

USING ROBOTS AND DIGITECH FOR STUDENTS WITH DISABILITIES

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Abstract

The Digital Technologies Curriculum in the Australian Curriculum is meant to prepare young adults for living and working in this new century. With the ever-changing possibilities of the latest technological innovations, this curriculum was designed to promote digital thinking and to prepare Australian students for what technological advances might exist when they get into the workplace.

However, this new curriculum highlights a growing problem: will students with disabilities be able to learn these abstract concepts? And how should teachers be preparing these students for a digital world? The Design and Technologies strand of the Technologies curriculum is too abstract for a school-aged child with an intellectual disability. The other strand, Digital Technologies, is what educators should be focusing on in their classrooms.

Digital Technologies include basic computational thinking, manipulation of objects, and interaction with digital devices such as robots and the newly introduced digital pet, Cozmo, a robot with an artificial intelligence that creates meaningful play. These new robots can help teach a range of skills from coding to emotional regulation. Educators should consider incorporating more artificial intelligent robots into their classrooms.

Keywords

Digital Technologies, Intellectual Disabilities, Special Education, Robots, Artificial Intelligence

Conflict of Interest

Please note that I do not work for, nor have received any incentive for including a discussion of the Cozmo robot by Anki in this paper. The views about this product are my own opinions based on my experiences using the robot in special education classrooms.

Technologies Curriculum

With the rapid change in technology at the turn of the 21st century, many educators advocated for a definition of '21st century skills', the training and knowledge that young people needed to work and live around these new technologies. Marc Prensky (2001) believes that this next generation thinks differently, and they expect to interact, construct, and discover as they learn. With the new Australian Curriculum, there is now a clear developmental construct for teaching all ages of students how to think in this new digital century.

The Technologies learning area consists of two subjects: Design and Technologies and Digital Technologies (Australian Curriculum, Assessment and Reporting Authority [ACARA], n.d.). The ICT teaching and learning in previous curriculums are now removed from Technologies and are classified as a general capability called Information and Communication Technology (ICT) capability spanning across all learning areas.

Design and Technologies emphasizes design thinking where students consider the societal and environmental implications of technological problems and solutions (ACARA, n.d.). In other words, this is teaching a global, holistic approach to solving complex issues. Digital Technologies includes general ICT knowledge, project management, computational thinking, and data management. Here, students use various technologies to create digital solutions.

This new emphasis on thinking is certainly important for the next generation workforce. However, this new curriculum highlights a growing problem: how will students with intellectual and cognitive disabilities participate in this new curriculum? The Design and Technologies subject is arguably too abstract for students below or at Foundation level.

In Australia, a person may be given a diagnosis of intellectual disability (ID) if they have a sub-average intelligence (typically defined as an Intelligence Quotient [IQ] below 70), limitations in communication and self-care, and a lack of daily living skills

(Westwood, 2002). 2.9% of the Australian population has an intellectual disability, “with prevalence rates of 4% for children aged 0-14 years” (Australian Bureau of Statistics, 2014, para. 2). Children with an intellectual disability are cognitively delayed in their development and need additional support throughout their lives.

Jean Piaget believed that a child develops through four distinct stages of mental development from birth into adulthood (Inhelder, 1966). While his research methodology was flawed, he argues that a child will have difficulty with abstract, intuitive, and systematic thinking until their brain matures (at around 11 years of age for a typically developing child). Similarly, Leo Vygotsky (1978) believed that abstract thinking is initially not available until a child can conceptualize symbols. Children with an intellectual disability are likely to have difficulty conceptualizing abstract concepts during their school years, particularly those with Autism Spectrum Disorder (Preissler, 2006; Westwood, 2002). Therefore, it is more than likely that the cognitive demands of Design and Technologies unfortunately make this new subject not 'available' to students who have an intellectual impairment.

Which is why I argue that the Design and Technologies subject is not appropriate for students who are pre-Foundational, and educators should instead be focused on the other subject, Digital Technologies, in their lesson planning.

Implementing and differentiating the curriculum

The new Digital Technologies curriculum in the Australian Curriculum expects teachers to incorporate more coding, problem-solving, and deep-level thinking tasks in their lessons. This initially seems like a difficult task, but there are many ways teachers can link their current lessons to the new curriculum. For example, reading/sorting/making a visual schedule is just one example of coding and sequencing that meets the new curriculum standards.

While the Australian Curriculum divides the Digital Technologies subject into two strands, Knowing & Understanding and Processes & Production Skills, I recommend that teachers approach the learning area and teach it in three separate sections. The first section is, in many ways, the old ICT curriculum in that it is the explicit teaching of hardware, software, and networking of ICT. Second, teachers should focus on collecting, sorting and sequencing, and using data. There are many forms of data including pictures, symbols, codes, and, of course letters, words and numbers. These activities are likely already part of teachers' lesson plans, but until now were never thought of as computational thinking.

Third and finally, teachers should look at using ICT for problem solving by teaching students to use a framework to analyze problems, test designs, and evaluate solutions. Despite how it is divided, Digital Technologies is simply a new way of looking at how we teach children to interact with technology and how to think about symbols, patterns, and sequences.

Modifying for those with disabilities

As mentioned above, teachers can modify tasks they are already doing to meet the requirements of this new curriculum. Despite the ICT-focus, teachers can use non-ICT activities to teach the concepts and get students thinking in sequential, logical, and computational ways. For example, an algorithm is simply a series of steps. A visual calendar of the day's schedule is an algorithm and students can even create their own schedules by taking photos (collecting data), sorting them (sequencing), and displaying them on a chart.

Thus, while the wording of the curriculum is rather technical and possibly confronting to a teacher of low ability students, I encourage teachers to think about what they already do in their classrooms as evidence of meeting the goals of this curriculum. Teachers, do not spent too much time on the complexities of today's technology because the next big thing for special education is just about here.

Robots & Digital Pets

Robotics have been used in education for the past few years, but with the advances in artificial intelligence, the next area of focus should be on digital pets. A digital pet is a robot with a programmed 'personality' that interacts with a user's speech and movements. In other words, robots now are becoming playmates who can talk, play games with, and who shows emotions like happiness, sadness, and anger.

While coding and project management are important skills, what is missing from the Digital Technologies curriculum is the use of robots for play and social emotional learning. And for students with disabilities, this digital interaction is a perfect tool for teaching social emotional skills. Slowly there have been an increase in interactive toys such as Beebots, Spheros, and Lego Mindstorms, which do build skills in coding, spatial awareness, and planning. But it is the inclusion of a 'personality' with emotions, even if computer generated like the new robot, Cozmo by Anki, could be as big of a revolution to the special education classroom as the iPad was.

Cozmo is a personal companion robot designed not just for coding and controlling but designed as a digital pet—a responsive plaything with built in games (Anki, 2018).



Cozmo is eight centimeters tall and nine centimeters long. He looks like a cross between Wall-E and EVE from Pixar. He might be digital, but he is a member of the newest innovation: digital pets. And he can be used to teach social skills, responsibility, and literacy.

Cozmo, is controlled by an iPad/iPhone app. Cozmo has his own personality and he talks and sings. Every day you are expected to wake Cozmo up, 'feed' him, play games with him, and perform maintenance tasks to keep him 'fit'. These tasks are not only engaging but also rewarding. Eichenbaum, Bavelier, and Green (2014) suggest that this interaction in which a user receives rewards can lead to an increase of dopamine in the brain, which may permit brain plasticity and learning.

The games can feature one or two students playing with Cozmo at a time, perfect for learning turn-taking and

socialization skills. Cozmo also sings, plays 'peek-a-boo', and recognises faces. For students with autism, for example, where social play creates anxiety, Cozmo could be a new learning tool, and special educators need to start trialing AI robots in their classes. Further, besides social emotional goals, Cozmo is also capable of helping students meet the other curriculum goals in the Technologies learning area, such as programming, sequencing, and collecting data.

In my personal experience of introducing students with disabilities to Cozmo, there has been overwhelming excitement and engagement with him and his features. I have informally trialed several of Cozmo's games on students with mild intellectual disabilities and, while I did not try to assess any curriculum goals during gameplay, students were very engaged and receptive Cozmo's 'personality'. Overall, my initial attempts at using Cozmo in the classroom were all positive (despite some young boys wanting to play with him roughly). With the continuous improvements not only in this product, but in AI overall, this is certainly a learning tool that needs to be investigated and researched.

Conclusion

Some of the best ideas, evidence and research comes from teachers themselves. Research is what is now needed for digital pets in the special education classroom and I urge teachers investigate robots to not only to meet the needs of the Technologies curriculum, but to meet social emotional needs as well. I hope my trials with Cozmo encourage you to try your favourite digital pet in the classroom. We have a very interesting future ahead of us where artificial intelligence and robotics can support our students.

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