Editorial

When countries closed down schools in early 2020 to deal with the Covid-19 pandemic, learning went digital. In the year since, teachers, students and administrators have done, what is effectively, a collective crash course on digital education. There have been many serious downsides to it, from screen fatigue and adaptation stress to the falling behind of those ill-equipped for digital learning or unprepared to learn on their own. But the experience has catapulted education systems, traditionally laggards when it comes to innovation, years ahead in what would have been a slow slouch towards smart schooling.

Remote classrooms, however, are not the same as smart ones. Rather, they have been a stop-gap measure that has kept learning going and conserved existing educational practice rather than transform it. As a result, remote classrooms have rarely been of the same calibre as physical ones, and, again, not for students without the wherewithal – technologically or mentally – to do online classes.

Two years before the pandemic, OECD's TALIS survey found that only half of teachers were letting students frequently use technology for projects or class work. But necessity is the mother of invention and, in the absence of physical classes, many teachers are catching the digital wave.

Now is the time for schools to dive into digital. Many have liked the "anytime-anywhere" capabilities of remote classes. More and more educators are getting ready, is the technology?

As it turns out, education technology is ready too. The OECD's Digital Education Outlook brings us up to speed on three areas of technology that are already being used in education systems: artificial intelligence (AI) or machine learning, robots and blockchain.

Software and social robots that are fed constant streams of data have the greatest disruption potential for teaching and learning: it's not just technology, it's teachology. While we study mathematics on a computer, the computer can now study how we study and then make our learning experience so much more granular, adaptive and interactive. Together with sensors and learning management systems, AI can give teachers a real sense of how different students learn differently, where students get interested and where they get bored, where they advance and where they get stuck. Teachology can help adapt learning to different student needs and give learners greater ownership over what they learn, how they learn, where they learn and when they learn.

AI can help teachers, especially novice ones, read the room better and slow down, speed up, or throw out a pop quiz question when there's a lull. Learning analytics can tell a teacher working out the next day's lesson plan who aced the homework assignment on carboxylic acid derivatives and who needs to review it still. A classroom robot can take Gabriel and Ishita to a corner of the classroom and have a 10-minute Spanish conversation while the rest of the class works on action verbs.

And of course, AI is helping assessment and exams make big leaps, whether these are assessments through simulations, hands-on assessments in vocational settings, or machine-learning algorithms scoring essays. One of the most consequential mistakes that education made as it industrialised learning over the past centuries was to divorce learning from assessment; that is, having students pile up lots of learning and then, sometimes years later, testing whether they could reproduce some narrow slices of that learning within a short window of time. Technology can now reintegrate learning and assessment, using real-time data and feedback to help students learn better, teachers teach better and education systems become more effective.

But for teachology to really take off it has to be user-friendly. Data on what percentage of the quadratic equations unit Hanzhou has mastered or whether Emilia has gotten bored with post-war social welfare history is no good if the teacher has to stop a classroom lesson to consult the data. Data needs to be intuitive. Education ministries can encourage developers to co-create with teachers and students digital tools that are relevant, affordable, interoperable and easy to use. Technology is unlikely to work for learning unless the teaching profession is part of the design of those tools.

Another constituent that can especially benefit from smart education tools are students with special needs. Smart software and robot tutors can adapt to Hector's learning needs or Farid's pace. They can help detect and diagnose problems that too often go under the radar, especially in primary school. And they can help plot curricular trajectories that fit each student's needs better.

That data-powered technology can help level the playing field (in the classroom!) and has applications beyond students with special needs to the situation now at hand. We face what is likely a catch-up period for young people who have struggled with school during the pandemic. Pinpointing where they need help and where they have excelled is something individualised Edtech can support.

Of the three areas of technology the report covers, blockchain is the most mature though applications, so far, are not in teaching and learning. Blockchain looks promising as a reliable, user-friendly credentialing system that can replace lumpy and expensive degrees, and help unbundle the institutional monopolies that often come with them. Authenticated certificates of completion from education and training programmes outside traditional academic institutions – like on-the-job training and massive open online courses (MOOCs) – are an important piece of the puzzle in bringing us closer to lifelong, life-wide learning. If everybody, independent of their jobs, can upskill and reskill and have blockchain-verified qualifications at their fingers, job-changing will be faster and more fluid, and much less anxiety-ridden.

But going back to teaching and learning, more technology here does not automatically translate into better learning outcomes. In fact, results from OECD's latest PISA assessment showed a persistent negative relationship between the intensity of technology use in classrooms and the digital reading, mathematics and science skills of 15-year-olds. Students who spent more time posting work on their school's website, playing simulations at school, using learning apps and websites or doing homework on a school computer tended to perform more poorly on the assessment.

Of course, there are many reasons that can explain the connection between higher tech use at school and lower cognitive performance. Perhaps lower-performing students simply spend more time on their homework. Or they spend more time on the computer because they are being directed to more practical digital assignments. It is also possible that the digital world helps develop knowledge and skills that are not easily captured by current assessments. But we should not discard the possibility that low-quality digital learning tools displace valuable instructional activities that could be better done without digital devices, or activities that teachers simply know better how to do in the analogue world. Not least, the demands that effective digital learning place on students' autonomy – their capacity for independent learning as well as their executive functioning and self-monitoring – are easily underestimated. These hypotheses are supported by the fact that the relationship between technology use and learning outcomes varies so widely across countries.

What is clear is that for robots, classware, predictive analytics and the like to work effectively will require reinventing the role of teachers. Technology and AI are not magic powers, they are just extraordinary amplifiers and accelerators that add speed and accuracy. AI will amplify good educational ideas and good practice in the same way it amplifies bad ideas and bad practice. AI can help remove bias and discrimination from educational practice in the same way it can spread and scale bias in educational practice. It can empower teachers to identify children at risk or disempower them from exercising human judgment. In so doing, AI can induce a paradigm shift from an education of consequences – with teachers helping their students understand who they are and who they want to become – to an education of correlations where all the technology does is to look back at what has happened with students with similar characteristics in the past. While technology is ethically neutral, it will always be in the hands of educators who are not neutral. The real risks do not come from AI but from the consequences of its application. When early warning systems flag a student in trouble, it should be a person who evaluates why and help get her/him/they back on track.

Humans have always been far better at inventing new tools than using them wisely. It is only by investing in teachers that technology can liberate them from routine administrative and instructional tasks, and provide them with the opportunity and support to become great coaches, mentors, role models, inspirers and leaders. Education will always work best when humans are kept in the loop, not left to their devices, whether their own or not.

The pandemic has picked up our education systems and hurtled them at light-speed from the 19th to the 21st century. From one-size-fits-all, factory-styled schools to more individualisable, free-range learning. In a way, the pandemic has revealed the enormous potential for innovation that has been dormant in education systems so often dominated by hierarchical structures that reward compliance.

But moving beyond the crisis will require a more level playing field for innovation in schools. Governments can help strengthen the professional autonomy of teachers and school leaders, and a collaborative culture where great ideas are refined and shared. Governments can also help fund incentives that raise the profile of, and demand for, what works. But governments alone can only do so much. Silicon Valley works because governments created the conditions for innovation, not because governments do the innovating. Similarly, governments cannot innovate in the classroom; they can only help by opening up systems so that there is an evidence-based, innovation-friendly climate where transformative ideas can bloom. That means encouraging innovation within the system and opening it up to creative ideas from the outside.

How do we know if education systems have opened up? When they communicate the need for change and build support for it. When they invest in capacity development and change-management skills. When they signal that teachers not passively implement technological and social innovations but get involved in designing them too. When they make it easier for innovators to take risks and bring out new ideas. And when they help innovators find more effective ways of scaling and disseminating their technologies.

We have learned many things during the pandemic. The trick is not to forget them when things return to 'normal'. Artificial intelligence, robots and blockchain are poised to transform how we teach, learn, and run schools. The technology is ready; are we? School closures forced us to dip our toe in the digital waters and for some students and teachers it wasn't so bad. With the quickly evolving smart education tools the report discusses, many of us may be ready to fully take the plunge.

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From:

OECD Digital Education Outlook 2021

Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots

Access the complete publication at:
https://doi.org/10.1787/589b283f-en

Please cite this chapter as:

OECD (2021), "Editorial", in *OECD Digital Education Outlook 2021: Pushing the Frontiers with Artificial Intelligence, Blockchain and Robots*, OECD Publishing, Paris.

DOI: https://doi.org/10.1787/12f94c3e-en