November 2019 Progress to Date

This note summarizes the policy dialogues held by the High Performing Systems for Tomorrow (HPST) collaboration between NCEE, the OECD and six jurisdictions -- British Columbia, Estonia, Hong Kong, Singapore, Finland and South Korea – to discuss the impact of artificial intelligence (AI) and related technologies on education systems. Broadly, the agenda for the group has four parts:

1. How will the advance of AI and related technologies impact how we live our lives, what our societies will be like, the future of work and the skills needed for the future workforce?

2. What will this mean for the goals of education, what students should learn and how it should be taught?

3. What will this mean for how we organize the education system ensure all students receive the education they will need for the future?

4. What will the impact be on the teaching profession?

To date, the group has met to: consider the project proposal and draft the scope of work (Seoul, December 2017); debate the impact of AI on economies and civil societies (Toronto, 2018); and the significance of AI for what people should learn (Helsinki, 2019). Building on the conversations to date, future meetings will focus on identifying design principles for equitable, high-quality education systems in an AI world (Hong Kong, 2019); the potential of AI to strengthen teaching, learning and assessment (Estonia, 2020); and the role of the teaching profession in an education system redesigned for an AI world (TBD).

Although each of these meetings is focused on a discrete topic, the group has recognized that each are interrelated, and reserved time in each meeting to consider how the topics of past and future meetings relate to the topics being discussed.

Initial Meeting in Seoul

When the HPST group first met in Seoul, the OECD's Michael Stevenson, NCEE's Marc Tucker and Tony Mackay acknowledged that while top-performing countries were being eagerly studied all across the globe, these countries' performances have stagnated. They contended that there was a need for such systems to think collectively about several ideas in parallel: how to sustain what works, how to iterate improvements for the near future, and how to plan for revolutionary changes that globalization and digitalization, including the advance of AI, might make necessary. This collaboration would be beneficial not only for the participating jurisdictions but also for leading think tanks like NCEE and for the design of the OECD's PISA.

Participants were then invited to consider to what extent they agreed with this proposition, by reflecting on where they have been, the trends they are currently seeing, and the unknown future they are trying to anticipate and adapt to. Finland's Olli-Pekka Heinonen reflected on the new research on how learning happens and what digitalization makes possible. He argued this vastly accelerated the pace of change in schools, but saw the central challenge for Finland as being how to ensure that every school is positioned to adapt to this new world of possibility so that innovation does not accidentally create new forms of inequality. Siew Hoong Wong described Singapore's attempt to infuse the central curriculum with the skills – multiliteracy and multiculturalism, among others – needed for a globalized, AI-driven world. He saw the challenge for Singapore as ensuring that schools were well-equipped to foster social cohesion and harmony to meet the challenges of the future, particularly as students and parents were frequently conditioned to think in terms of competitive advantage.

Maie Kitsing discussed Estonia's push to figure out how to promote and measure learning outside of school, and to prioritize cultivating happiness, love of learning and wellbeing among students. Her account of these challenges was echoed by Jimin Cho, who described Korea's challenges in developing happy, confident learners who could think critically. Korea's Exam Free Semester was a crucial first step, but was it enough?

Marc Tucker provided a stimulus on systems thinking and the delicate balance between centralization (as a means to ensure equity) and autonomy (as a means to promote the professionalism of educators). Jurisdictions that have recently invested heavily in decentralization, he explained, are now starting to recognize that they may need to incentivize big changes in education, and may need to act more from the center.

While participants disagreed about the nature of the challenges the future may hold, the design of the responses required, and whether the eventual changes that will be necessary will be evolutionary or revolutionary, all agreed that a collaborative study of what the future may hold, and a series of seminars to debate the changes that might be required, would be valuable for all.

First Policy Dialogue: The Impact of AI on the Labor Market and Civil Society

In the first policy dialogue, in Toronto, participants reviewed NCEE's research on trends in the highest-performing jurisdictions (organized around the 9 Building Blocks framework) and began to discuss artificial intelligence (AI) and its effects on the labor market and civil society. Marc Tucker led a session on emerging principles of global best practice, organized by NCEE's 9 Building Blocks framework, a distillation of what NCEE 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 into principles of global best practice, participants participated in a seminar structured around Marc Tucker's research into what advances in AI mean for the labor market and civil society, grounded in a paper he had recently completed for New South Wales. Tucker described how literature 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, they have they have 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. 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 cognitive content of a lot of jobs, putting a premium on the development of the "human" side for workers. Further, the political stress caused by the coming economic dislocation will put a premium on development of adults' understanding of history, economics and politics.

Based on these predictions, participants agreed that continuing to the advent of advanced technologies and the implications for education systems made sense. Debate continued on whether the challenges were incremental or existential, but all agreed that change was coming, or already here.

Following the meeting, participants' feedback led NCEE to consolidate the 9 Building Blocks into Four Building Blocks of High Performance Education Systems. This new framework would serve as the basis for a set of policy memos NCEE sent to each jurisdiction in 2019, providing an external view of how each jurisdiction approaches each broad policy area, noting which approach appears to be similar to or different from how the other top performers are approaching that area, identifying some key challenges the jurisdiction appears to face and pointing to approaches other jurisdictions have taken that might be useful.

Second Policy Dialogue: Focus on What AI Means for What Students Should Learn

The second dialogue, held in Helsinki in April 2019, was focused on three central discussions. In addition to these discussions, there were also two presentations: one by Finnish policymakers and one from a group of Estonian entrepreneurs.

Each discussion featured both a "catalyst" and one or more respondents.

1. Review of what AI means for how we live our lives, the future of work, the skills needed for the future workforce and the goals of education
2. Focus on what AI means for what our students should learn
3. Looking ahead: What does AI mean for teaching, learning and assessment?

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's Olli Pekka Heinonen argued we are now transitioning out of the knowledge age, and Heinonen argued that the new era will be the "Interaction Age", because what makes us human, what machines can never replace, is how we interact. What becomes increasingly important for education in such a society are general competencies such as empathy and social emotional skills. Estonia's Heli Aru-Chabilan cautioned that Estonians are beginning to worry that

digitalization will create important competitive advantages for privileged groups and ultimately increase the polarization we are already seeing around the world.

Chern Wei Sng characterized the growing consensus in Singapore as a recognition that the changes caused by AI would be *both* evolutionary and revolutionary. The degree would vary by sector, with education at the evolutionary end of the spectrum. He made the case that 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 and their contributions to society. He was joined by Kai Fong Chng, a representative of the agency responsible for attracting foreign investments into Singapore and growing the economy. He structured his remarks around five major points:

- First, the potential of AI that we should be harnessing is to *transform* jobs, not to create or destroy them. Skills that he sees as increasingly important in the newly transformed labor market are data analytics and automating processes.

- Second, Chng argued that the participants needed to look at skills in a more integrated manner, along with their impacts on 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 the existing workforce.

- Fourth, because the future will require ever-more creativity from humans focus on what humans are best at: synthesis, pattern recognition and creativity.

- Fifth, education has a role to play in emphasizing collectivity and the importance of community.

Marc Tucker concluded the discussion by urging participants to recognize that the political and education-related threads of the discussions were actually interwoven. Frightened people around the world feel like they have been sidelined by elites. In addition, AI is likely to obliterate jobs with minimal skills. How can we create a society where we can relate to one another and address these problems? Further, what we call the "challenge of the future" is actually happening *now*: voting decisions citizens make today will be conclusive for education systems and economies 20 years from now.

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

Catherine Chan and Kai-Ming Cheng described how Hong Kong has transitioned from subjects to learning areas; this has enabled more integration of applied learning experiences, and overseas experiences. But it has proved challenging to integrate this new organization of secondary education with traditional higher education.

Scott MacDonald outlined British Columbia's goals, which include developing healthy, happy members of society who could exercise social responsibility. He noted that British Columbia has recognized that AI makes the tasks of educators more urgent.

Structures that incentivize teachers and learners to do their best work will be essential. Anneli Rautiainen and Olli-Pekka Heinonen noted that how the purposes of learning are conceived is evolving. Students will need to explore and define problems and choose what 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?

Chern Wei Sng argued 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 be adept at differentiation, diagnosis, prescription, lesson delivery and real-time assessment to degrees of granularity that had been impossible. Despite these exciting prospects, AI can often contain inherent biases, which are often impossible 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.

Invited Presentations

In addition, Olli Pekka Heinonen delivered a presentation on how host country Finland had brought together several government agencies to leverage AI to "anticipate citizen needs and them to help themselves." Heinonen used the example of a new tool called "Digital Me," where a digital avatar enabled youth and their families to imagine their potential future paths. Students could answer, for example, if they had a certain set of grades at a certain time in their life, what universities are available to them if they continue down that path? What job opportunities do those higher education opportunities open up in turn? And to what extent would they need to change their results in school in order to have a broader set of opportunities open up?

Finally, a panel of Estonian entrepreneurs offered their perspectives on the kinds of workers they were looking for and how the education system should respond. All of them agreed that a radical rethinking of the education system would be needed to adapt to the entrepreneurial, AI-driven future. They urged policymakers to question how technology could optimize the learning environment. They reminded participants that some potential revolutions to education that had once seemed fantastical now were in the realm of the possible within the not-too-distant future: downloading information into students' brains and using technology to optimize brain function being examples with far-reaching implications.

Looking Ahead

Based on these conversations, participants charted the course for the next several meetings. The next meeting, in Hong Kong, will focus on broad design principles for future education systems. After looking at the level of the system, the group should hone in on teaching, learning, assessment, and the teaching profession in 2020.