Looking at the future of learning

The Children’s Plan
What does it really mean?

Plus an interview with Susan Greenfield, neuroscientist, writer, broadcaster and member of the House of Lords

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A far from robotic education

Yet that does not mean that teachers will find themselves redundant in the future. Dr Will Browne, Lecturer in Cybernetics at the University of Reading, sees a future where teachers still play a key role in students’ learning, but they are assisted by robots. “There will be a lot more non-human support for teachers over the next 10 to 20 years,” he explains. “For example, students may see a real violin teacher once a week, and then go home and practise with a robot.

A teacher in the classroom with 30 children may have one or two robot assistants. This could free up some of the practitioners’ time to concentrate on teaching.”

Steve Grand, Director of Cyberlife Research, agrees: “We’re a long way from human-level intelligence so far, and I think teachers can remain safe in their jobs for a few months yet! But as artificial intelligence improves and robots become able to cope with more realistic environments, I can imagine they will become integrated into learning, just like any other tool. Children will learn through teaching their own robots. There’s no better way to understand something than to try to teach someone else how to do it, and dim-witted robots would make good pupils.”

Response and recognition is a vital area for robots of the future that may be required to become mentors, teachers and friends to children. A basic robotic machine that
Spouts French oral examination dialogue in the corner of the classroom and has a limited ability to respond proactively to students is likely to become a repository for used bubblegum within weeks. Yet imagine a robot that recognises individual students’ faces and voices and can remember what happened in the previous lesson, and maybe even has a sense of humour. That will have much more enduring appeal and use in the personalised learning environments of the future.

Scientists have been studying how to give robots this humanoid trait of recognition for many years. One example was Kismet, the robotic platform developed at Massachusetts Institute of Technology (MIT) in 2001. Kismet was created with the idea that for robots to fit into and work better within human society, they should take on more human characteristics, a crucial one of which is the ability to recognise people. This would enable humanoid robots to build relationships with people, to contextualise them, and to learn.

Increasingly key to robots’ usability in the future, is the current development of modular robots. Wei-Min Shen, Director of the Polymorphic Robotics Lab at the University of Southern California, specialises in self-reconfigurable robots, and in particular, a creation called Superbot. Superbot is a robot made of modular units that are individually intelligent, and that can work together collectively to create an even smarter robot order to slide through cracks to get to the person and deliver help. It could also be used to go into space; Shen says Superbot is destined for Mars. NASA is interested in Superbot as a multi-tasking robot to replace the countless robots it sends into the ether to carry out single tasks.

Superbot could also be applied to the classroom, showing students how different modules collaborate. Shen comments: “Each child could be given two or three modules to work with, and then they can get together to build different structures using different modules, but those structures would be alive and intelligent. Superbot would be a quick way to teach kids how to make a robot.”

A simpler version of Superbot is LEGO Mindstorms, but Mindstorms cannot self-reconfigure; it requires programming.
At Luckwell Primary School in Bristol, children and their teachers have worked with Stakeholder Design and Futurelab to create an intelligent fountain. The fountain is programmable and interactive, and uses LEGO Mindstorms’ sound, touch and proximity sensors so that children at the school can use it for a variety of purposes. For example, they use it for recreation, in science lessons, and for drama - where a special part would be written for it as an individual member of the cast.

Tash Lee Jones, a Learning Researcher at Futurelab, comments: “The idea is giving children tools to play and experiment with, and having the tool respond. The experiment aims to see if the fountain can change the old order of things, where the teacher stands in front and tells the children what they need to learn. Here, the children are deciding what to programme the fountain to do.”

Rather than putting sensors in building blocks, Alison Druin, Director of the Human Computer Interaction Lab and Professor at the College of Information Studies at the University of Maryland, is putting them in icons - toys or parts of toys that act in a way that a child would expect them to, because of how they look, eg a toy’s hand that waves. Druin is looking at how robotic technologies can be used to enable collaboration, storytelling and learning in children. One project she and her team have worked on for the past two years is Story Rooms.

In Story Rooms, a child can take a stuffed toy hand or foot, put a toy mouth next to it, tap both objects with a ‘magic’ wand, and make the objects react to each other. The order in which they are tapped changes the programme, as does the combination of objects tapped. “The sensors are large, obvious and make it easy for young children to grasp the concept of programming,” Druin says.

A lot of the robotic technology that Druin points to as having a role in the future of education revolves around the idea of developing social skills in children. “We as human beings are really social animals, so if we can develop robots that help develop that ‘socialness’, it’s all good,” she states.

There is evidence that learners will be able to integrate socially with robots. At the University of California, San Diego, a Sony Qrio robot was introduced into a group of 2 year-olds as part of an experiment to see if the toddlers would accept the robot as one of them. Qrio giggled when touched on the head, moved about the room, and lay down on the floor when his batteries ran out. By the time the experiment was nearing its end, scientists had seen the children patting, touching and hugging the robot, treating it like another child, and when its batteries ran out, covering it in a blanket and saying “night night”.

Dylan Evans, Senior Research Scientist and Evolutionary Psychologist at University College Cork, Ireland, comments: “Experiments like that are still in the early days, but I think they’ll become more common. Robots have been developed that help children communicate where they feel pain; the Huggable is one, but there are several others in development. The Sony Aibo robot dog was taken to care homes in America in another experiment, along with real dogs. In the end, the old people became just as attached to the robot dogs as they did to the real ones. Maybe, with the ability to form attachments like these with real people, these kinds of robots could help with therapy and, of course, education.”

However Druin adds a note of caution: “The thing with many of these robot toys and tools that give you the control you actually need to make them useful, is that they are very expensive individually, so it’s cost-prohibitive to give a school a ton of them. On the other hand, kids can learn powerful things from these robots and we will start to see much cheaper robotic devices being developed in the near distant future.”

Evans certainly believes that children could be taking their own personal friend and robot to school with them in less than 10 years’ time. This teddy-bot would be a furry comforter, it could record lessons to help with homework, teachers could download instructions for revision to the robot, and it could be fitted with a webcam to enable communication with parents.

So it seems we are not too far away from a world where robots play an active part in our children’s learning. Furthermore, it seems that these robotic friends and mentors could play a significant part in their ability to socialise or, as Druin puts it: “Hopefully all this technology will make us more human, by asking what it really means to be human.”

Where does the word ‘robot’ come from?

Initially introduced to the masses in 1920 by Czech playwright Karel Capek in his play R.U.R., which stands for Rossum’s Universal Robots, the word was thought of by his brother, Josef.

R.U.R. is about a robot factory where human clone-like robots are created. The issue of whether they are being taken advantage of, despite their willingness to serve, is explored.

Yet the word ‘robot’ comes from the word ‘robota’, which in Czech, Slovak and Polish means literally ‘serf labour’. Robotina comes from the first literary Slavic language, Old Church Slavonic, where the word ‘rabota’ meant ‘servitude’, or ‘work’ in modern Bulgarian and Russian.