Introducing the ‘new’ digital literacy of coding in the early years
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Introduction
Twenty-first century educators and teachers need practical strategies to introduce the ‘new’ literacy of coding in the early years. It is critical that young children enjoy playful digital learning experiences that expose them to coding and robotics for two key reasons. First, children have a right to play, relax and enjoy a range of cultural artefacts, including digital ones. Second, proficiency with coding is an increasingly important digital literacy practice. Play-based digital learning (PBDL) is a simple way to introduce coding and robotics into early years settings. PBDL is an appropriate, scaffolded and purposeful way of familiarising young learners with digital hardware and software in play-based settings. Our PBDL approach is a fun way to introduce the literacy of coding and robotics to our youngest learners.

Coding: the ‘new’ digital literacy for early childhood
In a time where new technologies are radically changing our lives, it is important to start digital literacies instruction in the early years. This is especially true of the ‘new’ literacy of coding. In the field of robotics, the terms coding and programming may sound intimidating and even confusing to some early years practitioners. To start, there is really no difference between the two terms. Both essentially mean to input instructions into a machine or robot. Robotics is the design, construction, operation and application of robots in society. In the early years, robotics tends to focus on how robots move and react to children’s sensory input. Children’s sensory input of directions or commands into the robot is an example of the digital literacy of coding.

In what follows, we outline a fun way to introduce coding and robotics in the early years, with and without technology. Our aim is to assist early years educators in increasing the participation of young learners in science, technology, engineering and mathematics (STEM) education with the goal of improving children’s digital literacy skills. By teaching coding and robotics across prior-to-school and school settings, early years educators can successfully introduce young children (toddlers up until 8 years of age) to the language of computer science through play-based digital learning.

Play-based digital learning (PBDL) for 21st century learners
It is well established that young children learn best through playful, hands-on, engaging and interactive learning experiences that are meaningful and relevant to them (Fleer, 2013). The Early Years Learning Framework (EYLF) (Commonwealth of Australia, 2009) advocates that effective early years educators intentionally plan and teach in ways that are responsive to the needs of young children and include a balance of child-led and child-initiated, and teacher-led and teacher-initiated learning experiences. PBDL capitalises on that balance by recognising that brain development and play are explicitly linked and that young children need increased opportunities to create meaning, negotiate and take risks through playing with digital devices, specifically robots.

Our notion of PBDL is built upon the fundamentals of best practice in early childhood education and care. At the heart of PBDL is Article 31 of the United Nations Convention on the Rights of
with symbols and by starting with the child and the familiar (his or herself). With this design brief, educators can support children to use what they know best – themselves! Importantly, the activity is an introduction to coding using concrete materials, or ‘coding they can touch’ without technology (the printout cards of the Bee-Bot symbols). Children typically enjoy the experience of pretending to be a robot and they develop meaningful understandings in a fun, safe, and relaxed way in a familiar context. We intentionally use key computer science vocabulary with children including terms such as coding, programming, design brief, robot, sequence, forward and turn symbols. Our experience highlights that very young children readily understand and use these terms as a part of their play.

Design briefs to introduce coding and robotics

As part of a PBDL approach, we give children design briefs or concise statements that outline tasks in simple terms. The design briefs always start with ‘the child’ and ‘the familiar’ so that all learning is responsive, meaningful and relevant to children. Progressively, over the course of a teaching and learning sequence, the design briefs require children to transfer what they know about themselves, familiar materials and familiar contexts to increasingly less familiar people, materials and/or contexts. For example, when setting up a PBDL coding activity, we provide students with concrete symbols that represent the coding language of the Bee-Bot robot (Figure 1). We also provide the design brief, ‘Make yourself move like a robot’. This design brief intentionally supports young children in a play-based exploration of coding through playing

Figure 1. The coding or programming language of the Bee-Bot robot.

the Child (1989), ‘Children have the right to relax and play, and to join in a wide range of cultural, artistic and other recreational activities’ (p. 9). Also important to PBDL is Goal Two of the Melbourne Declaration on Educational Goals for Young Australians (2008), which states that successful learners ‘have the essential skills in literacy and numeracy and are creative and productive users of technology, especially ICT, as a foundation for success in all learning areas’ (pp. 8–9). PBDL also draws heavily on Outcome Four and Outcome Five of the Early Years Learning Framework (EYLF) (Commonwealth of Australia, 2009), by specifically providing children with authentic opportunities to use symbols in play to represent their learning and construct meaning. Finally, PBDL provides Foundation to Year 2 students with ‘opportunities to create a range of digital solutions through guided play and integrated learning, such as using robotic toys to navigate a map’ (ACARA, 2015, p. 72), as part of the Digital Technologies subject of the Australian Curriculum’s Technologies learning area. By introducing coding and robotics to young children, educators are also setting children up for success in their future schooling via curriculum continuity as they will already be familiar with the topic.

Then, a few days later, a second design brief can be introduced to the children that asks them to, ‘Make your friend move like a robot’. The children move from a meaningful and familiar space (making themselves move like a robot) to one that is less familiar and more dynamic as they engage in playful, interactive learning activities (making their friend move like a robot). Through this design brief, children are scaffolded and supported to transfer their understandings about coding themselves to coding a friend.

At this point, we then introduce a third design brief, ‘Make the robot move’, effectively moving from the ‘familiar’ and ‘concrete’, to the ‘unfamiliar’ and ‘abstract’ as students code a robot. This is then followed up with more explicit design briefs that ask the students to, ‘Make a program for the robot’, (using the same cards) and ‘Test your program using

‘Make yourself move like a robot’ design brief symbol cards.
PBDL involves immersing children in a technology-rich environment, where they are encouraged to play and experiment with coding and robotics in whatever ways are meaningful to them. And, they are encouraged with feedback like, ‘Great coding!’ and ‘Excellent programming!’ when they make Bee-Bot move from one place to the next. When likened to ‘best practice’ in planning and teaching the traditional literacies, PBDL makes good sense.

References


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the robot’. Importantly, we always ask the students to tell us what and how they made themselves, their friends and the robot move. By using design briefs as part of PBDL, early years educators can plan carefully sequenced, scaffolded, purposeful and playful teaching and learning experiences through and with robots. Playing with the robot is an example of children coding. When children verbalise what they did with the robot, they are engaging in algorithmic thinking. Critically, students are using digital systems just for fun as part of their play. Once children have had the opportunity to play, explore and experiment with robots without formal instructions, educators can introduce slightly more complex design briefs to further extend and enrich their learning experiences.

Coding Bee-Bot through free play and inquiry play

Conclusion

PBDL is an approach to authentically introduce digital literacies—specifically coding—and the ‘T’ in STEM into early years settings. When learning to read and write, young children are immersed in print-rich environments, encouraged to play and experiment with books and other texts in ways that are meaningful to them. And when young children are playing and experimenting with ‘traditional literacies’ by, for example, holding a book up-side down and turning the pages ‘left to right’ instead of ‘right to left’, educators smile and encourage the child with feedback such as, ‘Great reading!’ ‘Wow! What excellent reading you are doing!’ Similarly,