



# Reflections on the Significance of AI for What People Should Learn

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## 1. Introduction

High Performing Systems for Tomorrow (HPST) is considering the implications of artificial intelligence for the future of education. Through a series of policy dialogues, the initiative is addressing five linked topics: the impact of AI (Toronto, 2018); the significance of AI for what people should learn (Helsinki, 2019); design principles for equitable, high-quality systems in an AI world (Hong Kong, 2019); the potential of AI to strengthen teaching, learning and assessment (Estonia, 2020); and the role of teachers in an AI world (2020, TBC). The purpose of this paper is to build on the Helsinki dialogue, with further reflections on the significance of AI for what people should learn. The paper begins with a brief discussion of issues that shape the initiative as a whole. What do we mean when we talk about AI? And how should we think about AI's potential impact?

## 2. What do we mean when we talk about AI?

In its contemporary manifestation, AI concerns machine learning, big data and computing power.

*An AI system is a machine-based system that can, for a given set of human-defined objectives, make predictions, recommendations or decisions influencing real or virtual environments. It uses real or machine-based inputs to perceive real or virtual environments; abstracts such perceptions into models; and uses model inference to formulate options for information or action... AI take-up is accelerating rapidly in sectors where it is possible to detect patterns in large volumes of data; and model complex, interdependent systems to improve decision making and save costs. (Artificial Intelligence in Society, OECD 2019)*

But many commentators, especially those interested in the impact of AI beyond economies, conceptualise AI as the defining technology among a family of technologies, embracing robotics, the Internet of Things, nanotechnology, biotechnology, materials science, energy storage and quantum computing. In this account, AI is one of the driving forces behind a new industrial revolution, characterised by:

**Velocity:** *Contrary to the previous industrial revolutions, this one is evolving at an exponential rather than linear pace. This is the result of the multifaceted, deeply interconnected world we live in and the fact that new technology begets newer and ever more capable technology.*

**Breadth and depth:** *It builds on the digital revolution and combines multiple technologies that are leading to unprecedented paradigm shifts in the economy, business and society, and individually. It is not only changing the "what" and the "how" of doing things but also "who" we are.*

**Systems Impact:** *It involves the transformation of entire systems, across (and within) countries, companies, industries and society as a whole. (The Fourth Industrial Revolution, WEF 2016)*

For some purposes, educators draw on the first, narrower conception. For example, analysis of what AI means for teaching, learning and assessment typically turns on the potential role of machine learning and big data, in the classroom and other learning settings. For other purposes, such as thinking about what people should learn for the future, educators are more likely to use the broader conception: AI as one of several disruptive technologies. In doing so, they often have in mind not only the technologies themselves but the societal transformations to which they are sometimes said to contribute, such as resource depletion and climate change, the widening gap between rich and poor and the corrosion of trust.

Since the High Performing Systems for Tomorrow (HPST) initiative is looking through at the implications of AI for education through the five separate lenses above, it will be important to bear in mind which conception of AI is more relevant and valuable at any one time.

### 3. How should we think about AI's potential impact?

In much of the discussion about what AI means for the future, the emphasis has been on how machine learning could bring further change in the nature of work, by accelerating existing processes of automation.

We are familiar with the evidence that automation has hollowed out routine jobs. We now see automation of high-skilled, non-routine jobs too. Automation is arguably the primary cause of challenges in the modern economy, including stagnant wages; declining labour market participation; diminishing job creation with increasing long-term unemployment; rapidly rising inequality; declining incomes/underemployment for recent college graduates; and job “polarisation” (Rise of the Robots, Ford, 2015.)

If AI is facilitating the automation of individual jobs, it is also transforming the business model. The combination of machines that are learning to solve problems on their own, a powerful and connected internet platform shared by a significant proportion of the world's population and the opportunity for individual people to invest in innovation through crowd-sourcing is creating new businesses with global reach while destroying old businesses (Machine, Platform, Crowd, McAfee and Brynjolfsson, 2017.)

At the leading edge of automation, therefore, AI is challenging the nature of work and indeed the need to work. Different sets of questions arise. One concerns how people without jobs will find an income. The other concerns where—if not from work—people will find activities to keep them occupied and engaged.

There is growing interest in AI's impact on a second area of human experience: decision-making. Artificial intelligence is already *influencing* people's decisions. Will it move from there to *taking* decisions on their behalf? In the political sphere, algorithms are being used today to target specific categories of voter with specific messages. Harari foresees future voters delegating their rights altogether to an artificially intelligent agent which remembers their prior choices and the circumstances in which they were made, interprets them in the light of patterns in *everyone's* choices and circumstances and casts a vote accordingly. In the consumer sphere, he foresees an agent that

remembers every product preference ever expressed—and makes the next purchase for us ([Homo Sapiens](#), 2015).

These are two of the ways in which AI will affect human beings: by increasingly doing their work and taking their decisions. What is the broader significance of these developments?

Kissinger sees a transfer of agency from human intelligence to artificial intelligence. He believes that after two Enlightenment centuries in which human thoughts and actions were decisive in shaping the world order, we are entering an age in which the explanatory power of human consciousness may be surpassed by AI ([Atlantic](#), 2018).

Harari goes further:

*Humans are an assemblage of many different algorithms lacking a single inner self. The algorithms constituting a human are not free. They are shaped by genetic and environmental factors and take decisions deterministically or randomly. An external algorithm that monitors each of the systems that comprise my body could know exactly who I am, how I feel and what I want – replacing the voter, the customer and the beholder...People will no longer see themselves as autonomous beings running their lives according to their wishes and instead become accustomed to seeing themselves as a collection of biochemical mechanisms that is constantly monitored and guided by a network of electronic algorithms. (Ibid.)*

Both analyses announce an inflection point in human history. Neither has much to say about the implications for education. But at the very least, and without accepting that dystopia and apocalypse lie round the corner, it seems reasonable to say that artificial intelligence will gradually encroach on key dimensions of personhood. In that case, the task of educators will be to equip people to find new sources of meaning and purpose.

#### **4. The significance of AI for what people should learn**

To ask what people should learn, for any era, not only the era of AI, is to ask a question prior to consideration of learning processes or learning sciences. Learning processes relate to the different levels of learning, from simple (remembering) to complex (creating). Learning sciences concern the relationship between neural development and learning. Learning processes and learning sciences together are the backdrop for the fourth HPST topic: the potential of AI to strengthen teaching, learning and assessment. It is important not to entangle them in the second topic: the significance of AI for what people should learn.

Over recent years, educators have drawn a useful distinction between a learning framework and learning content. The framework provides an account of the different categories of things that people should learn, whereas the content refers to curriculum. What is the appropriate framework and content for the AI world?

## Framework

The Education 2030 learning framework (OECD, 2019) represents a collaboration of 30 jurisdictions, including the HPST jurisdictions. To what extent is it serviceable for the emergent AI world?

The structure of the 2030 framework rests on these propositions:

- What people should learn falls under four categories: knowledge, skills, attitudes and values, all not only malleable but also measurable.
- In the field of knowledge, people should develop a rigorous grasp of the concepts that underpin each discipline and a capacity to transfer and combine them.
- Knowledge, skills, attitudes and values are the constituent components of competences.
- People should develop competences through anticipating what they are going to do; doing it; and reflecting on what they have done.

The orientation of the framework comes from these key ideas:

- The goal of humankind is to maximise the well-being of societies, communities and individuals.
- The goal of education is to enable people to act in the world (agency).
- To act effectively in the world, people should develop a set of transformational competences: creating new value; reconciling tensions and dilemmas; and taking responsibility.
- Learning provides a navigational compass through life.

The challenge from AI to the framework's structure is grounded in new thinking about intelligence. Luckin argues that as we progress through the 21<sup>st</sup> Century "we need an intelligence that is human, that emanates from our emotional, sensory and self-effective understanding of ourselves and of our peers" (Machine Learning and Human Intelligences, 2018).

She distinguishes between knowing the world and knowing ourselves. Knowing the world requires contextual knowing, practised by people who understand that knowledge is context-dependent and that different viewpoints must be evaluated in order to reach a conclusion about any particular knowledge within its context. Knowing ourselves requires meta-cognition and meta-intelligence.

She proposes that being intelligent requires sophistication across:

- Academic intelligence (knowledge and understanding about the world)
- Social intelligence
- Meta-intelligence:
  - Meta-knowing intelligence (knowing about knowledge);
  - Meta-cognitive intelligence (includes regulation skills);
  - Meta-subjective intelligence (emotional and motivational knowledge and regulatory skills);
  - Meta-contextual intelligence; and

- Perceived self-efficacy (accurate, evidence-based judgement about our capacity across academic, social and meta-intelligence).

She argues that AI is currently limited to academic intelligence.

Luckin's work is related to Howard Gardner's (Frames of Mind: The Theory of Multiple Intelligences, 1983). But it is safe from some of the criticisms subsequently made of Gardner (Reframing the Mind, Education Next, Willingham, 2004). In particular, Luckin's intelligences form a coherent family, and she is not claiming that each resides in a different location in the brain.

Her thinking acknowledges fears that AI may match or exceed what humans can do but suggests that humans will retain a decisive edge. It has three important implications for the 2030 learning framework:

- Intelligences should have a higher place in the taxonomy than competences.
- Academic, social and meta-intelligence are all grounded in knowledge, but the distinction between knowing the world and knowing ourselves suggests how our attitudes and values are derived from what we know.
- As a component of meta-intelligence, meta-cognition is more than a cog that facilitates our actions.

The challenge from AI to the framework's orientation comes from AI's encroachment on human work and decision-making. First, if we accept that the landscape shaping the 2030 orientation is volatile, uncertain, complex and ambiguous (VUCA), then the AI landscape looks more VUCA still (strengthening the case for seeing learning as a navigational compass). Second, agency needs to become co-agency, not only in the sense that humans should work together but in the sense that humans should harness machines or even partner them. Third, the maximisation of well-being, as the goal of societies, communities and individuals, needs further specification. How can humans achieve well-being without having meaning and purpose at the centre of their lives?

## Content

In the context of a learning framework for the AI world, learning content for the AI world should equip people to deal with the impact of AI. This suggests three new curriculum emphases, following our earlier analysis: supporting people to do valuable work, exercising decision-making responsibility in key areas and finding new sources of meaning and purpose.

### *A. Supporting people to do valuable work*

Fadel argues that artificially intelligent agents will out-perform humans in solving those problems that require the classification of data according to rules. He goes on to argue that humans will out-perform artificially intelligent agents in:

- Experiencing authentic emotions and building relationships
- Formulating questions and explanations across scales and sources

- Deciding how to use limited resources strategically across dimensions (including which tasks machines should be doing and what data to give them)
- Making products...usable for humans and communicating about them
- Making decisions according to abstract values

The execution of tasks, then, will fall increasingly to AI. But determining aims, shaping priorities and ensuring that outcomes are consistent with desired values will continue to be done by humans ([Artificial Intelligence in Education](#), 2019).

If this is what it means to harness and partner with machines, what additional learning content could equip people to do this well? The answer may lie in developing much broader technology courses than we have so far seen. A [new technology curriculum](#) will be implemented in New Zealand in 2020. Drawing on computational thinking and design processes to address human challenges, students will take account of ethics, legal requirements, protocols, codes of practice, and the needs of and potential impacts on stakeholders and the environment.

### *B. Supporting people to exercise decision-making responsibility in key areas*

In managing their health, many people may be willing to pool personal data in order to optimise the understanding of a particular condition, treat it and even administer medication in real time: here, the out-sourcing of decision-making to artificial intelligence seems to make sense. But in reaching decisions that determine public policy, many may hesitate. How can educators help people determine when and how to take decisions as citizens?

Researchers at Oxford University have launched a project called Citizenship in a Networked Age. They note that algorithmic decision-making in public affairs is increasingly prevalent. They see a tendency to quantify public policy goals and to balance competing interests by applying utilitarian principles rather than through processes of deliberation.

Their approach is to identify the characteristics or virtues that will help people maintain the quality of public decision-making. These might include appreciating that citizens are uniquely able to navigate complex moral questions; distinguishing between participative deliberation and interest-based advocacy; and understanding when public policy options can be compared on a cost-benefit basis, and when they require the weighing of competing considerations.

### *C. Supporting people to find new sources of meaning and purpose*

As we think about meaning and purpose in an AI world, the qualities we need to determine goals and values and the characteristics we need to contribute to decisions as citizens are suggestive. Both sets of qualities and characteristics have roots in the humanities.

The core humanities encompass history, politics, philosophy, ethics, civics and law. Our identities, our rights and our responsibilities to others—and therefore our values—are

central to each field. To be expert in them is to have an understanding of the present informed by an understanding of the past.

That understanding is of greater importance still in an age of contestation and anger. In Asia, Europe and South America, people have taken to the streets, protesting grievances and injustices. Standards in public life are falling. The authority of international law is weaker. In the face of this and more, the humanities encourage perspective, empathy and compassion.

In recent decades and in many countries, education has given priority to science, mathematics and problem-solving. The AI world suggests a new balance, between science and mathematics on the one hand and the humanities on the other, between innovative problem-solving and responsible decision-making, between an orientation toward the future and a respect for the past. It may be that a broader, integrated and inter-disciplinary education can itself be the source of renewed meaning and purpose.

## **5. The significance of AI for what people should learn in different countries and traditions**

We now consider the bearing of the analysis so far on Finland and Singapore, the jurisdictions that led the discussion at the Helsinki HPST meeting on what people should learn for an AI world. We also consider its bearing on the Anglo-Saxon tradition. In each case, what societal goals are being pursued? How do education goals support those societal goals? What are the implications of the AI learning framework and content discussed above?

### **Finland**

Recent policy thinking in Finland has focused on new models of collaboration enabled by technology. These models aim at improved growth and productivity. But they also aim to reassert the worth of individual lives. The thinking is exemplified in Perspectives on New Work, Esko Kilpi (ed.), 2016:

*In the industrial era, only a few people had to have novel ideas; everyone else executed them. But in the Social Era, ideas are the fuel. We don't need the ability to do the same thing consistently, over and over again. We need the ability to adapt, create, and customize. The future of work is captured in three shifts.*

- *That you enable everyone – possibly everyone – to bring all of themselves to work. You want to draw on the ideas and creativity of all people. Each of us stands in a unique spot. It is a function of each person's history and experiences, visions and hopes. This is the source of the novel ideas that fuel innovation.*
- *That you create scale by allowing connected people to share what matters. Repeatable systems suggest that you can forecast and plan in theory. But when real people are involved, why not count*

*on those real people to share information, advocate for you and share their love for the service they've received.*

- *People know what needs to be done. So, we need to give them more discretion and agency over their work. In other words, let them do it. Let them focus on the value creation activities they want to do and then let them be accountable to their peers for whether they do it.*

Writing in the foreword, Olli-Pekka Heinonen suggests that the potential of the Social Era is unlocked by digital technologies. Because individuals can interact so easily, through apps and devices, they can determine the scope, nature and outcomes of their work and the people with whom they work. The structure of work is no longer provided by the corporation but the network; the worker is no longer an employee or contractor but something in between. This is the vision of an Interaction Society. It is the broader account of AI, based on the relationships between the family of disruptive technologies, that animates it.

Arising from discussion of the Interaction Society, two related sets of ideas are attracting significant interest and support. Both have influenced policy-making across governments.

The first concerns collective intelligence (Big Mind, Mulgan, 2018.) The argument here is that the problems facing societies, governments and systems today are uniquely collective and complex, in the sense that they are shared problems and their strands interlace. Collective problems, including those of climate, health, prosperity or war, can be solved through the exercise of collective intelligence: people learning to pool different kinds of knowledge, understanding and skills. Collective Intelligence is not the same as AI, though it would use machine learning as its engine. Moreover,

*It now seems inevitable that our lives will be more interwoven with intelligent machinery that will shape, challenge, supplant and amplify us, frequently at the same time. The question we should be asking is not whether this will happen but rather how we can shape these tools so that they shape us well – enhancing us in every sense of the word and making us more of what we most admire in ourselves.*

The second set of related ideas concerns different levels of human development. In Immunity to Change (2009) and subsequent publications, Kagan identifies a hierarchy of adult mental complexity in organisations. The **socialised mind** describes team players who seek direction from others. The **self-authoring mind** describes those who create a direction for others to follow.

*People with **self-transforming minds** are not only advancing their own agenda and design. They are also making space for the modification of their agenda or design. The information they value most is the unasked-for ...this new mind would have the ability not just to author a view of how the organisation should run and have the courage to hold steadfastly to that view. It would also have the ability to step outside of its own ideology or framework, observe the framework's limitations or*

*defects, and re-author a more comprehensive view – which it will hold with sufficient tentativeness that its limitations can be discovered as well.*

Kagan's examples of how people with self-transforming minds source the information that drives their transformations come from interactions with human colleagues. But it is clear that data from face-to-face engagements will be exponentially enriched by machine learning and big data.

Finland was one of the first countries to adopt a curriculum based on transversal competences, each consisting of knowledge, skills, values and attitudes. The competences are thinking and learning-to-learn; cultural competence, interaction and expression; taking care of oneself; managing daily life; multiliteracy; ICT competence; working life competence and entrepreneurship; and participation, involvement and building a sustainable future (New National Core Curriculum, Finnish National Agency for Education, 2014).

To what extent is the 2014 curriculum a sufficient education platform for the societal directions described above? Do the 2030 framework as enhanced for an AI world and the content initiatives identified for an AI world suggest new curriculum priorities? These questions are the focus of continuing constructive debate among Finnish educators.

The construction of the 2030 framework was itself influenced by Finnish education policy; and the structure and orientation of the framework correspond closely to the Finnish transversal competences. However, two of the proposed framework enhancements would contribute significantly to Finland's emerging societal goals.

Insofar as new models of collaboration in work, the exercise of collective intelligence and the ability continually to challenge and change mental paradigms entail a deep awareness of others and of self, there may be a greater role for the cultivation of social intelligence than is already implied in cultural competence, interaction and expression; and for the cultivation of meta-intelligence than is already implied by thinking and learning-to-learn.

All three emerging goals recall the emphasis in the 2030 framework on preparing people to create new value through innovation processes. But they also recall its emphases on taking responsibility and reconciling tensions and dilemmas, both of which are aspects of decision-making. Does the Finnish curriculum give sufficient weight to decision-making alongside problem-solving? Decision-making draws equally on perspectives from the humanities and the sciences. How successfully are the seven transversal competences embedded in history, politics, philosophy, ethics, civics and law?

## **Singapore**

In Singapore, there is a striking consonance between societal goals, education goals and the understanding of technology's significance for both.

For many years, the city's goal has been the development of a world class knowledge economy, equipped to flourish in a global world built on free trade. Restating this

direction in the 2019 National Day address marking Singapore's Bicentennial, Prime Minister Lee Hsien Loong set out enabling long-term priorities: to ensure that the different religious traditions are practised in an open and inclusive way with a view to social cohesion; to prepare Singapore for climate change by strengthening its sea defences; and to invest in the development of Singapore's people by extending access to pre-school and post-secondary education and preparing people for longer careers.

Singapore describes the current phase of its long-term education strategy as student-centric and values-based. The direction was set in 2012 by Heng Swee Keat, then Minister for Education.

*We equip our students with strong foundations for lifelong learning. We provide them with multiple pathways to develop their potential. We are a system of high peaks and high averages. We support all our students, the exceptionally talented as well as the average, the scholastically inclined as well as those with other talent..*

*Knowledge and skills can become outdated, but a mature, social-emotional core, deep values and strength of character will enable our children to thrive as they grow older. It is not cognitive skills alone, but character traits of empathy, graciousness, responsibility and integrity that will enable our students to succeed. ([MOE Work Plan Seminar Keynote, 2012](#))*

The Singapore curriculum embodies these ideals. It declares an ambition to develop confident people, self-directed learners, concerned citizens and active contributors. It seeks to nurture values of respect, responsibility, resilience, integrity, care and harmony. It sets high priority on the social and emotional competences: self-awareness, self-management, social awareness and relationship management. And it defines as emerging 21<sup>st</sup> century competences civic literacy, global awareness and cross-cultural skills; creative and inventive thinking; and communication, collaboration and information skills.

Singapore emphasises the profound significance of disruptive technologies, including machine learning and big data, for driving economic growth while challenging social cohesion. The central component of its technology strategy is again an investment in people.

*Smart Nation is integral to Singapore's next phase of nation building. Technology disruption is a global force we must confront and harness to our advantage. We can expect fundamental changes to society and economy in the decades to come, changes as profound as those resulting from electricity, the combustion engine as well as chemical and materials engineering of previous industrial revolutions. Beyond delivering on the future we can foresee, Singapore must continue to push ahead in this fast-moving space, to continually innovate and transform ourselves, and strengthen our capabilities and expertise so that we are prepared for the unknown. We secure our future by strengthening the nexus between academia, industry and government, making strategic bets in frontier*

*technologies, and forming strong relationships with the international community. (Smart Nation, 2018)*

As became clear in the HPST Helsinki dialogue, the implications of disruptive technologies for Singapore's curriculum have already been given a great deal of thought. Singapore, for example, will look to build the use of data analytics into classroom learning, but mediated by human judgement, as part of inter-disciplinary investigations into climate change, resource depletion and epidemics. Singapore believes that the future will place increasing demands on human creativity, and favour societies that give greater weight to community than individualism. It is recognised that both beliefs imply a deeper engagement with the humanities.

Perhaps there are two additional issues to be weighed. One is the *scope* of an engagement with the humanities. To what extent should the curriculum prioritise history, philosophy, ethics, politics, law and civics? And how can their study be linked most effectively to the development of complex competences? The second arises from the thinking already underway about nurturing human judgement. Does this suggest an investment in decision-making capacities, in all spheres of life, including decision-making by citizens in consultative policy development?

### **The Anglo-Saxon tradition**

The United States, the United Kingdom and Australia are characterised today by contestation. In the 80s and 90s, market economy policies opened fault-lines between different groups. Over the early years of this century, those fault-lines have widened, first through the effects of globalisation, second through the years of austerity that followed the financial crash. The result is increasing division.

More recently, an aspiration has emerged that is broadly shared. Leaders from across the spectrum favour inclusive growth, to give greater prosperity to everyone. But the debate that rages about how this aspiration should be met, whether through globalist or nationalist policies, is itself fierce and polarising.

Perhaps it is not surprising that in the Anglo-Saxon tradition, unlike in Finland and Singapore, AI is primarily conceptualised as a force likely to cause wider divisions still. Harari imagines those who control AI dominating those who do not, and those who are physically enhanced by AI dominating those who are not completely. Bostrom posits an AI that escapes human control and teaches itself to enslave the entire human race (*Superintelligence*, 2014).

Education goals are also contested, though the roots of disagreement go back longer still. In all three countries, it is possible to trace competing traditions: one that values a deep, unifying body of knowledge, one that promotes the development of the child without reference to shared knowledge; and another that emphasises knowledge intertwined with skills (Husbands, *Knowledge and the Curriculum*, Eds. Simons and Porter, 2015).

The Education 2030 framework offers a reconciliation between knowledge and skills, by giving weight to powerful knowledge that equips people with underpinning

disciplinary concepts to help them think, for example, like scientists or mathematicians (Young, Bringing Knowledge Back In, 2009). In addition, the place it opens up for attitudes and values forms a seductive home for educators interested in character development. But the language of competences, in which the framework is couched, remains problematic in these countries, and the framework has so far failed to attract the support of policy-makers.

The AI debate has served to stimulate not only new thinking, as we have seen, about *human* intelligences. It has also stimulated thinking about *human* flourishing. Could these ideas bring new perspectives to the Anglo-Saxon debate both on the goals and purpose of education? And if so, could they also enrich discussion in Finland, Singapore and the other HPST jurisdictions?

The emphasis on human intelligences concerns the goals of education and offers a new conceptual and terminological start. It potentially provides a framework that transcends competences; and it persuasively re-presents character development as an investment in social and meta-intelligence.

Human flourishing offers insights into the purposes of human life— and therefore the nature of education for life. It represents a retreat from long-prevalent assumptions that the success of educating a young person stands or falls on preparing them for work. It is being widely discussed in the United Kingdom. Related approaches are being explored in the United States. It offers a perspective that could help shape the HPST initiative as a whole, across all the remaining dialogues.

Kristjan Kristjansson, its foremost current commentator, returns to Aristotle (Flourishing as the Aim of Education, to be published in 2020). He suggests that a flourishing life is a meaningful life, which gives expression to each individual's natural capacities, in those areas in which human beings can most successfully excel. Such a life should be freely chosen and embody a sense of meaning and purpose. Kristjansson follows Aristotle in arguing that people should both pursue valuable activities and find space for contemplation. He diverges in recommending a sense of awe in the natural world. He cites Charles Taylor's view that in life we need moments of depth, joy and fullness to counteract the "terrible flatness of the everyday", that is particularly characteristic of consumer society.

Early enquiries into what human flourishing means for education have so far looked at curriculum, pedagogy and measurement.

Reiss and White counter arguments that curriculum should be subject-based:

*A central aim of the school should be to prepare students for a life of autonomous, wholehearted and successful engagement in worthwhile relationships, activities, and experiences... With their development towards autonomous adulthood in mind, schools should provide students with increasing opportunities to choose among the pursuits that best suit them. (An Aims-based Curriculum, 2013)*

They approach curriculum by defining the personal qualities the student should develop: self-regulation, confidence and self-esteem, independence of thought, determination, good judgement in weighing up conflicting considerations, courage and the ability to keep “our values in proper perspective, so that we pay due regard to those that are of more, and of less, importance to us.” They make a case for moral education, education for citizenship and education for work – in that order.

Kristjansson (ibid.) encourages approaches to teaching and learning that fulfil students’ potential for competence, relationships, self-efficacy and intrinsic engagement; and fun and stimulate wonder, aim at the essential goods of truth, understanding, knowledge, good judgement and self-governance; and take place in an environment of co-operation, warmth and trust.

VanderWeele has developed questions that explore a person’s happiness and self-satisfaction; health; meaning and purpose, character and virtue and close social relationships (On the promotion of human flourishing, *Perspective*, 2017). These offer a starting point for the measurement of education outcomes.

## 6. Conclusion

This paper returns to the first HPST dialogue in Toronto to clarify the different connotations of AI and the different dimensions of AI impact. It then addresses what people should learn for the AI world. Taking its bearings from the OECD Education 2030 project, it considers the implications for the 2030 learning framework of new thinking about human intelligences; and proposes areas in which curricula might be developed. It then suggests ways in which these proposals might influence education goals and curricula in Finland and Singapore.

The paper ends with reflections on human flourishing, an emerging body of ideas which is shaping the conceptualisation of societal goals, education goals and education practices. Human flourishing offers a direct response to artificial intelligence. It may provide perspectives not only on society and education in the United Kingdom but also elsewhere.

Getting clear on what people should learn for the AI world is useful in itself. It also supports the three topics that lie ahead for HPST.

- What people should learn may be considered independently of how people learn, since the former is a normative issue and the second a function of learning processes and above all learning sciences. But it is nevertheless true that learning the value of AI in problem-solving can be developed by using AI in learning.
- The development of curricula for AI, especially in challenging areas such as interdisciplinary problem-solving, decision-making processes and the significance of the humanities for human meaning and purpose, poses an important set of challenges for future teachers.
- And as education purposes and goals evolve in response to AI, the importance of maintaining equitable provision of high-quality learning grows ever greater.