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CHILDREN AS ARCHITECTS OF THEIR DIGITAL WORLDS

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Introduction

Given current sweeping changes in digital literacies, children need to acquire knowledge and proficiencies to navigate a constantly changing, complex digital world (Berger et al., 2001). Across the globe, a general consensus exists that classrooms need to shift the 20th-century models upon which they were originally designed and remain predominantly structured, in response to these changes. School systems worldwide are addressing new digital challenges (Burnett & Merchant, 2016; DEEWR, 2012; Gov’t of Alberta, 2016; Sahlberg, 2015), and beginning to acknowledge, understand, and address the ways in which children’s own digital agency, usage, and proficiency are also shifting.

Recent developments in mobile device technologies enable young people to access and contribute to digital media and the social worlds around them from early childhood. They are able to extend their play across digital and physical worlds in ways that were not previously possible (Marsh, 2010; Rowsell, Saudelli, McQuirter-Scott, & Bishop, 2013). This chapter’s authors have been investigating how the relationships across language, literacy, and literature in the curriculum have been impacted in the digital era. This work finds that young people constantly shift between/across/through these communication forms as they text/design/produce/phone/play games/talk with each other, often simultaneously. The children and young people focussed on have shifted their textual dispositions, mirroring Carrington’s (2017) research suggesting that the boundaries between the digital and ‘offline’ realms are blurring, and that the metaphors for online/offline may no longer be valid. Moving from the stability of the printed word to the ephemerality of digital texts, textual genres are constantly morphing and young people are developing both new and traditional digital literacy and design skills through their digital play (Laidlaw & Wong, 2016; O’Mara, 2017; O’Mara & Laidlaw, 2011; Rowsell, 2014; Yelland, 2015) as they become architects of their digital worlds.

This chapter considers how children can become architects of their digital worlds and the ways that the adults around them might support this. It draws on three case studies from Australia and Canada to illustrate ways in which young people aged 5 to 10 years old design and create within open-ended applications, and describes how schools might utilise young people’s engagement with these applications to develop digital literacy, design, and coding skills.

The term ‘digital literacies’ is used to refer to literacy practices that are digitally and technologically mediated, as children access, use, analyse, produce, and share texts and other artefacts
(Marsh, 2005; Merchant, 2015; Pahl & Rowsell, 2010; Sheridan & Rowsell, 2010; Walsh, 2011), drawing from the maker movement to inform this research. The maker movement refers to an approach that embraces creative production by providing the technologies, resources, and materials to make texts and objects through experimentation and problem-solving (e.g., Halverson & Sheridan, 2014; Peppler & Bender, 2013). Students engage in ‘making’ and producing different kinds of texts and objects, and then reflect upon their processes. These processes inform new ways of thinking about literacy learning and teaching, particularly where children and youth are able to respond to the affordances of digital media to produce, design, and even make widely public their own digital texts and products. The metaphor of ‘the architect’ is used to represent the requirements for effective digital literacy learning – where students are cast in the role of designers, producers, problem-solvers, and innovative thinkers, and can be working to develop spatial literacies and concepts in three-dimensional spaces, and with a range of materials and media, both virtual and actual.

**Unboxing Dot and Dash: Creating Imaginary Worlds through Coding and Digital Play**

The first example draws from a case that is part of a longitudinal study of home and ‘out of school’ literacy practices. In this case, Suzanna began observing and gathering literacy data from a set of twin girls in Canada when they were three years of age. The authors have continued to follow the girls’ digital literacy interests and engagements, and, in the example focussed on here, they are now ten years old. Olivia and Hannah have been active and curious users of a range of technologies (iPods, iPads, laptop computers) from the time Suzanna began observing them when they were younger and perhaps even earlier. While older now, they have remained interested in creating and producing their own play materials, both digital and traditional print based. As three-year-old children they owned individual iPods and before the end of the initial study phase, which followed them for two years, they also began to use iPads. Their mother gave them a small amount of pocket money every month for buying apps (applications) and they learned to pool their resources and share the games and apps they purchased to increase their play options. Fast forward to more recent times and the girls continue to show resourcefulness, interest, and curiosity about ‘making’ and technology. Their mother is a library technician for a city library ‘maker space’ and former teacher. The girls are being home schooled due to their mother’s interest in teaching and her belief that she can support their engagement and deep learning. Home schooling or ‘parent directed learning’ is an option that receives support and funding from the local school district, with a significant portion of participating families choosing this option due to the desire for flexible instruction. Both girls also attend some classes at a school district centre that offers support for home-schooled children.

The following vignette occurred when Olivia and Hannah were invited to visit Linda and Suzanna’s literacy lab at the University of Alberta to try out some new robotic and ‘maker’ resources. They chose to ‘unbox’ the ‘Wonder Pack’ that contained the small robots Dot and Dash and ‘challenge cards’ for beginning to use coding to work with the robots (www.makewonder.com). Dash is a small interactive and mobile robot than can be programmed to respond to voices and sounds, while Dot can be programmed to create a range of different interactive games. The girls commented that Suzanna and Linda should make a video of their ‘unboxing’ (see Marsh, 2016 for further description of the ‘unboxing’ phenomena) and were keen to have their robotic activities recorded. While Olivia and Hannah had extensive experience working with iPads and a range of computer games, they had never worked with robotics previously, and the ‘Dot and Dash’ robots were new to them. They were keen to work in the role of ‘testers’
for these new activities. Their ‘unboxing’ and initial activities were filmed as part of data gathering and also because the girls were keen to have their experiences recorded.

After they open the kit, Hannah and Olivia intently examine the interface on the two iPads (Suzanna and Linda had previously uploaded the Wonder app (www.makewonder.com/apps/wonder):

Hannah decided she would work with ‘Dash’, while Olivia was in charge of ‘Dot’. They explore, poke, tap on the iPads and review information on the coding cards. They make some changes to personalise the robots, modifying their eye colours, and give the robots new names. After observing and testing out how the robots can respond to simple commands via the iPad, Hannah sets Dash on the floor in order to explore the little robot’s capabilities – playing with movement and sound options. Hannah makes Dash roll quickly down the long hallway alongside Linda and Suzanna’s department colleagues’ offices. Hannah explores the sound options and learns how to make Dash bark like a dog, and make other animal sounds, but no adults come out to investigate the curious sounds outside their closed office doors. ‘Hmmm,’ reflects Hannah, ‘You know, we could record someone knocking on the door and see if that gets someone’s attention . . .’. She brings the little robot to our work space and records herself knocking loudly on the door. With a mischievous smile, she sends Dash gliding back down the hallway, where he ‘knocks’ on a colleague’s door. Eventually there is a response from a neighbouring office, and an adult peers out in response to the ‘knocking’. Hannah, in a fit of giggles, hurries back into the literacy lab, making Dash run behind, before our confused colleague can sort out what has just taken place.

While this first ‘case’ example is a simple one – two young girls who are exploring coding through the ‘Dot’ and ‘Dash’ robot characters – it was selected as a representation of how easily and quickly children can begin to design and create an imaginary ‘world’ through digital play. For these girls, the experience was connected to exploration of a new digital device (the robots) ‘having a bit of fun’ and playing a trick on the adults. For them, learning some new digital skills (simple coding) was secondary to working with the devices in a way that extended their own social and play preferences, with Hannah actively trying to engage others in her ‘game’ with Dash, and Olivia working individually to program Dot to play a game she would show later to her sister and mother. As they learned how the robots operated and explored some of the possibilities through coding on the ‘challenge cards’, they brought their own interests and capabilities to the activities, and subsequently have communicated with Suzanna that they would like to return to test out some new ideas they have for working with the robots.

As Marsh (2016) suggests, the relationship between children’s online and offline practices deserves consideration, which can be extended further to digital and non-digital learning and play in this example. The realm of digital learning – that of interpreting basic coding instructions and working with the iPads to operate the robots – for the two girls was interconnected with their desire to engage in mischievous play, and also perhaps to engage in a ‘performance’ to show the adults (researchers, parent, and the colleagues ‘down the hall’) that they had agency and control over what the robots could do. The girls’ ‘unboxing’ and exploration of the devices and the capacities of the robots quickly shifted to social engagements, with each other and also extending an invitation for others (even outsiders) to play by luring them to open their office doors. Significantly, the ten-year-old children rapidly figured out how to engage with the robots and get them to perform particular tasks, and they learned how to use the coding instructions very quickly. This was in stark contrast to observations of a group of teachers invited to test out the Dot and Dash; the adults took much longer to figure out how to work very basically with
the robots and, unlike the two children, spent much longer reading instructions before getting started and were more hesitant about physically touching and engaging with the devices.

**Designing a Sustainable Present: Teachers Enabling Minecraft Worldmaking**

Along with the introduction of robotics such as Dot and Dash in schools, there has been an increase in schools using open-world digital games where players can create virtual worlds and interact with the world in the classroom. These games, such as *Minecraft* (Mojang, 2011), are readily adaptable to a wide range of curriculum usages, whereas linear games are often less adaptable to classroom usage. In *Minecraft*, players build using blocks – designing, creating, and making their own world. There are many different modifications in the game, enabling some customisation, and also a huge array of materials that can be mined, grown, and sourced. As well as being persistently and overwhelmingly popular with young people, having reportedly over 91 million players per month (Statistica, 2019), *Minecraft* offers multiple affordances to schools with a wide array of curriculum possibilities. It has been used in maths to create a scale replica of a school and to make scale models of rooms, in history to create a replica of historic locations such as the Globe Theatre and ancient Rome, and to create designs for sustainable housing. The ways in which the game’s affordances might be drawn upon, particularly the passion and dedication many young people have to the game, and the possibility of drawing on this to create impassioned learning (Dezuanni & O’Mara, 2017), enables children to operate as literal architects in creating collaboratively a digital world.

Jo researched the development of a *Minecraft* unit with a group of over 130 Grade 5/6 students in an Australian primary school. In this unit the students worked collaboratively to design a new, sustainable virtual world in *Minecraft*. The teachers designed this unit (approximately 80 hours altogether over 10 weeks) following a ‘Spaceship Earth’-styled scenario (see, for example, Morgan & Saxton, 1989), where the Earth is destroyed and there is an opportunity create a new, utopian version. In this case, the planet is in chaos due to the effects of human-induced climate change: loss of food and drinking water, and an exponential increase in the rate of natural disasters lead to civil unrest, poverty, and spread of disease. Throughout this unit, the students were given opportunities to ‘terraform’, design and create the new planet, and the design included both structural and societal aspects of life there. In preparation for leaving Earth, everyone designed a spaceship. In doing this, the young people drew upon their knowledge from both science and science fiction, merging the scientific and the fictive together in their designs, and drawing on their imaginings of what they might need for the journey – how to prepare, what they might need to bring to the new planet, and what was important to them. This activity deepened the inquiry through enabling students to imagine both possibilities and restrictions of leaving Earth. Classes then conducted a drama exercise where the chairs were placed according to the rocket design selected, the students acted out packing the rocket, the farewells to friends and family, and the lift-off to the new planet. When the rocket landed, everyone held onto their seats and imagined themselves zooming into *Minecraft* and entering the new planet, which was the *Minecraft* server. Laptop lids were opened and the students shifted between the dramatic virtual world and the digital virtual world, imagining themselves landing on the planet in *Minecraft*. Jo was present and participated in one of these classes. She noted that the students shifted the play from the dramatic virtual world to the digital virtual world seamlessly.

While teachers framed the design of the unit, they tried to work so that students could collaborate and work creatively together to make the decisions for how the new world would operate. Teachers provided an overview structure where students worked on different districts or sections of the *Minecraft* world, each with a specific purpose: Industry, Agriculture, City and Culture,
Discovery and Education, and Recreation. Additionally, a weekly ‘All Citizens Meeting’ was held in the school hall. Initially the meetings were teacher-led, with new questions and prompts given to the students. Later, students worked in their districts, with reports from each district about issues that were occurring given to everyone. Over the duration of the project, the teachers stepped back and the students took increasing control of organising the meetings. At the end of the unit, students presented their findings more broadly at a large summit to younger students at the school, parents, and invited external guests.

For the teachers involved in the Minecraft unit, the development of high-level IT skills and teaching styles that worked with this kind of project were key. One of the teachers, Bec, commented:

> You have to be comfortable with changing your style of teaching. I think that for some teachers it’s difficult because it is very much a ‘facilitator’ role and not a ‘dictator’ role, and you have to be comfortable with that. You have to be comfortable with the fact that the kids are going to know a heap more than you, and you have to trust them … there is a lot of fear of the unknown.

She described the skills for teachers as ‘additional, not different’ to skills used in everyday practice. She said, “it’s another tool. You’re not replacing existing strategies. You are enhancing through the use of gaming”.

In addition to developing new teaching skills, working with parents is integral to the success of a curriculum unit like this one. Parents can sometimes be suspicious of ‘open’ curriculum work, and the school was constantly dealing with ‘moral panics’ connected to technology, particularly when additional technology was introduced into the curriculum. In this unit, most parents were impressed with the quality of the work the students achieved and were generally supportive of the work. However, there were some parental complaints about the killing of animals in Minecraft, and the school had complaints about the “clearing the land of creatures that live there”. Bec expressed her frustration at this. She iterated that the teachers were not “sending messages to children to hurt the land animals … They weren’t animals! They were shapes! They are pixelated shapes!”

In this unit, in order to enable the students to have the freedom to design, teachers’ practices had to change significantly, they had to trust the students, and they needed to work carefully in communicating clearly with parents.

**Digital Game Making in School**

This chapter now considers how schools and teachers might work with young people to enable them to be architects of their digital world. It is becoming more common for students to design, code, and make their own games in school, particularly with the focus on STEM subjects in both Canada and Australia. Jo has worked with several teachers who have been developing their programmes and practices over an extended period of time, finessing them as they offer game making year after year to their students. One of these high school teachers, who has guided his classes through game making with GameMaker™ from YoyoGames for over ten years, noted that one of the great pleasures of this work is that every student designs, makes, and codes a playable game that they can play and share with friends (O’Mara & Richards, 2012). At his school there were many examples of the student-made games being played extensively by others. In one case, Jo researched a small group of students who had made a very successful game in class. After the class game making unit finished, the students continued building levels on the game, accepting ideas and even levels made by students outside the group. A large group from
across the year level designed an informal ‘Championship Series’, where young people competed against each other to become the champion player of the game. The game architecture the students designed in this case extended from the production of the game itself into the social aspects of its usage – the playability, the ability to be reconfigured and re-designed, and a shaping around the purposes of play – the championship itself.

It is only recently that more opportunities have been provided for children to make games in elementary/primary school, and we noticed that this has occurred in conjunction with the rise of provision of 1:1 computing in elementary schools (O’Mara, Laidlaw, & Blackmore, 2017). Kon, a teacher at a government primary school in Melbourne, worked over a three-year cycle with the 8–10-year-old children in his class making their own digital games using Scratch, free ‘visual’ programming software developed by the Lifelong Kindergarten Group (2003) at the MIT Media Lab. The Scratch website is designed to be both a resource and a community, and is highly accessible for usage with young people. Resnick et al. (2009) describe it as “more tinkerable, more meaningful and more social than other programming environments” (p. 2). Scratch has blocks of computer instructions that can be moved around to create commands. Marji (2014) describes programming in Scratch as “snapping those color-coded blocks together as you would puzzle pieces or LEGO bricks” (p. 21).

The students in Kon’s class worked in teams, positioned as software architects and designers, running their own digital game design lab, taking on and sharing different production roles. The work was integrated more deeply into the curriculum as Kon came to understand the game making processes and affordances more deeply himself. By the third year of running the game making unit with his students, Kon worked much more extensively to prepare the students for making the games than he did when he first ran the unit, so that extensive critical literacy and analysis work were linked into the making process. Students began by reviewing commercial games. They analysed digital game storylines and how they worked, considered that some games have multiple possible ways of being played and that some games have sequential levels, and how all the elements of a game come together to produce the experience of gameplaying. The unit also focussed on the marketing of games and the usage of ‘in app’ purchases. Students then designed their own narratives, storyboarding, and characters, and wrote a prequel to the game. Games were programmed using Scratch, with character drawings and narrative elements built into the game. Once a game was coded, it would be tested by other students, with feedback provided about the clarity of the instructions and the ‘playability’ of the game. The games were saved onto CDs and the students designed logos and box covers for the games, as well as an in-box game booklet.

In an interview with Kon at the end of the project, he described the final game pack as having everything in it: “to show the journey, beginning with nothing, and then to the end product”. He described the improvements made to the game making unit over the three years:

The first year was building an interactive game. Because that was the first year, it was more about getting games working and having sort of a rough story. And the second year was more consolidating that and getting all that literacy stuff like character design and character profiles and stories and trying to get it together. And then this year, actually, we have been getting it all together ... This year they were able to build a game, build a game booklet, and then like a DVD case that went with it ... They have actually produced a product like you would buy in the shop. So, we finally got it to where we wanted it. So, it feels like we have accomplished more this year than ever before.

Students were further enabled to become game producers as Kon’s familiarity and skills with both the game making and the teaching and learning cycle around the game making unit
increased. Lankshear, Snyder, and Green (2000) note the importance of teachers being adept users of technology, arguing for ‘teachers first’ when introducing digital technologies in the classroom. Nearly 20 years later, this same principle is in action again with Kon, an expert user of technology and an expert teacher incorporating technology into the teaching and learning cycle – and that as his specific knowledge around the unit increases, the design of the curriculum becomes more nuanced and provides more opportunities for students to become architects of their digital worlds.

**Children as Architects of Their Digital Worlds**

These three examples illustrate the ways in which young people can be provided with opportunities to be producers rather than consumers of digital knowledge. In each of the three cases the children and young people are positioned as planners and designers, with the opportunities to imagine and create. As architects report that they do in their work (Leclerc, 2018), the young people in the three examples were also planners, problem-solvers, non-linear thinkers, who made connections within their immediate contexts and ‘worlds’.

Importantly in each case, the young people were given the opportunity, support, and freedom to develop and create their own digital worlds. Olivia and Hannah have been supported and encouraged throughout their lifetime in their experimentation, usage, and creation using digital technologies, so they were open, knowledgeable, and imaginative in their approach to Dot and Dash. The school-based examples required the teachers to provide more openness to the students and, as Bec put it, to shift from ‘dictator’ to ‘facilitator’. While many different approaches to teaching and a range of practices are available, teachers and adults working with children must work as enablers and facilitators, with young people provided with the time, space, opportunity, and supports to create and design as architects of their digital worlds.

**Notes**

1. We acknowledge a presentation by architect Eleonore Leclerc which has further informed our use of this metaphor.
2. You can watch a short video of Kon and his students through this link here: https://youtu.be/aTO99H50p8.

**References**


