, augmented with new technologies, could become more adept at differentiating instruction, diagnosis, prescription, lesson delivery and real-time assessment to a degree of granularity that has not been possible to date. Despite this potential, AI can contain inherent biases, which are often difficult to anticipate. Further, education systems lack a deep bench of talent in AI, so a partnership between experts in AI and pedagogy will be necessary.

Finally, a panel of Estonian entrepreneurs offered their perspectives on the kinds of workers they were looking for, how the education system should respond to develop competitive workers in the tech marketplace, and the technical tools they were creating to expand educational experiences for learners. All of them agreed that a radical rethinking of the education system would be needed to adapt to an entrepreneurial, AI-driven future. They urged policymakers to think about how technology could optimize the learning environment. They told participants that some revolutions in education that once seemed fantastical may soon be possible: downloading information into students' brains and using technology to optimize brain function being examples with far-reaching implications.

OECD Perspective

OECD's Director for Education and Skills Andreas Schleicher offered several observations from OECD's research about the impact of AI and related technologies. Schleicher echoed Estonia's earlier observation that rising global inequality — with the top 10 percent of earners making 10 times as much as the bottom 10 percent — may be exacerbated drastically by the rise of AI. Technology may be able to facilitate democratization, enable non-wealthy entrepreneurs and creative types to create before they have access to capital, and facilitate the spread of messages from all levels of society. But it also enables the ultra-wealthy to augment their access and even their

intelligence, concentrates power and the ability to control data and media, and prevents low-skilled workers from finding work.

This threat of growing inequality makes realizing education's promise to create a more level playing field in society and in the workforce even more urgent, Schleicher said. Technically, it is possible to salvage automatable occupations through on-the-job training, lifelong learning and upskilling. But given that roughly 70 percent of the world's population works at tasks that can be done by AI, according to Schleicher, our current lifelong learning systems are insufficient to the task at hand. Further, our current challenge demands that the education system shift from emphasizing content knowledge to emphasizing deep understanding. While the specific new skills of the future may be contested, Schleicher argued that there was emerging consensus on the broad themes of these new skills. The workers of tomorrow need to be able to: anticipate needs and create new value; reconcile tensions and dilemmas; and navigate ambiguities.

Third Policy Dialogue:
What a Changing Future Means for the Design of Education Systems
Macau, China (hosted by Hong Kong) November 2019

The third policy dialogue was focused on how to design equitable, high-quality education systems in an AI world. Hong Kong served as the host jurisdiction. In addition to an opening presentation from host Hong Kong, participants debated four major topics: the future of education and the economy; the future of learning; the future of schooling; and getting from here to there.

To begin, Rose Luckin from the University College London led a discussion comparing human intelligence and AI and offered suggestions for how educators could draw on what AI does best to expand human capabilities. Hong Kong's representatives then facilitated a discussion of the rise of AI in China, and how AI was being used in classrooms throughout China. They described how as physical "centers" like shops and law firms disappeared, many kinds of jobs disappeared with them. However, this had created new forms of working: transient startups and gig-based employees. There is widespread concern that there is a mismatch between what the changing workplace expects and what education provides, as teachers are underprepared to deliver authentic workplace experiences for the future. On the horizon, Hong Kong sees much more attention being paid to experiential learning, social emotional learning, and learning about AI. This begs important policy questions, such as how to teach students about AI, and whether the common strategy of teaching coding classes is adequate.

Turning to changes in communications, Hong Kong explored how new sources of knowledge and new kinds of relationships are forming via the internet. Yet those communications channels are also being weaponized to harass and spread misinformation. While we may have no idea what happens next, Hong Kong argued that we need to quickly figure out a framework for how learning and values formation occurs in this new media landscape. Much more personalized learning and more innovative ways to document learning are emerging. These are but a precursor to the level of individualization.

In response, OECD's Andreas Schleicher and NCEE's Anthony Mackay wondered whether China was harnessing AI to strengthen the current paradigm or to leap forward into a new one and questioned whether the emphasis on coding ("the trigonometry of the day") really addresses what students need to know in an AI world. These reflections prompted even bigger questions:

- Should we be thinking about changes in our societies and economies more broadly than just AI?
- Should the focus be on communities, or the needs of individual learners? How do we define and measure character?
- Are we emphasizing the potential damage of AI, rather than thinking only about its potential to help us explore what it means to be human?

The group concluded by debating whether networks of innovators could put pressure on government to innovate and redefine learning environments in more radical ways.

After the remarks from Hong Kong, NCEE's Marc Tucker presented a discussion paper, which framed the remainder of the meeting. In brief, Tucker described how second-stage globalization, combined with widespread introduction of intelligent technologies, is accelerating the automation and export of jobs in high-wage countries, threatening the livelihoods of hundreds of millions. According to Tucker, societies can avoid destabilization by radically upgrading the knowledge and skills of their workforces, providing the kind of education to all that was once only available to a few. Automation is also requiring us to develop citizens who have morality, decision-making skills, the ability to interact with one another, and the ability to preserve freedom and democracy. Work on the nature of expertise shows us that it is still necessary to know a great deal about the core disciplines, even in the modern age. In Tucker's view, neither focusing on "learning to learn across disciplines," nor adding social and emotional competencies, nor applying cognitive science principles to the current system alone will result in the broader and

deeper learning for all students that is necessary. The only adequate response, he argued, it is to design a new system based on the latest cognitive science research on learning that enables all students to learn at very high levels with equity and efficiency.

Following this overview, participants discussed four major topics proposed by Tucker:

1. The future of education and the economy
2. The future of learning
3. The future of schooling
4. Getting from here to there

Discussion 1: The Future of Education and the Economy

In the first discussion, Singapore described how its strategy has always been to pilot reforms and new technologies to ensure they add value, then refining and improving them iteratively. Singapore is committed to having teachers use more automated grading technology in order to figure out how real-time assessment using machine learning can help teachers differentiate instruction effectively. Piloting and refining allow the country to ensure that approaches are well-designed before they are expanded. Nevertheless, there is concern that there may be diminishing returns to the current paradigm, and that incremental improvement may not be sufficient to meet the challenges on the horizon.

Other jurisdictions felt that Singapore was unique in its clarity and alignment about the goals of education, the relationship between students' success and the success of the broader society and economy, and how and why it would use AI to promote learning. Other partner jurisdictions felt they were not as cohesive in how they integrate their economic and education goals and plans. There was concern about the impact of this lack of cohesion in goals and planning as societies continued to face volatility and new challenges. Between the 4th industrial revolution, globalization, financial shocks and widening income inequality, many jurisdictions were proving less resilient than they would have thought. Some suggested that these jurisdictions needed to broaden their education goals to include those that serve political stability and social cohesion to address these challenges.

Discussion 2: The Future of Learning

To start the second discussion, Hong Kong put a proposition on the table: the core business of education is not the act of teaching, but the act of learning, which puts the emphasis on what the student learns, not where or from who the student learns. But because education systems are shaped by the trends of their time, they can quickly

become obsolete and fail at their core task if they do not pay careful attention to the latest developments in the science of learning.

Some participants noted that many education systems are hamstrung by the practice of organizing content by year. Systems where there is a range of five or six years of learning per grade level rarely effectively serve either the most accelerated learners or the learners who need the most support. Those who are behind have no hope of catching up, and those who are ahead cannot deepen their learning successfully because they are not being challenged. Finland saw an opportunity to elevate public discussion around pedagogy; they argued that new language to describe effective pedagogy was needed among teachers. NCEE's Anthony Mackay suggested that education systems regularly violated every best practice outlined in the science of learning.

Discussion 3: The Future of Schooling

To start this discussion, the group debated how to manage change in complex systems, and the question of what decisions to centralize (and how) and what decisions to leave to professional judgment (and how to oversee those). Estonia described Estonia's Lifelong Learning Strategy 2035 as an attempt to provide an overarching roadmap for the future of schooling. The hope is that innovation will flourish within this roadmap: Estonia is collecting examples of innovative practice, spreading new ideas in teacher communities, and developing didactics in networks of partner schools devoted to co-creation, research and experimentation. British Columbia noted that many of their schools were mired in an industrial model and lack the incentives to transition out of it. British Columbia hoped that much of these incentives could come from assessment. But it would need to be properly designed and implemented in order to collect rich evidence on how the system was functioning, and to provide evidence and incentives for change.

Singapore's approach to managing ambitious change has typically been to start with more centralized guidance and gradually cede it over time. For example, after a period in which teachers' professional development resources were centrally developed, the teaching profession has gradually taken ownership of professional learning and growth. The system also used to assess schools centrally using external appraisal, but eventually transitioned to supporting all schools in conducting regular self-appraisals. In Finland, where municipalities maintain autonomy by constitutional right, policymakers engaged in a process to develop centralized structures to support implementation, not to control the system. The Finns see their system as promoting autonomy because educators are so interdependent that there is professional accountability between them.

Discussion 4: Getting from Here to There

Hong Kong described five steps to get from today to its vision for the future: understanding human learning; introducing the concept of teacher as facilitator of learning; moving to teaching less and learning more and understanding that learning also takes place in alternative pathways and outside of school; creating spaces for independent learning; and envisioning schools as hubs for learning coordination. Hong Kong also shared the findings of a survey on early participation of schools in AI in education. The respondents thought understanding AI was more important than applying it, at least initially, but expected more professional development opportunities to consider how best to use it in education.

Finland suggested a somewhat different trajectory, arguing paradigm shifts require unlearning assumptions about existing systems in order to transform. What is important to Finland is that education systems don't aim at a static goal, but instead an evolving target, because future-ready systems must have the capacity to constantly adapt to an uncertain future. A system will never change to meet this moving goal from top-down action — or at least, it will not change in the intended ways. Instead, in Finland's view, improvement must happen "from the inside-out." Teachers must create possibilities and spaces for constant feedback and reflection between theory and action, and thereby ongoing growth.

Singapore suggested yet another approach. Given that predicting what we need to know in 20 years' time is impossible, Singapore said that supporting lifelong learning is essential to prepare citizens for the future. That is just what Singapore has done with its SkillsFuture Initiative. This provides structures and incentives for Singaporeans to learn throughout their lives, including an individualized learning portfolio and subsidized learning for all citizens throughout their life. One of the most powerful impacts of the initiative is to impel educators to rethink their assumptions that all learning has to be front-loaded in the first 20 years of a learner's life.

OECD Perspectives

The OECD's Andreas Schleicher and Michael Stevenson added their perspectives to these discussions. Schleicher described the "contradictions of an AI world": AI is simultaneously producing positive and worrisome changes for learners. For example:

- AI facilitates lifelong learning. But lifelong learning widens inequality. Those with high levels of education are much more likely to complete further learning.
- AI tailors content for specific groups, but also homogenizes opinion.

- AI empowers, in that anyone can use it, but also disempowers, in that we are subject to algorithms that understand us better than we understand ourselves.

Schleicher stressed the importance of a set of transformative competencies, which are things that humans can accomplish but that cannot be done well by machines. These are: creating new value for economies and/or societies; taking responsibility and building agency; and managing complexity. In this context, epistemic knowledge is key: the facts of history can be found by Google, but thinking like an historian is a human skill. Schleicher worried that teachers are supportive of these competencies in theory but unable to create the right kind of learning experiences to develop them in practice. For example, over 90 percent of British teachers say that their role is to facilitate inquiry, yet Britain leads the world in rote learning.

Michael Stevenson's reflections connected the impact of AI on learning, education systems, and teaching and learning to the broader question of human flourishing: how will people thrive and be happy in the world of the future? He suggested that most agreed that the economic effects would be profound, but whether the automation of job tasks would produce economic shifts or profoundly new business models was up for debate. Most acknowledged that AI is affecting our ability to make decisions but disagreed about the extent to which this is true. AI is influencing consumers to make purchases, but is it influencing voters? And there are those that are arguing that the advent of AI signals the end of the enlightenment — and potentially, even the end of humans' free will.

Stevenson argued that the goal of all humans should be to maximize human flourishing, and the goal of education is to enable us to act in pursuit of flourishing. AI offers many ways to help us achieve this goal, but AI also creates profound uncertainty about the future of work and life. In response to this uncertainty, curriculum should not only enable people to do good work and exercise responsible decision-making, but also strive to find new sources of meaning and purpose in life.

Stevenson suggested that this line of argument is playing out in three distinct traditions: the Scandinavian, Asian, and Anglo-Saxon traditions. Stevenson argued that in Finland, AI is seen as a potential liberator: a way for workers to design their own forms of work and do it in new and innovative ways. Finland's education system is gradually shifting into the role of preparing learners to exercise that kind of autonomy, enabling all Finns to harness collective intelligence to solve the problems of the future. Singapore is an education system already responding to the potential of AI as a concrete tool to further refine its already-world-class knowledge economy. Singapore is exploring how AI can

better facilitate the student-centered and values-based learning experiences that are Singapore's hallmark.

In the Anglo-Saxon tradition, where deep divisions in society and in education policy are worsening, some scholars are responding to the challenges of the future by advocating "an old vision for new times." They argue that the purpose of education should be helping learners engage in purposeful activities, contemplation, and cultivate an "awe in human existence." Yet Stevenson acknowledged that this expanded goal for education may have limited use beyond the United States and the United Kingdom, and asking teachers to embrace such a radically different view of education is a very tall order.

Fourth Policy Dialogue: What a Changing Future Means for the Design of Innovative Learning Environments Estonia (host), Conducted Virtually, May 2020

In the fourth meeting, the first to be affected by the coronavirus pandemic, participants reflected on how their jurisdictions were adapting to distance learning environments, discussed how teachers were responding to the need to teach in these environments, explored implications from the OECD's Innovative Learning Environments Project, and reflected on questions and issues raised in another discussion paper from NCEE's Marc Tucker.

Although the meeting was conducted virtually, Estonia served as the host jurisdiction. Mart Laidmets, Secretary-General of the Ministry of Education of Estonia, welcomed participants as the meeting's official host. He reflected that one advantage of the current situation was Estonia could experiment with the personalized learning pathways promised by the country's 2035 Strategy. With more than 99 percent of students participating in distance learning, there were more opportunities to test out assumptions about virtual and blended pathways more than ever before.

Estonia led participants in an in-depth discussion of their future strategy and the implications of the pandemic. These were facilitated by Estonia 2035 working group leads Marju Lauristin and Raul Eamets as well as Heli Auri-Chabilan, representing HITSA, a public-private foundation formed to support the use of technology in schools. Aru-Chabilan argued that personalized learning pathways were the most important new concept in the 2035 Strategy, but she stressed that schools will need support in providing widespread, high-quality, and equitable online opportunities. While Estonia has developed the national infrastructure and tools for digital learning over many years, educators still need time and support to facilitate digital learning at scale. She also suggested that self-directed learning requires careful learning design and schools need

support to share their experiences, especially in thinking through how to reconceptualize teachers' roles. Distance learning has created the potential for more teacher leadership opportunities, as teachers take on more autonomous responsibility for guiding students' learning. Digital platforms need to be able to disseminate information about individual learner's learning pathways, new and innovative teaching practices, and new ways of organizing teachers' work to promote more teacher leadership. That information needs to be accessible and navigable to everyone in the system. Data governance and learning analytics are essential policy levers in this process.

Eamets discussed several issues that policymakers in Estonia still have not fully resolved in their design for a future system of education. Although Estonia is committed to having "no dead ends" for any student, in the current system students choose vocational secondary schools – and thereby limit their higher education options – very early. Eamets also discussed what he sees as a need to consolidate higher education institutions and dramatically increase Estonia's public investment in R&D. He suggested that centrally managing secondary education through the national government would help accelerate these changes, which would otherwise only happen after a large, and painstaking, shift in public support. Aru-Chabilan agreed that maintaining momentum at the national level was crucial but argued that many decisions were best left to localities, including those related to implementation of curriculum and strategies for supporting struggling learners.

OECD Perspectives

OECD's Andreas Schleicher began with the observation that the coronavirus crisis provoked a debate about curriculum priorities: should we refocus on the "essentials" or emphasize social and emotional skills? Changing curriculum priorities, combined with the need to be adept at technology, has led to a significant need to develop "just-in-time" resources for teacher professional learning. Schleicher noted that currently, deep levels of professional collaboration— where pedagogical innovations are born— are still uncommon. In his view, the goal should be to raise the productivity of systems through innovation so that more learning happens in the same amount of time. This will require that teachers be given much more time for professional collaboration.

OECD's Head of the Innovation and Measuring Progress Division Dirk Van Damme and Michael Stevenson described the Innovative Learning Environments (ILE) project started by David Istance, senior analyst at the OECD's CERI, in 2008. This project catalogued and analyzed innovations in teaching and learning in classrooms across OECD countries, and distilled lessons learned from these innovative practices for policymakers and educators into seven principles, such as "being highly attuned to learners' motivation" and "operating with clarity of expectations . . . [with] formative feedback to

support learning" and three areas of innovation, including "opening up to partnerships". Van Damme noted that the work was grounded in social constructivism, which was very popular a decade ago but increasingly falling out of favor, but the principles and areas of innovation were still very relevant today.

Stevenson reflected on the value of problem-solving, ethical decision-making, the ability to transfer what we know creatively to new situations, and human flourishing in an AI world. He compared the ILE work to a publication in the learning science, Stanislas Dehaene's *How We Learn*. This popular book argues that the propositions which underpin machine learning also apply to the brain. According to Dehaene, active learning involves four sequential brain processes: attention; active engagement; error feedback; and consolidation. Stevenson saw education technology as key in supporting active learning by providing automatic feedback and guidance, in addition to exploratory learning applications that can guide independent thinking. Nevertheless, Stevenson cautioned that education technology would face challenges in fully incorporating experiential learning and developing the social dimension of learning. He concluded by questioning how an emphasis on human flourishing might affect the teaching profession, and how policymakers can ensure that private technology companies do not stand in the way of equitable and inclusive education.

Discussion: Issues Facing the Teaching Profession

Participants reflected that the suddenness of the challenge teachers were facing in adapting to distance learning environments had stunned everyone. Architects of some of the jurisdictions' most forward-thinking strategies noted wryly that when they unveiled their vision of the future of learning a year ago, many thought it was too far off and too abstract to be useful. But suddenly, today, the future they thought was years away is here.

Yet jurisdictions also discussed "the opportunity of a crisis." They noted that they have opportunities to: collaborate globally to solve many challenges; better leverage philanthropy and community resources; focus more on STEM; rethink the role of teachers as designers of learning; prioritize students' intrinsic motivation and capacity for self-guided learning; better serve students with social anxiety who do not thrive in school; and build stronger connections with parents.

Many jurisdictions noted that they had advantages that made them better prepared to handle the transition to distance learning: strong technology infrastructure; trust in the education technology sector; extensive professional learning and collaborative opportunities for teachers to work on new applications of education technology; existing

e-learning days on the calendar for students to adapt to learning in the home; and strong digital learning materials aligned to a core curriculum. Many were seeing students participating in digital learning at rates of 95 percent or higher, and student, teacher and parent satisfaction rates at about 70 percent. Many expected that going forward, schools would do more to promote student motivation and engagement by incorporating time management and other independent learning skills as part of the curriculum.

In a preview of the next dialogue, jurisdictions also reflected on challenges facing the teaching profession now and in the future. Issues that came up included: teacher shortages; the difficulty of building a "case for change" in systems that are already high-performing; getting teachers to take charge of their own professional learning; helping teachers to manage their time, and especially, to best maximize their collaborative professional learning time, during distance learning; and how to get uptake on new technologies and teaching strategies when teachers already feel overburdened.

Reflections from NCEE's Marc Tucker

Marc Tucker then shared his latest thinking on the challenges ahead, which he outlined in a discussion paper for the meeting. He opened his remarks by acknowledging that there is a wide range of plausible views for long-term AI future, encompassing evolutionary and revolutionary paths forward. Instead of trying to resolve these different visions, he acknowledged that it is possible to plan for a plausible range of possibilities, and consider strategies for all. Tucker argued that if we plan for a radically different future, we could undermine support for existing systems that are performing very well, and that we need to be open to the possibility that the systems performing best now may be poorly adapted for a new environment. He offered an analysis of how each jurisdiction is preparing for the future now, but also argued that systems in the best position to respond to an uncertain future may be those designed from scratch by multi-national, multi-disciplinary teams working in parallel to the current systems. Tucker asked the group for their reactions.

Some noted that while Tucker posed the right question, they had no easy answer to the challenge of designing a new system from scratch. This presents a challenge for Tucker's attempt to lay out principles for a way forward. Some wanted more discussion about the catalyst for change, feeling that it might be broader than just AI. At the very least, they felt AI was an "invisible threat" that was hard to build a call to action around. Others wondered where the impetus for revolution is going to originate: can policymakers around the table expect to drive or shape it or will it be driven entirely by outside forces?

Fifth Policy Dialogue:
What a Changing Future Means for the Teaching Profession
Singapore (host), Conducted Virtually, November 2020

Singapore hosted the November meeting virtually via Zoom due to the ongoing coronavirus pandemic. The meeting focused on what the changing future means for the teaching profession. It included: a presentation from host country Singapore; a presentation from the OECD on competences for human flourishing; a roundtable discussion on the future of the profession; and a discussion of what four proposed scenarios for the future of education might mean for the profession.

As the host, Singapore presented its SkillsFuture Strategy, which lays out its vision for the future of lifelong learning. The Strategy builds on the idea that all citizens should be lifelong learners to ensure they are equipped to shift to other jobs as the economy changes. The initial ideas underpinning SkillsFuture trace back to 1979, when the Skills Development Fund was established. In the early 2000s, when the Ministry established the Singapore Workforce Development Agency and Singapore Workforce Skills Qualifications framework to monitor and promote continued education. The "SkillsFuture Movement" has existed since 2014, with the goal for learners to take ownership of their own learning. Key initiatives that have emerged since 2014 include work-study programs, SkillsFuture Credit, and various training programs for workers to upgrade their skillsets. Over the next five years, the government is planning a number of refinements. The first is to enhance the role of enterprises, being the key vehicle for economic transformation. The second is to further enable individuals to pursue their own learning, including through expanding the SkillsFuture Credit. The third is to prioritize skills upgrading for mid-career workers to ensure people in their 40s and 50s remain economically competitive through career transition programs, train-and-place programs, and more financial support.

OECD Perspectives

OECD's Michael Stevenson argued that in addition to the application of AI to education technology, AI will affect education by influencing all three spheres of human life: the economic, civic, and personal. Stevenson said that education in an AI world should ensure that humans flourish. He posited while many philosophers have seen human flourishing as the purpose of existence, there was new and emerging recognition that the definition of human flourishing should include not only the personal good but also the collective good. This is especially true given current global issues such as climate change, social justice, and biotechnology.

In Stevenson's definition, well-being is not sufficient to achieve human flourishing. He argued there are three key dimensions associated with flourishing: future readiness for whatever may come in our uncertain global future; futures literacy as a toolkit for considering the possibilities of the future; and awareness-based systems thinking, which links self-change with systems-change. Stevenson also noted that there are competencies that humans have but machines do not that go beyond the OECD's 2030 Learning Framework. These include adaptive expertise, or the ability to address an ill-defined, open-ended problem, which is critical to the professional and personal sphere, and ethical decision-making, which plays a large role in the personal and civic sphere.

Following this presentation, OECD's Dirk Van Damme was asked to respond. He noted that human flourishing was a deep and encompassing framework for thinking about learning and showed promise. But he said the real question is whether AI will require us to just add to the set of competencies and values we currently require or if it will broaden or change our existing ones. For example, what kind of knowledge is needed in an age with internet?

The Future of the Teaching Profession

Individual jurisdictions then outlined their plans for the future of the profession. The participants discussed how the pandemic confirmed the integral role of educators in schooling and the need to strengthen teacher capacity to meet student needs now and in the future. Finland suggested that there are a range of new competencies that teachers will need for the future, including being learning guides, innovators in the use of technology, and supporters of whole child development. Singapore's perspective is that teachers need to embody the competencies they want for their students. It also detailed how it plans to shift its professional learning system to help develop those competencies. There was some debate about whether these visions for the future of the education profession were truly transformative or were depicting a vision for the best version of educators in the current system.

Hong Kong outlined the professional roles of teachers and principals, which were created by the Committee on the Identity of Teachers. Teachers are caring cultivators, inspiring co-constructors, and committed role models. Principals are ethical enablers, versatile architects, and visionary "edu-preneurs". In Hong Kong, teacher professional development is school-based, but schools use this framework to inform their offerings. Estonia said they had focused on three reform directions for educators. First, it changed educator occupation standards to be more aligned with labor market needs. Second, it developed a competence model for teacher quality, including how teachers should be self-aware, support student progress, be self-directed learners, be cooperative and

collaborative team-members, and support the individual needs of each student. Third, Estonia is thinking about how to reshape the teaching profession to attract strong candidates given the increasing teacher shortage they face.

Four OECD Scenarios on the Future of Schooling

OECD's Tracey Burns and Marc Fuster, both with CERI, joined this meeting to present four scenarios for the future of schooling. The goal was to spark broader discussions about how to prepare for the uncertainty of the future. The first scenario is "schooling extended", which is a continuation of the current model but with added influence of technology and global collaboration. The second scenario is "education outsourced," in which education providers become more privatized and diverse, with technology as the key driver. The third is "schools as learning hubs" where schools are regularly changing, evolving and experimenting, with open doors to the community and learning that takes place "anytime, anywhere." Finally, the fourth scenario is "learn-as-you-go," where there is no distinction between formal and informal learning.

The participants debated the benefits, risks, and challenges of each scenario. While they focused on the risks of each, such as concern about equity and the increased power and influence of big data, they agreed that these scenarios are powerful tools to invite discussion around transformative change. Burns reflected that to better understand the balance between transformation and modernization, we must first have a deeper understanding of the present. The participants also suggested that a convergence of these scenarios is the most likely future outcome.

Finally, NCEE's Marc Tucker suggested that there are two possible strategies to enable all citizens to acquire the knowledge, skills, and attitudes needed for success in a fast-changing future. First, there is the optimization strategy, which focuses on identifying current best practices globally and formulating them into a coherent design for an education system which is far more effective, efficient and equitable. Second, there is the transformation strategy which draws on what we know about how students learn and harnesses the power of new technologies to completely redesign our education systems. Tucker presented his views on the optimization of two key components of the learning system: teachers and learning systems. In his view, some core characteristics of an optimal teaching and learning system include: teaching a national curriculum for all students; incorporating best practices from learning sciences into instruction; diagnosing learning challenges early and accurately; providing time for collaboration between educators; and advancement for teachers through career ladders.

Sixth Policy Dialogue:
Getting from Here to There: How to Move Forward to Build New Systems
United States (host), Conducted Virtually, May 2021

In this final meeting, the HPST group reviewed themes discussed throughout prior meetings; discussed each jurisdiction's future reform strategies; heard from a working group focused on the governance, system design, and metrics for a proposed future-ready system that promotes human flourishing; considered Marc Tucker's observations about potential future directions for curriculum, governance and international collaboration; and reviewed preliminary findings from the comparative study of HPST member learning systems being conducted by NCEE and ACER.

Discussion 1: Jurisdictions' Plans for the Future

In the first discussion, participants compared and contrasted their respective strategic plans for their education systems over the next several years. These plans are summarized in Appendix A.

British Columbia explained that moving forward from the pandemic, they are rethinking every part of their system. This includes investing more in early childhood education and care; updating performance standards in literacy, numeracy, and other core competencies so they align with their new curriculum; and providing teachers with tools to clarify the learning progressions in each area and assess students' progress. They noted that AI, globalization, and politics likely had more of an effect on British Columbia's reform agenda than did the coronavirus pandemic to date.

In Hong Kong, task forces reviewed components of their current education system, including curricula and the professional development of teachers, and proposed ways of sustaining and deepening the reforms in these areas. While the pandemic brought more attention to wellbeing and gaps in access to digital tools, Hong Kong was already working to promote whole-person development, equity, values education, ways to address learner diversity, and expanding applied learning throughout their learning system.

Although Singapore had already planned to provide personal learning devices for every student, the pandemic accelerated the timeline. In addition, as a result of the pandemic, online learning has become a regular feature of the curriculum of secondary and post-secondary school. If and how to introduce it into primary schools is being considered. For adults, Singapore is already providing additional credits towards classes and workforce credentials through Singapore's SkillsFuture platform. An ongoing challenge is to narrow their performance gap between students from higher-SES homes and those

from more vulnerable home backgrounds by providing greater support to the latter group, to ensure that education remains a social lever.

In Estonia, the pandemic did not change the country's long-term vision for education. It is still to create a learner-centered, rich learning environment where educational opportunities are diverse and accessible. But it did make substantial changes to its strategies, priorities, and timelines. Going forward, Estonia wants to better align the education system with the labor market; encourage more collaboration between vocational and general secondary schools; invest in modern study materials for both general and vocational schools; and further develop work-based learning and training opportunities.

Similarly, Finland saw the pandemic take long-standing goals and accelerate their urgency and timeline. Finland has extended compulsory learning by two years until students age 18. In addition, it will improve learning supports using digital tools, virtual learning environments, and personalized learning, and will strengthen its emphasis on student wellbeing. These goals were already on the National Agency for Education's agenda before the pandemic. They are part of Finland's implementation of their Education 2030 vision and were developed based on interviews and workshops with stakeholders such as teachers, parents, and local authorities. But they are now ever-more urgent. Finland's current plan is to promote equality and equity by balancing technological development with social development. This vision requires community-led development, innovative leadership, ongoing collaboration with stakeholders, and a focus on students' wellbeing in addition to academic achievement.

Discussion 2: Report from the Working Group on System Design for Human Flourishing

OECD's Michael Stevenson explained that a working group was formed to consider the feasibility and opportunities for designing education systems to promote human flourishing. The group first assessed the global technology landscape by considering HolonIQ's five scenarios for education in 2030 and the four OECD scenarios on the future of schooling. They then came up with three potential trajectories for the future. These were: 1) governments continue to provide schooling while working within an ecosystem; 2) governments regulate schooling, but the market provides education materials; and 3) governments cede provision of education and educational materials to the market.

In discussing these trajectories, the group made some observations. They conceded that the market has more players and can advance public purposes. But they identified risks of ceding control to the market: fragmentation, incoherence, and difficulty of adaptation. The group acknowledged that governments already have the public's trust; however,

they suggested that trust has eroded in many countries due to how governments handled the pandemic. One compromise discussed was pluralism which would have the government identify education goals and regulate the market while working with the education profession at all levels. They explored how technology can personalize learning for each student but alongside that prioritize collaboration and relationships with teachers and peers to develop social and emotional skills. Effectively overseeing data systems that shape personalized learning experiences requires the government to be creative. Public-private partnerships are helpful in achieving this goal.

Singapore reflected that the discussion about the potential role of the private sector in education was worthy of consideration, but they doubted whether a stronger involvement of the private sector would necessarily lead to better educational outcomes. In Singapore, for example, preschool education is dominated by the private sector which has led to high fees, fragmentation, and inequitable outcomes. Nevertheless, Singapore saw the merits of nudging the system towards stronger private-public partnerships in areas where the private sector has expertise that educators lack. But Finland argued that some kind of new social contract is needed if the market is involved in education. They said it is helpful to have the "north star," human flourishing, as a guide, as national education strategies may not be effective anymore. Hong Kong explained how in their system, private companies now approach schools from a social responsibility angle rather than as a marketing one. This is a new and promising development. Still, comprehensive frameworks will be needed to ensure the private sector's involvement in education is ultimately supporting the government's goals for education.

OECD's Andreas Schleicher said the working group's analysis helped the HPST group consider diverging philosophies in education systems. He suggested that human flourishing is the most radical idea the group has contemplated. He also agreed with Finland that a new social contract might be needed if the education system might involve stakeholders outside of government. Finally, he noted Singapore's suggestion that these stakeholders may play a key role in "nudging" the system in new directions.

Discussion 3: Report from the Working Group on Metrics to Measure Human Flourishing

The second part of the Working Group's conversation focused on if and how to develop metrics and assessments to measure human flourishing. Michael Stevenson explained the first issue the group discussed was the feasibility of assessing students in three proposed competencies — adaptive problem-solving expertise, ethical decision making, and aesthetic perception. PISA has already begun to assess students in adaptive problem solving. One approach to assessing ethical decision making is having students reason through a given situation; trained experts would then score responses against

sample responses to determine whether the student exhibited humility, an ability to balance multiple perspectives, and an understanding of conflict resolution and compromise. The group discussed how to make this kind of assessment fair for all students and suggested formative assessments to help to ensure students are well-prepared which would make the assessment less stressful for students.

Stevenson proposed a comprehensive assessment framework based on principled assessment design, embedded assessment, and recognition of learning. Principled assessment design requires asking which competencies should be assessed, which features of those competencies are observable, what rubrics can be designed to measure them, and what tasks will be measured on those rubrics. Embedded assessment allows teachers to have real-time access to student data so they can adjust their teaching accordingly. Recognition of prior learning allows assessment results to create a more accurate picture of learners, which can help educators, employers, and policymakers make informed decisions.

In response, the OECD's Tracey Burns said it may not be possible to develop a normative measure of the three proposed competencies as they depend heavily on the learners' context. Burns also suggested that education reform could consider what parts of the old system work well and layer on new components to address shortfalls rather than implement something entirely new. She pointed out the difference between learning, which is ongoing, and education, which only takes place in a formal learning environment. Based on these definitions, she argued that Stevenson was proposing and testing measures of learning, not education outcomes.

This comment led to discussion among the HPST members about whether countries could ever agree on an overall education destination and strategy as a basis for comparative measurement. There was concern that input measures may be too crude or too complex. British Columbia felt that changes to assessment should be incremental, as a foundation of literacy and numeracy is necessary to scaffold additional competencies. They also thought that other kinds of data, like transit usage, expenditures, nutritional intake, and health outcomes, could create a more complete picture of students to better inform instruction, supports, and policy decisions. But the collection of this data also raises privacy concerns. Estonia agreed about the value of incorporating different data sources and compared this to medical data used to save lives; education could use this data to make teaching and learning more efficient. Finland shared their cautious attitude towards assessment, as they do not want to value only things that are easy to measure. However, they liked the idea of measuring competencies and attributes (such as resilience) at both individual and system levels. Singapore also expressed interest in

assessing non-academic outcomes and assessing learning outside of school. They are currently studying what additional data on students' behaviors (for example, log data like the amount of time they spend reading a single page or working on an online task) can tell educators and policymakers about engagement, motivation, stress or boredom.

Discussion 4: Discussion of Curriculum, Governance and International Collaboration in the Future

NCEE's Marc Tucker then led a conversation with participants around three key areas for consideration in the future: curriculum, governance, and international collaboration. This was structured on a discussion paper he wrote for the meeting, which was the basis for his report titled *The World's Best Performing Education Systems: What Would it Take for Them to Adapt to What Might be a Very Different Future* (see Appendix C).

Tucker first briefly summarized the themes in his paper, which focuses on how the global economy has changed dramatically and his observations about the challenges facing high-performing education systems. He said advanced industrial democracies must now provide a kind and quality of education that we have provided only to our elites to all our students at a cost no greater than the cost we are now incurring. He noted that there is broad agreement on an expanded range of outcomes systems want for their students — deep disciplinary knowledge, the ability to apply that knowledge creatively and effectively, social and emotional attributes that enable students to work together and to be successful independently as well as values and skills like empathy, ethics, adaptability and others — but said it is a challenge to construct a curriculum that can address all of these goals in the time that is available to teachers and their students and to do it in a way that is not superficial. Tucker also said systems need to figure out how to redesign education systems so that initial schooling is the front end to highly integrated and yet very flexible lifelong learning systems. He closed with proposals for greatly increasing investment in cognitive science and the neural sciences as well as creating one or more international laboratories patterned on the CERN project for international collaboration on nuclear research but in this case focused on creating advanced forms of dynamic digital environments crafted to enhance learning.

Tucker then facilitated a discussion of these issues. He first asked British Columbia to comment on their new curriculum. They reflected that while they were proud of their progressive curriculum, they worried that more investment was needed in policies to support it, such as high-quality teacher training and development of learning materials and tools. Tucker asked Estonia about their approach to governing education, which has included a set of independent agencies linked to the Ministry with responsibility for implementation of specific areas of policy. They said while this has been useful to

support implementation, having too many independent agencies (i.e., Innove for curriculum development, HITSA for IT) made it difficult to manage. They have now merged these agencies into one agency — the Education and Youth Authority — which allows them to look at the larger picture of a student's entire lifetime of learning, including adult education, to create, implement, and measure broad education goals.

Finally, Tucker and OECD's Andreas Schleicher discussed the possibilities for international collaboration going forward. Schleicher stressed the importance of international collaboration and said that the major challenge ahead is clear: "educating the many." He thinks it is unlikely that incremental change will be enough to accomplish this goal, however. Education is often seen as a national issue, but the coronavirus pandemic has raised the value of learning together and taking an international approach. He suggested we need a new commitment to collaborate effectively in the field of education and asked how we can create a global ethic that also works at the local level. Schleicher expressed doubts that the international community could effectively co-create new systems, but said the international collaboration seen during the pandemic shows it may be possible.

Discussion 4: Update on the Comparative Learning System Study

Finally, Geoff Masters, CEO of ACER and lead researcher of the comparative learning systems study, described his initial findings about the set of top-performing learning systems in focus. He explained that there was a high level of consensus across the systems about the purposes of learning, or the knowledge, competencies and attributes each expects students to learn. He also said there was a high degree of consistency in the conditions the jurisdictions are trying to create for learning. These systems organize teaching and learning to be student-centered, equitable, meaningful, integrated, diversified, lifelong, digital and social. The learning systems that were constructed to reach these goals have common key components: a quality curriculum, informative assessment processes, a supportive learning ecosystem, comprehensive student support, strong leadership of learning, and highly effective teaching. Masters said that these systems have, over time, become more adaptive for students. They have also developed similar reform directions to move toward their broad goals, but have different historical and cultural contexts, are at different points in implementing them, and are proceeding at different paces. The purpose of the study, he explained, is to identify these similarities and differences and what insights can be drawn from them to help other systems improve going forward.

III. Conclusion: Key Issues in Designing Education Systems for the Future

The first phase of the HPST project was a fruitful three-year partnership between NCEE, OECD, and the Directors-General of five of the highest performing jurisdictions on the OECD's PISA assessment: British Columbia, Canada; Estonia; Finland; Hong Kong, China; and Singapore.

This report summarizes each of the policy dialogues of the HPST project to capture the themes of the discussion. The report can hopefully serve as a record for participants, an introduction to newcomers to later phases of HPST, and a report to the public on how the world's leading education systems are thinking about complicated and uncertain questions related to the future of our schools, economies, civil societies, and planet.

There were some commonalities and through-lines across each meeting. Every dialogue included a presentation from a host jurisdiction on a recent reform or initiative that was pertinent to thinking about the future of education. British Columbia described how it was rethinking curriculum and assessment to more authentically measure students' competencies at graduation. Finland discussed building new digital platforms to create personalized profiles and plot learning pathways for students and adult learners. Hong Kong described how China was engaged in creating new virtual learning environments. Estonia discussed the opportunities and challenges of capitalizing on the pandemic to test out new blended learning approaches. And Singapore outlined its decade-long strategy to build a stronger lifelong learning system that would prepare all citizens for work and life.

In addition, NCEE and OECD served as advisors, contributors, and commentators at every meeting. NCEE's CEO and Board Co-Chair Anthony Mackay facilitated every discussion. And former President and current Senior Fellow Marc Tucker drafted a series of iterative pieces laying out issues and raising key questions on the transformation of our education systems for a world transformed by intelligent machines. OECD's Director of Education and Skills Andreas Schleicher regularly offered reflections on the OECD's latest research into education, work, and life and its implications for policymakers. And the OECD's Michael Stevenson led discussions into the latest research on human flourishing, tested its propositions with participants, and proposed a set of competencies to measure it.

That said, this brief report cannot possibly do justice to the full complexity of the discussions. Because of the wide range of perspectives across participants, advisors,

and project staff, the project resulted in a number of contributions about education policy responses to the changing future.

Areas of High-Level Agreement

While the project did not result in consensus on commonly endorsed principles, there were some broad areas of agreement on where systems needed to go, as well as some shared recognition of the tensions and challenges that would need to be considered in a complex and uncertain future. In summary, the systems agreed on the following points at a very high level:

- Participating jurisdictions all described many of the same thorny challenges confronting them: globalization, the rise of artificial intelligence, widening inequality, simmering civic unrest, challenges to democratic norms and institutions, and, of course, a global pandemic.
- In the face of these challenges, systems require broader educational goals that serve political stability and social cohesion.
- Learning systems should be organized around principles consistent with the science of learning. Many education systems organized in the industrial era for mass production contain structures that are incongruent with what the science of learning suggests is best for learners. These include organizing learning by year, moving students along before ensuring that they are ready and have the support to succeed, and requiring students to learn a wide range of factual and procedural information at the expense of deeper learning.
- Learning systems need to focus on not only strengthening the conceptual understanding of the core disciplines for all students but also impart the skills and attributes encompassing what humans do best relative to machines. These include, but are not limited to, person-to-person interactions and interpersonal skills, synthesis, pattern recognition, moral reasoning, and creativity. These skills and attributes should be couched within disciplines because epistemic knowledge will be key.
- The breadth of knowledge, skills and competencies we want to impart cannot possibly be taught in 12 years of schooling. This has several implications. For one, current curricula are overcrowded and need to be pared back to enable deeper learning of core disciplinary concepts. For another, lifelong learning is becoming increasingly important to education systems.
- Technology carries enormous potential for redesigning education systems. It can facilitate more sophisticated diagnosis and differentiation, instill motivation and

create new forms of more engaging learning environments, and help design and organize learning pathways, including for lifelong learning. But technology also carries tremendous risks: the potential to exacerbate inequality, exploit students' data, promote rote learning, or alienate teachers or students. In addition, present-day conversations about the role of technology in learning have often focused on unhelpful tweaks to the current paradigm.

Issues and Challenges

Despite the amount of consensus among the five jurisdictions and many advisors around the HPST table, a number of debates and tensions remained unresolved. There were considerable differences in how participants saw the issues facing education systems; in the ways that education systems should frame their goals; and in the pace, sequencing and design of the strategies being shaped in each jurisdiction. These differences led to respectful and productive debates and revealed many possible pathways forward. Some open questions and ongoing challenges are sketched out below.

- Do AI and related technologies represent a surmountable disruption to economic models, an existential threat to humanity, or something in between?
- How broad and how deep do the goals of education need to be to grapple with a future that is complex and unknowable?
- All agree that education systems need to change, but should the pace of change be evolutionary or revolutionary? Incremental change risks systems being left behind in the dust. Transformative change risks alienating the public, losing sight of the goal, and failing to test and validate new practices in a disciplined way.
- Where should the impetus for change, whether evolutionary or revolutionary, originate? Can policymakers around the table expect to drive or shape it, or will it be driven entirely by public will? Does the impetus for change only come from a perceived crisis?
- Do we need to redefine what a high-performing system is? Are the metrics for high performance changing?
- How explicitly should policymakers sketch out the pathway forward?
- How much should experimentation within a common vision be encouraged, and under what conditions should teachers' autonomy be cultivated?
- To what extent is curriculum a promising policy lever for changing pedagogy? Under what conditions might assessment, professional accountability among teachers, professional learning, or other structures be just as useful?

- How should policymakers and educators take advantage of the potential of AI (to diagnose student learning, prescribe learning interventions, and create radically new forms of learning environments) while guarding against the dangers (data privacy and equity concerns) it naturally creates?
- Can the education technology marketplace offer equitable opportunities? How must policymakers regulate it, to ensure that technology is designed and used in ways that enhance learning, and to prevent private companies from standing in the way of equitable and inclusive education?

Far from being discouraged by these sticking points, we hope that some of these themes will serve as a starting point for future phases of work with the HPST and other education system leaders that seek to proactively plan for uncertain challenges and opportunities of the future.

Appendix A. Jurisdiction Future Plans

A key feature of high-performing systems is that they are continually reassessing their system, based on monitoring global and domestic economic and social context, data they collect on system effectiveness, and benchmarking of policy across the world. All of the HPST jurisdictions have developed plans and planning processes to redesign their systems for the future. Common threads across their plans for 2030 and beyond include:

- *Moving from prioritizing factual and procedural knowledge to an emphasis on deeper understanding of key concepts and competencies in their curricula*. The HPST jurisdictions believe that this range will better equip students to apply their knowledge to problems and to approach complex issues from multiple perspectives.
- *Building lifelong learning systems to enable all citizens to keep learning throughout their careers.* Jurisdictions have recognized that as the global economy changes rapidly so will the focus and nature of work. This means that there will be an increasing need for workers to continually update their skills to keep pace.
- *Creating flexibility in learning pathways.* The jurisdictions are both increasing options for students to switch between or combine courses from academic and vocational pathways at the secondary level and opening pathways from vocational programs pathways to academic postsecondary programs.
- *Adding academic rigor to vocational pathways and making academic pathways more applied.* Jurisdictions are adding foundational content to vocational programs and providing students in academic programs with opportunities to apply what they have learned in an effort to strengthen — and perhaps unify — both pathways. They are also creating new kinds of postsecondary options, like technical bachelor's degrees, that combine academic and vocational learning.
- *Rethinking assessment systems*. Jurisdictions are focused on ensuring that assessments measure what it is most important; provide useful information to system leaders, teachers, students, parents, postsecondary partners and employers; and lead to improved learning, not to sorting students for different pathways.
- *Redefining the role of teachers*. Jurisdictions see teachers' roles changing from explaining subject content to facilitating student learning across a wide range of knowledge and competencies. Teachers are also expected to be facile with technology as it helps them personalize learning for each student.

- *Recognizing the need to work with families and the broader community.* Jurisdictions have all made efforts to reach out to families before children start school and while they are in school to better coordinate supports and learning. In addition to parents, jurisdictions are recognizing the role of other institutions in the community in providing outside of school learning experiences for students.

British Columbia

The purpose of the British Columbia (B.C.) school system set in 1989 is to "enable learners to develop their individual potential and to acquire the knowledge, skills and attitudes needed to contribute to a healthy society and prosperous and sustainable economy." The guiding goal for the system is the "Educated Citizen," characterized as the intellectual, human and social, and career development of students.

In addition to these long-term goals, there are complementary shorter-term goals determined by government mandates. The province's current goals under its Service Plan for 2022/23 to 2024/25 are:

- All Students Become Educated Citizens
    a. Support Student-Centered Learning and Improve Equity of Outcomes
    b. Establish and Maintain High and Measurable Standards
    c. Enhance Student Preparedness for Their Future
- Learning Environments Foster Healthy and Effective Learning
    a. Implement High Yield Strategies to Support Student Growth and Achievement
    b. Support Student and Staff Well-Being
- Support families and social-emotional development of children 0-12 years of age through access to inclusive and affordable childcare
    a. Continue the development and implementation of a universal, inclusive childcare system

A major priority that permeates all of the Ministry's divisions are COVID management and recovery, including alignment with public health mandates in schools, issues management, and support to staff and students through the pandemic. Of note, BC is one of the few jurisdictions in the world to have kept in-person learning open throughout the COVID pandemic.

Some selected key strategies from these Service Plan goals include:

- In partnership with FNESC, First Nation rightsholders, Métis Nation BC and Inuit and sector partners, work to close the equity gap for First Nations, Métis, and Inuit learners through fully implementing the *Declaration on the Rights of Indigenous Peoples Act*, with specific attention to building system capacity and anti-racism. In addition, work with FNESC, First Nations and federal partners to implement the *BC Tripartite Education Agreement: Supporting First Nation Student Success*.
- Promote equity and address racism in the education system through the development and implementation of an anti-racism action plan with IBPOC (Indigenous, Black and People of Colour) partners.
- Modernize and improve online learning in BC by addressing issues of quality, equity, accountability and access for students and teachers, and promoting group interactions.
- Provide teachers and students with access to updated learning and teaching resources, including through the new Provincial Learning Management System, to support ongoing instruction and assessment across the redesigned K-12 curriculum.
- Analyze the effects of COVID-19 on learning and develop strategies to address gaps.
- Continue to implement the updated Graduation Program and monitor graduation rates to support student success.
- Conduct qualitative and quantitative research on key factors and considerations to support student success, with an emphasis on using evidence to guide decision-making.
- Engage school districts to review local policy, governance structures, data in the *How Are We Doing?* report and student experiences to address systemic barriers to educational achievement for First Nations, Métis, and Inuit learners through the Equity in Action strategy.
- Refresh the approach to continuous improvement/accountability across the education system by implementing the *Framework for Enhancing Student Learning* to ensure all students are successful and resources are being used effectively.
- Improve access to quality early learning opportunities for young children and support transitions into the K-12 education system.

- Implement the three elements of the Mental Health in Schools Strategy — Compassionate Systems Leadership, Capacity Building and Mental Health in the Classroom — to provide a vision and pathway for mental health in the BC K-12 education system.
- Work with the Ministry of Agriculture, Food and Fisheries to develop a plan which, if approved, will support local school meal programs in school districts, based on district data and priorities and integrating locally-grown food through Feed BC.
- Begin implementation of six new regional offices to support the transition and alignment of childcare service delivery under the Ministry of Education.
- Develop a comprehensive childcare funding model.
- Continue expansion of the $10/day ChildCareBC sites and develop a strategy to support sustainable and equitable growth of childcare spaces aligned with community need, including the before and after school spaces.

References:
2023/24 Ministry of Education Service Plan

Estonia

Estonia's vision of its education system for 2035 is one where:

- Learning opportunities are diverse and accessible, and the education system enables smooth transition between levels and types of education;
- There are competent and motivated teachers and school principals, a diverse and rich learning environment and learner centered education; and
- Learning options are responsive to the development needs of society and the labor market.

Estonia is also committed to research and action on how to cope with crises like the pandemic going forward.

Estonia's current strategies to build this system include:

Curriculum and assessment

- Modularizing the curriculum so that teachers can work with students who are struggling to master smaller elements,

- Developing diagnostics tests and feedback for teachers to use in core subject areas to help teachers better plan for individualized instruction,
- Developing tests of general competencies (learning to learn skills, social competence and self-management) and feedback for teachers to help teachers better support students' learning,
- Adding more physical movement during the school day, including movement during and between classes both in and out of doors, to help students learn better and have higher levels of well-being,
- Ensuring all learning materials and texts are available digitally and enhancing the digital competency of teachers, including piloting of a new digital competence self-assessment tool for teachers to use, and
- Building awareness and developing skills needed for a green economy and future.

Vocational and secondary education

- Creating regional vocational education and general secondary schools so that all students have access to a full range of opportunities and are prepared for higher education or the workplace,
- Linking academic and vocational secondary education, by providing opportunities for students to study in either program,
- Upgrading vocational education facilities and study materials, expanding opportunities for work based learning and better monitoring that vocational training meets workplace demand,
- Rethinking skills credentials to create skill profiles that describe a person's skills,
- Expanding advanced VET options to include both sub-degree and degree level, and
- Changing VET funding to be partially performance-based and to allow accredited schools flexibility to provide instruction in approved "curriculum group" areas.

Teacher Quality

- Expanding induction programs to prepare the increasing numbers of teachers entering the profession through alternative paths,
- Expanding professional learning for teachers, including providing individual coaching on request and a free helpline,

- Offering professional learning to school teams rather than school leaders, and
- Reducing teacher workload and supporting teacher mental health.

Entrepreneurship and ICT

- Promoting and expanding ICT education to develop broad expertise in this area which can fuel the economic growth of the country,
- Promoting entrepreneurship in schools and continued partnerships with the technology community to develop innovative tools and strategies to advance learning, and
- Promoting evidence-based school management and leadership.

Reference:
Education Strategy 2035

Finland

Finland aims to instill a passion for learning in its students and to create opportunities for each child and young person to fulfill their potential and build a good future for themselves and their community. Schools should be "hubs of well-being and support" for students where teachers, families and allied professionals work together to ensure that all children have the support they need to be successful.

Finland has set broad goals for its education system by 2040 which include

- higher levels of education and competence among the population at all levels,
- smaller gaps in learning outcomes and more equity of learning opportunities,
- wellbeing for all children and young people, and
- increased attractiveness of Finland as a place to study, conduct research and invest for the global community.

Finland proposes to reach these goals through a comprehensive set of strategies:

Funding

- "Redirecting" funds saved from a declining student population to strengthen early childhood, primary and secondary education; create needs-based funding for students; and fund an expanded system with 13 years of free compulsory school, including two years of pre-school and secondary school extending to age 18.

Equity

- Narrowing disparities in learning outcomes by fostering wellbeing for all children, in partnership with school communities.
- Improving educational opportunities for students with an immigrant background and those with disabilities.

Primary and Secondary School

- Strengthening children's literacy and numeracy skills and critical thinking in primary and lower secondary schools.
- Increasing cooperation and pathways between general and vocational education and training, and increase general knowledge and basic skills in vocational education to ensure that students have access to further studies and lifelong learning.
- Using new technologies to build personalized study paths in upper secondary school.

Teacher Capacity

- Improving the knowledge base of teachers and early childhood educators and ensure that their education is based on the best research about learning.
- Increasing the number of study places at the universities to train more early childhood education and care teachers to ensure qualified teachers for all children in early learning.

Lifelong Learning

- Expanding tertiary education programs so that half of young adults can attain a higher education degree by 2030.
- Increasing enrollment of foreign students in higher education institutions with the goal of offering them employment in Finland after graduation to meet the workforce needs in Finland's economy.
- Increasing public investment in research so that Finland will be an "inspiring place" to carry out research, will attract top talent from around the world, and will encourage private sector investment in research and development.

Reference:
Education Policy Report 2040

Hong Kong

Hong Kong's vision for the future of its education system rests on six broad goals:

- Reinforce the importance of whole person development
- Give higher priority to values education
- Create space for and cater to learner diversity
- Promote applied learning opportunities for students
- Enhance flexibility in university admissions
- Strengthen STEM education in primary and secondary schools

Hong Kong intends to move forward on these goals through a broad range of strategies:

- Rethinking the content of core subjects in the senior secondary curriculum so as to open space for more electives, lifewide learning and applied learning; broaden the curriculum; to lessen the assessment burden on students when possible; and strengthen STEM education. Specific plans include:
    a. shifting emphasis in Chinese curriculum and assessment to include more on reading, speaking and listening and less on memorizing grammar;
    b. reducing the writing requirements in English;
    c. replacing Liberal Studies with Citizenship and Social Development which will reduce the time in half and shifting the assessment to be pass/fail.
    d. encouraging more students to take the extended math option, as part of a focus on STEM preparation.
- Enhance moral and civic education by adding law abidingness, empathy and understanding of the national security law to the curriculum. These additions are meant to help students "see both sides of issues" and to understand their role as a citizen with responsibility for their community and for the common good.
- Shift university admissions to look at students more holistically and consider not only test scores and academic achievement on core subjects in admissions decisions but also experiences in applied subjects and lifewide learning and leadership skills.

- Enhance professional learning of teachers by encouraging continuous learning, promoting a career ladder that provides career progression opportunities and providing opportunities to recognize outstanding teacher and school leaders.
- Strengthen vocational education and recruit more students to participate in it by supporting closer coordination between school and industry partners, creating more flexible and personalized pathways for students, and expanding opportunities for work-based learning.
- Expand the higher education system by helping to sustain an emerging private sector. An expanded sector will provide a diversity of pathways for students to meet their interests and goals and will help reduce the competition for entry to the public higher education institutions.
- Supporting expanded home-school partnerships to support student learning and development which include the development of a parent education curriculum for schools, training for schools on home-school communication and cooperation and development of a learning platform for parents with organized resources on parenting and child development.
- Improve school management by reducing the administrative burden on schools and encouraging more collaboration among schools to identify and share best practices. In addition to streamlining the workload for schools, the government will provide training and supports.
- Increasing research and development investments to “nurture, retain and expand” local research talent. The government will support new fellowships and encourage more interdisciplinary research.
- Develop more technologically enhanced designs for learning and enhance the digital literacy of both students and teachers and ensure that there is equitable access to these.
- Pay more attention to both academic and affective well-being of students.
- Maintain the public and non-public partnership in education.

Reference:

Task Force on the Review of the School Curriculum (2018-2020)

Singapore

Singapore's current reform agenda for education builds on the Learning for Life movement which was first announced in 2018. The goal is to prepare students to be "future ready" and to provide them with "multiple pathways and opportunities" and ensure that education is an "uplifting force" for all students. The Ministry of Education is partnering with other government agencies as well as community and private sector partners to reach its goals.

Singapore's evolving strategy to reach these goals currently includes:

Curriculum and assessment

- Further develop the Ministry of Education's online learning platform, the Singapore Student Learning Space (SLS), through the addition of AI tools, such as AI enabled marking and an AI learning companion to motivate and engage students during learning and customize learning activities.
- Make "blended learning"—a mix of in-person and virtual learning—a key feature of secondary and pre-university students' schooling experience, to help students become self-directed, passionate and lifelong learners. To support blended learning and enhance students' digital literacy, each secondary school student is equipped with a personal learning device.
- Shift towards subject-based banding in primary and secondary school as a way to make learning more flexible and more personalized for each student. This would move away from providing different options at course level towards a more modularized system, where students exercise options at subject level.
- Enhance Character and Citizenship curriculum to anchor students in a strong foundation of moral values, good character and resilience and expand mental health and cyber wellness education in primary and secondary schools as well as post-secondary institutions.
- Reduce overemphasis on test-taking and examinations, to instill greater joy of learning in students.
- Expand interdisciplinary learning in higher education, as the challenges of tomorrow require expertise that transcends disciplinary boundaries. Higher education institutions are reviewing their programs and progressively implementing these reforms.

Supporting teachers

- Focus professional development for teachers on the goals of nurturing future ready learners and encouraging lifelong learning. Priorities will be to support teacher growth in assessment literacy, differentiated instruction, inquiry-based learning, e-pedagogy, character and citizenship education and supporting students with special needs.

Vocational and lifelong learning

- Expanding the education system to make formal education and adult learning a seamless lifelong journey. Launched in 2014, the Skills Future initiative has begun building such a system, offering all Singaporeans learning credits and subsidizing employers to offer work placements. The vouchers can be used for all kinds of learning, as the aim is to build a lifelong learning culture.
- Strengthen linkages to industry to ensure vocational curricula meets their evolving needs and scale up opportunities to learn in work settings.
- Expand programming for mid-career workers and career transition programs.

Supporting vulnerable students and their families

- Expand the UPLIFT program and activities which focus on improving motivation, reducing absenteeism/dropping out, and engaging families of vulnerable students. Activities include recruiting community volunteers to provide support as well as creating care centers and supports in schools for vulnerable students.

Reference:

Learning for Life: Equipping Ourselves for a Changing World

Appendix B: Background Readings

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Appendix C: HPST Materials

Documents

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Stevenson, Michael. *What People Should Learn for an AI World*. (November 2019)

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Stevenson, Michael. *Education for Human Flourishing and Assessment: An OECD Perspective*. (May 2021)

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NCEE Summaries

NCEE: HPST Jurisdictions AI Plans and Summaries (November 2019)

NCEE: The Implications of AI for the Future of Education: Key Groups and their Contributions (April 2019)

NCEE: The Impact of Artificial Intelligence on Society, Education and the Economy Selected Reading List for HPST Jurisdictions (April 2019)

Appendix D: Partner, Staff, and Guest Experts

Partners

British Columbia

Ministry of Education:

- Scott MacDonald, Deputy Minister
- Keith Godin, Assistant Deputy Minister

Estonia

Ministry of Education and Research:

- Mart Laidmets, Director General
- Kristi Vintner-Nemvalts, Deputy Secretary General for General Education, Youth Affairs and Language Policy
- Robert Lippin, Deputy Secretary General for Adult and Secondary Education
- Maie Kitsing, Advisor, External Evaluation

Finland

National Agency for Education:

- Olli-Pekka Heinonen, Director General
- Anneli Rautiainen, Head of Innovation Unit
- Juhi Helminen, Head of Impact Program
- Erja Vitikka, Counselor of Education

Hong Kong

University of Hong Kong:

- Kai-ming Cheng, Emeritus Professor
- Catherine Chan, Professor of Practice, Faculty of Education

Education Development Bureau:

- Christine Choi, Under Secretary for Education
- Jeff Sze, Political Assistant to Secretary for Education

Singapore

Ministry of Education:

Chern-Wei Sng, Deputy Director General

Chia Hai Siang, Senior Specialist, Technology for Learning

Lin Huiyuan, Senior Research Specialist, International Benchmarking and Research

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Nathan Driskell, Associate Director of Policy Development and Analysis

OECD

Andreas Schleicher, Director of Education and Skills

Michael Stevenson, Advisor

Guest Experts

Alan Adojaan, Board Member, RobLab, Estonia

Pekka Ala-Pietila, Chair of Finland's AI Programme and the EU's AI High Level Expert Group

Mart Aro, Co-founder Dream Apply and founder of Ed Tech Forum, Estonia

Heli Aru-Chabilan, Chair, HITSA, Estonia

Yuri Belfani, Directorate of Education and Skills, OECD

Tracey Burns, CERI, OECD

Chua-Lim Yen Ching, Deputy Director General of Education for Professional Development, Singapore Ministry of Education

Chng Kai Fong, Managing Director, Economic Development Board, Singapore

Marc Fuster, CERI, OECD

Marten Kaevats, National Digital Advisor, Government of Estonia

NG Tai Kai, Hong Kong Academy of Gifted Education

Marju Lauristin and Raul Eamets, leads of Social Cohesion and Economic Competitiveness Workgroups for the Estonia 2035 Strategy

Okhwa Lee, Chungbuk University, Korea

Rose Luckin, Institute of Education, University College London

Geoff Masters, CEO, Australian Council of Educational Research

Kam Wai Ming, Chair, Hong Kong Association of Computer Education

Michael Reiss, Institute of Education, University of London

Dirk Van Damme, CERI, OECD

Martin Villig, Co-founder Taxify, Estonia

Nancy Walt, Director of Curriculum and Assessment, British Columbia Ministry of Education

Siew Hoong Wong, Director General, Singapore Ministry of Education

Liu Yue Xiang, Director, SkillsFuture Division, Singapore Ministry of Education