

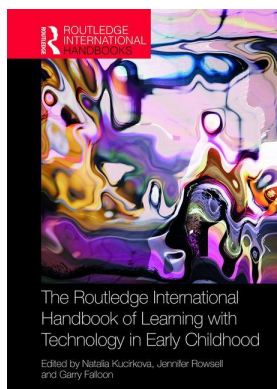
This article was downloaded by: 10.2.97.136

On: 11 Dec 2023

Access details: *subscription number*

Publisher: *Routledge*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: 5 Howick Place, London SW1P 1WG, UK



The Routledge International Handbook of Learning with Technology in Early Childhood

Natalia Kucirkova, Jennifer Rowsell, Garry Falloon

The parent-child-app learning assemblage

Publication details

<https://test.routledgehandbooks.com/doi/10.4324/9781315143040-15>

Donell Holloway, Leslie Haddon, Lelia Green, Kylie J. Stevenson

Published online on: 12 Feb 2019

How to cite :- Donell Holloway, Leslie Haddon, Lelia Green, Kylie J. Stevenson. 12 Feb 2019, *The parent-child-app learning assemblage from: The Routledge International Handbook of Learning with Technology in Early Childhood* Routledge

Accessed on: 11 Dec 2023

<https://test.routledgehandbooks.com/doi/10.4324/9781315143040-15>

PLEASE SCROLL DOWN FOR DOCUMENT

Full terms and conditions of use: <https://test.routledgehandbooks.com/legal-notices/terms>

This Document PDF may be used for research, teaching and private study purposes. Any substantial or systematic reproductions, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The publisher shall not be liable for an loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

THE PARENT-CHILD-APP LEARNING ASSEMBLAGE

Scaffolding early childhood learning through app use in the family home

*Donell Holloway, Leslie Haddon, Lelia Green
and Kylie J. Stevenson*

Introduction

The roll out of touchscreen technologies such as smartphones and tablets into the domestic sphere has allowed very young children the opportunity to use digital media. Somewhere around the age of 10 months to 14 months a baby learns to point with his or her forefinger, and is ready to tap and swipe a touchscreen (Holloway et al., 2015). Previously, such very young children needed assistance to use a mouse or keyboard on laptops and PCs. As a result of this new user group, mobile touchscreen devices now have a large choice of child-friendly apps and games that help create relatively straightforward access for infants and pre-schoolers, allowing even the youngest children to go online, or interact with them.

This chapter investigates the complex interplay between pre-school children, their parents, touchscreens and literacy learning apps within the family home. It is written in the context of a project funded by an ARC-Discovery Grant entitled *Toddlers and tablets: exploring the risks and benefits 0–5s face online*, which investigates family practices and attitudes around very young children's internet use in Australia and the United Kingdom. The study draws on the notion that the home is a discrete environment with its own material-discursive practices. Domestic technologies are locales wherein these material-discursive practices are articulated and enacted, and the three-way intra-action with these technologies outlined in this chapter (when a parent co-uses an app with their child), forms a complex learning assemblage that transcends established understandings of adult-child learning practices.

The chapter begins by outlining the conceptual framework and research methods used in this analysis. This is followed by an investigation into the notion of scaffolding and its use within the context of early childhood practices with technology. We go on to argue that, when parents co-use learning apps with their very young children, an instructional assemblage is formed between parental scaffolding, in-built (app) scaffolding and the child. This complex interplay between parent, child and app can be interdependent, complementary or incrementally beneficial in nature, depending on the design affordances of learning apps, as

well as reflecting parental attitudes and skill sets in scaffolding their child's learning through technology.

Conceptual framework and research methods

The conceptual framework for this chapter draws on a broad posthumanist approach to education and early literacy (Taylor, 2016); one where careful attention is given to both human and nonhuman bodies and things within the research process, in an effort to devolve the anthropocentric dominance of normative research methodologies and methods (Taylor, 2016). Within this framework, researchers thoughtfully consider “theories and matter in the world (i.e. students, schools, teachers, writing, books, art supplies, plants, digital tools and so forth) in order to create new theories, literacies, methodologies . . .” (Kuby & Rowsell, 2017, p. 287).

Grounded in relational ontology, involving humans, nonhumans and more-than-humans (as in humans-plus-other-entities) (Kuby & Rowsell, 2017), posthumanism takes into consideration the entanglement between humans and other sentient and non-sentient actors. In education, it is concerned with the intra-activity between humans, things, communities, languages and so on; exploring how this active entanglement produces new ways of knowing or, in the case highlighted within this chapter, new ways of ‘doing’ literacies.

By taking into consideration both human and nonhuman bodies, and by being sensitive to the intra-activity between these bodies, attention can be given to intra-actional elements very often ignored by researchers when using traditional, human-centric approaches to qualitative research. Therefore, in talking about and investigating young children's uses of digital technologies and the contexts in which these technologies are used, researchers, parents, pre-schoolers and digital technologies are seen to interact and be given equal importance – as equivalent research subjects within the research moment. As media studies researchers, we worked with parents and children in their broad domestic contexts (including in- and out-of-home activities, and grandparental and wider-family involvement), to investigate and share the everyday knowledge and strategies that this cohort of technology users has already developed when intra-actively using touchscreen technologies.

The methods used in this chapter are influenced by posthumanist researchers who now argue that posthuman research should be regarded as a methodological framework from which research methods evolve. Therefore, there is not an overly prescribed research design “with predetermined questions and methods of analysis” (Kuby & Rowsell, 2017, p. 287), but rather (like grounded theory research) a broad area of research approaches through which new theories, literacies, methods or methodologies are developed during the research and analytical stage of the project. A central difference, however, between grounded theory research and posthuman research is the emphasis placed on the nonhuman subject and the agency evident within any enactment between nonhumans and humans (Kuby et al. 2017).

Assemblage is a concept initially propounded by philosophers Gilles Deleuze and Felix Guattari in the 1970s and 1980s. Deleuze's conception of assemblage is that it is “a multiplicity which is made up of many heterogeneous terms and which establishes liaisons, relations between them across ages, sexes and reigns – different natures” (Deleuze & Parnet, 1987, p. 69). The commonality involved in an assemblage is that the heterogeneous parts co-function together to form a whole, that operates in synthesis over a certain period of time (Muller, 2015). The educational assemblage described in this chapter contains human (parent and child) and nonhuman (learning app) actants that function together for a certain time. This instructional assemblage (of parent, child and learning app) is a pro tem assemblage with no predetermined hierarchy or permanency.

The qualitative research took place in Perth, Australia and London, UK. It consisted of three stages, which are:

- 1 In-depth interviews with 21 families (9 in the UK and 12 in Australia). This phase involved interviews with parents, and play-led interviews with their children aged between 0 and 5. Still pictures and/or video recordings were also made during the play-based interviews with children;
- 2 Participant (parent/older sibling) produced video recordings of children using their touchscreens occurred over the four weeks following the initial interview. This allowed access to areas of everyday life that usually exclude researchers, including moments that young children are engaged with their touchscreens; and
- 3 A follow up interview, usually occurring when the video recordings were collected.

The interviews and video recordings were then transcribed and analyzed.

This chapter focusses on data from one of the Australian case studies. Despite observing parents and siblings co-using learning apps with their pre-school aged children (either first-hand or in the parent-made videos), the data from this Australian family (with distinct input from the app) clearly illustrates the three-way intra-active entanglement between child, parent and technology.

Cognitive, affective and technical scaffolding: parents, children and apps

First coined in 1976 and used by psychologist Jerome Bruner (1915–2016), scaffolding, as a concept, involves coordinated interaction between an adult and child with the aim of reaching a specific learning goal (Wood et al., 1976). The term scaffolding is quite similar to Vygotsky's zone of proximal development and the terms are sometimes used interchangeably. In terms of technology use, Yelland and Masters (2007) suggest that adults scaffold children's learning in three ways: cognitive scaffolding, affective scaffolding and technical scaffolding. Cognitive scaffolding "helps children solve problems, gain content knowledge and understandings about their world, and involves asking questions, providing directions, expansions on vocabulary and word meanings, repeating and emphasizing words" (Nuemann, 2017, p. 4). Affective scaffolding gives children positive or supportive feedback, and technical scaffolding helps children navigate the tasks on the app (Nuemann, 2017).

The focus child in the highlighted transcript is Scott, who was 2 years and 7 months at the time of the interviews. He lives with his mum, dad and older brothers aged 5 and 8. The family is Anglo-Celtic Australian. Mum is a part time university student and dad works as a fly-in-fly-out mechanic and workshop manager in Kununurra. The older boys own their own tablets while Scott tends to use his mother's iPad and smartphone. The boys Skype with their father on a weekly basis when he is away for work. The family also has an Xbox, a PC and a laptop.

Our research with families of very young children found that parents carry out all three forms of scaffolding when co-using learning apps with their children. The following transcript from Australia highlights the manner in which parents scaffold their very young children's engagement with learning apps. The excerpt is taken from a follow up interview with Kate (AU), mother of Scott (2), Liam (5) and Ben (8). The interviewer asked Kate to talk her through the participant videos she was handing over. Scott, who was the only child at home with his mother at the time, climbed onto Kate's lap, picked up Kate's iPad and turned on his Reading Eggs app.

The research assemblage

The instructional assemblage described in this chapter relied not only on the intra-activity of the parent, child and app but also on the material-discursive conditions at the time of the interview. Scott (2), having taken part in a play-based interview with the same researcher, and having watched his mother being interviewed four weeks beforehand, was aware that these research interactions in his home were about him and his digital world – and that this was a time he could freely use his mother’s tablet. Thus, the physical presence of the interviewer as she entered his home signposted for Scott that this was a time that he could play on the iPad. At the same time, proximity to his mother likely engendered further comfort and relaxation in the company of a near-stranger. Indeed, Scott choosing to sit on his mother’s lap generated a proxemic arrangement similar to other parent-child-text encounters.

The full transcript indicates that Scott (2) is not directed in any way by the interviewer, who intended to talk with his mother about the videos she had taken. Scott’s engagement with the learning app and his mother, although engendered by the presence of the interviewer, was not initiated by adult questioning or direction. By climbing up on his mother’s lap with the iPad, and playing on an app while the interviewer entered the house and joined the family circle, Scott was reacting to the physical presence of his mother and the interviewer, adult bodies that (while together) supported and encouraged his digital play. The material-discursive conditions of the interview, therefore, were inductive to Scott initiating engagement with the app, and with his mother, without concern about the extra adult at the table.

Parent scaffolding: the anthropocentric approach

The following transcript excerpt is an example of a normative, anthropocentric approach to research; one where the human voice is given priority over non-human actants. Indeed, non-human actants are often unconsciously dismissed or taken out of transcripts written by researchers and transcribers. For example, noises made by apps during an activity-based interview with a child (who is actually playing on that app) may be mentioned in a transcript as “app playing in background” or similar. Or the friendly dog in the room who facilitates rapport between researcher and child is seen as an interference to the research process – making the interview and transcript seem messy and unfocused.

The following excerpt depicts a three-way conversation between the interviewer, Kate and Scott. The excerpt draws attention to the ways in which the parent scaffolds her child’s learning through cognitive, technical and affective scaffolding. It incorporates all humans in the room at the time that Scott was playing his Reading Eggs app, illustrating how normative research frameworks and methods tend to be anthropocentric – concentrating on human-to-human exchanges only.

Parent scaffolding in the parent-child-app learning assemblage

Kate: (To Scott) Alright, do you want me to turn it up a little bit? (*Kate shows Scott where the touchscreen volume control is.*) Technical scaffolding
It’s that one.

Interviewer: So he doesn’t know how to turn the volume up himself?

Kate: Oh, he works it out sometimes. (To Scott) You’re going the wrong way. There you go. (To Interviewer)

- He . . . on some apps there's a volume control on it so he mightn't do that, that's why he was stuck. Technical scaffolding
- Scott: One more, Mum?
- Kate: (To Scott) *No, the other one's just locking it.*
- Interviewer: And so when he's on the touchscreen do you sit with him and co-use it sometimes?
(Reading Eggs app plays quietly in background as Kate speaks.)
- Kate: (to Scott) *Doing writing? Can you do the writing?* Cognitive scaffolding
(Scott traces a letter with his finger on the iPad screen.)
- Kate: (to Scott) Can mummy have a turn?
- Scott: No, mum.
- Kate: (to Scott) *Yay, you got the letter.* Affective scaffolding
- Interviewer: So that's the Minecraft video, when they are playing Minecraft together?
- Kate: That was yesterday. When you've got the volume, they talk about it and it shows what they are doing to each other. I thought you'd like that. It's the first time I'd seen them doing that, yesterday.
- Kate: (to Scott) *B for baby. What's B?* Cognitive scaffolding
- Scott: B . . . a B there. (Points to iPad Screen.)
- Kate: (to Scott) *that's a B there . . . but this is different. This is C. (Sounds out hard C.)* Cognitive scaffolding
- Scott: C! There.
- Kate: (to Interviewer) Most of it's Scott.
- Scott: C is there. D.
- Kate: *D. D, D, d for dog.* Cognitive scaffolding
- Scott: dog.
- Kate: *This is E. E for egg.*
- Scott: Two.
- Kate: *No, that's not two, this is an E. Egg.*
- Scott: Egg.

In this recording, Kate is captured scaffolding Scott's learning by encouraging, redirecting, correcting and repeating the audio scaffolding on the app. She uses cognitive scaffolding (e.g. that's a B there . . . but this is different. This is C), affective scaffolding (e.g. yay, you got the letter) and technical scaffolding (e.g. you're going the wrong way. There you go.).

The parent/child/app instructional assemblage

Augmenting the previous transcript, the following excerpt incorporates audio of the three-way learning assemblage, highlighting the intra-active entanglement. It expands the conversation to include the Reading Egg app running during the interview. It shows that, at the same time that Kate is supporting Scott's learning through affective, cognitive and technical scaffolding, the app is also scaffolding Scott's learning with affective scaffolding (e.g. you're doing a jolly good job), cognitive scaffolding (e.g. B, B . . . B is for baby) and technical scaffolding (e.g., try again).

App scaffolding in parent-child-app learning assemblage

- Kate:* (To Scott) Alright, do you want me to turn it up a little bit? (Kate shows Scott where the touchscreen volume control is.) It's that one.
- Interviewer:* So he doesn't know how to turn the volume up himself?
- Kate:* Oh, he works it out sometimes. (To Scott) You're going the wrong way. There you go. (To Interviewer) He . . . on some apps there's a volume control on it so he mightn't do that, that's why he was stuck.
- Scott:* One more, Mum?
- Kate:* (To Scott) No, the other one's just locking it.
- Interviewer:* And so when he's on the touchscreen do you sit with him and co-use it sometimes?
(Reading Eggs app plays quietly in background as Kate speaks.)
- Kate:* (to Scott) Doing writing? Can you do the writing?
(Scott traces a letter with his finger on the iPad screen.)
- Kate:* (to Scott) Can mummy have a turn?
- Scott:* No, mum.
- Kate:* (to Scott) Yay, you got the letter.
- Interviewer:* So that's the Minecraft video, when they are playing Minecraft together?
- App:* *Try again.* Technical scaffolding (app)
- Kate:* That was yesterday. When you've got the volume, they talk about it and it shows what they are doing to each other. I thought you'd like that. It's the first time I'd seen them doing that, yesterday.
- App:* *B, B . . . B is for baby.* Cognitive scaffolding (app)
- Kate:* (to Scott) B for baby. What's B?
- Scott:* B . . . a B there. (Points to iPad Screen.)
- Kate:* (to Scott) that's a B there . . . but this is different. This is C. (Sounds out hard C.)
- Scott:* C! There.
- Kate:* (to Interviewer) Most of it's Scott.
- Scott:* C is there. D.
- Kate:* D. D, D, d for dog.
- Scott:* dog.
- App:* *You're doing a jolly good job.* Affective scaffolding (app)
- Kate:* This is E. E for egg.
- Scott:* Two.
- Kate:* No, that's not two, this is an E. Egg.
- Scott:* Egg.

This audio transcript hints at, but does not capture, the visual scaffolding offered in the app. These visual cues most often provided Scott with affective and technical scaffolding, in the form of mini games as rewards and flashing images and signs to help him navigate the game.

Cognitive scaffolding within well-designed apps for young children uses little text support, preferring the use of text-to-speech comments and instructions where needed (e.g., B, B . . . B is for baby). Voice instructions are presented at a speed and language level suitable for young children, and instructions are repeated if the child does not respond. Affective scaffolding in app design is afforded through the use of voice reinforcement (e.g., you're doing a really good job) as well as the use of badges, characters, cheering or clapping to indicate positive results. Technical scaffolding in the design of children's apps underpins children's independent navigation of their app. Objects, characters or signs are often animated to signal to children they can be touched and, for children who do not respond as desired, animations or images are used to model the appropriate response (e.g., @@@@ through the use of arrows to indicate that the child should use a swipe) (Marsh et al., 2015).

Extensive thought and planning are consequently evident in well-designed apps, but not all apps are created equal. Thus, with some apps, it is not clear what the desired goal of the activity should be, nor necessarily how the child progresses to the next screen, or the next level. Sometimes, the app will let the child know that their response is 'wrong,' but will not offer suggestions or support the correct response, or how to attempt something differently. Sometimes apps are well-designed, but are more suited for an older child than the child currently using it: offering text instructions, for example, when the actual app user at that moment might be a pre-reader. Thus, although the Reading Eggs app was a productive actor in the intra-activity transcribed previously, not all apps would have played such a positive, supportive, scaffolding role.

Discussion and conclusion

Children are using the internet and other digital technologies at a younger and younger age, with an emerging trend of very young children (babies, toddlers and pre-schoolers) using apps on touchscreen tablets. This chapter explored the material-discursive practices of an Australian family's use of touchscreen technologies by analyzing the complex learning assemblages evident when a very young child used a specific app with a parent present. In this example, the parents supported their very young children's learning app use by scaffolding his early attempts at using apps. This scaffolding is carried out in tandem with in-built scaffolding available through the apps, and involves a complex interplay between the parent, the app and the child.

The knowledge produced from this case study reveals the material-discursive reality of digital tool use within a family home. While a normative analysis of this research event could confer agency to both nonhuman and human entities – including Scott – the aim of the analysis, however, is to highlight the enacted agency “that emerges between people and materials, not residing solely in individuals” (Kuby & Rowsell, 2017, p. 291). For example, within this event Scott is not fully agentic when playing with the app, relying both on his mother and the app to provide timely scaffolding. Similarly, his mother is not individually agentic when scaffolding Scott's use of the learning app; she operates in tandem with the in-app affordances. The interaction she facilitates between herself, Scott and the Reading Eggs app is dependent on how Scott responds to any in-app scaffolding, and his response to her attempts at providing support. Further, the app itself is not wholly agentic: it relies on human input in order to function within the transcribed context. Taken together, however, there is an entanglement of intra-activity between the three actants – Scott, Kate and the Reading Eggs app – that generates enacted agency.

The analysis offered here also highlights the increasing imbrication or overlap and interrelationship of humans and technology within educational processes. The combination of parental and in-built scaffolding (demonstrated in the excerpt) demands on-the-spot interpretive skills on the part of children as well as parents. This applies whether or not app instructions need repeating or rephrasing, whether or not further explanation is needed, when and how much praise and encouragement to give, how much or how little technical scaffolding to give, as well as when to be silent to allow the child to process information given by the app.

When parents co-use learning apps with their very young children, they add a layer of scaffolding to the existing in-built scaffolding within the app. In some well-designed apps it is quite possible that this additional medium of instruction is anticipated, expected, prompted-for and accommodated to enrich the experience for both adult and child. In most cases, nonetheless, parents perform and manage a complex interplay between the app, the child and the self, in supporting their children's learning. While this study demonstrates how parental scaffolding and in-built app scaffolding share some similarities (with cognitive, affective and technical scaffolding exhibited by both) further research is needed to examine when and how parental scaffolding and in-built app scaffolding are interdependent, complementary or incrementally beneficial in combination. This is likely to reflect the different affordances and design features of the app, the age of the child concerned and the dispositions and engagement of the parents. It may well be a key characteristic of effective app design is that children's apps incorporate features which support parent scaffolding and active engagement.

While this chapter has focused on learning assemblages within the family home, our findings about the material-discursive reality of children's literacy learning is of particular significance to educators, when they plan and effect their pedagogical practices in early childhood settings. Considering material artifacts (including digital artifacts) as potentially significant actants within literacy learning affords educators new ways of conceptualizing agency and literacy, new ways of understanding literacy learning as an intra-activity between artifacts and humans and new ways of considering the self as part of these learning assemblages. App developers could also benefit from ensuring that their product's environment of expected users incorporates the potentially complex assemblages of human and nonhuman intra-activity that may be evident in the family home and early childhood settings. The parent/child/app assemblage, in particular, might further benefit from flexible in-built scaffolding affordances that can be turned on or off by parent or child – in order to suit an individual child's preferences, as well as the level of scaffolding offered by adults within any learning assemblage. Such affordances could also respond to different characteristics of child users, for example, minority language users, or the specific interests of the child. From an early childhood perspective, they ought also focus on developmentally appropriate, emergent literacy needs of very young children, as opposed to the "school like sub-skills of reading and writing" (Sari et al., 2015, p. 15).

We have also argued that new research methods are required in order to adequately research, capture and describe the ways in which digital technologies infuse early childhood literacy learning through human and non-human learning assemblages that are intra-active, context-specific and transient in nature. For example, we found that audio and video recordings are rarely effective in capturing the part an app plays in these learning exchanges. Further, as with the exchange just discussed, the auditory tends to be privileged because it is more easily (and cheaply) captured, than the auditory-plus-visual. But the lack of relevant information should be made explicit in such circumstances in order to highlight the true richness of the interaction discussed. In line with this perception, more emphasis needs to be given to observing and recording the app itself as an actant within these learning assemblages (Falloon, 2013).

As researchers we witnessed many instances of parents scaffolding their children's app use – both at the time of the interviews and within the many of the participant videos we received from parents. This parent/child/app interaction is sometimes missed by, or invisible to, other observers. Nonetheless, they offer opportunities for parents and children to enjoy quality interactions around a further crucial everyday activity: technology use. These exchanges are typically made with the child sitting on a parent's lap and, like shared reading experiences, the children enjoyed the social (or bonding) aspects of these exchanges – in which parent, child and artifact (app or book) are intra-actively engaged. One aim of this chapter, therefore, was to showcase an example where the record captured a nuanced and sophisticated interplay between child, adult and app, revealing the richness and depth of this engagement.

References

- Berk, L.E. and Winsler, A. (1995) *Scaffolding children's learning: Vygotsky and early childhood education*. NAEYC Research into Practice Series, Volume 7, ERIC.
- Deleuze, G. and Parnet, C. (1987) *Dialogues*. Tomlinson, H. and Habberjam, B. (trans.). New York: Columbia University Press.
- Falloon, G.W. (2013) Young students using iPads: App design and content influences on their learning pathways. *Computers & Education* 68, 505–521.
- Gorzig, A. and Holloway, D. (2017 forthcoming) Internet Use. In: Hupp, S. and Jewell, J. (eds.) *The encyclopedia of child and adolescent development*. Hoboken, NJ: Wiley.
- Holloway, D.J., Green, L. and Stevenson, K. (2015) Digitods: Toddlers, touch screens and Australian family life. *M/C Journal* 18 (5).
- Kuby, C.R. and Rowsell, J. (2017) Early literacy and the posthuman: Pedagogies and methodologies. *Journal of Early Childhood Literacy* 17 (3), 285–296.
- Kuby, C.R., Rucker, T.G. and Darolia, L.H. (2017) Persistence (ing): Posthuman agency in a Writers' Studio. *Journal of Early Childhood Literacy* 17 (3), 353–373.
- Leong, D. and Bodrova, E. (1996) *Tools of the mind: The Vygotskian approach to early childhood education* (2nd edition). Cranbury, NJ: Pearson Education.
- Marsh, J., Plowman, L., Yamada-Rice, D., Bishop, J., Lahmar, J., Scott, F., . . . and Piras, M., (2015) Exploring play and creativity in pre-schoolers' use of apps: Final project report. *Technology and Play*.
- Merchant, G. (2015) Apps, adults and young children: Researching digital literacy practices in context. In Jones, R., Chik, A. and Hafner, C. (eds.) *Discourse and digital practices: Doing discourse analysis in the digital age*. Abingdon: Routledge, 144–157.
- Müller, M. (2015) Assemblages and actor-networks: Rethinking socio-material power, politics and space. *Geography Compass* 9 (1), 27–41.
- Neumann, M.M. (2017) Parent scaffolding of young children's use of touch screen tablets. *Early Child Development and Care*, 1–11.
- Sari, B., Takacs, Z. and Bus, A. (2015) *What are we downloading for our children?* DIGILITEY <http://digilitey.eu/wp-content/uploads/2015/09/Apps-for-young-children-across-four-European-countries.pdf>.
- Soderman, A.K., Gregory, K.M. and O'Neill, L.T. (1999) *Scaffolding emergent literacy: A child-centered approach for preschool through grade 5*. Boston, MA: Allyn & Bacon.
- Taylor, C.A. (2016) Edu-crafting a cacophonous ecology: Posthumanist research practices for education. In: Taylor C. A. and Hughes, C. (eds.) *Posthuman research practices in education*, New York: Springer, 5–24.
- Vygotsky, L. (1978) *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Wood, D.J., Bruner, J.S. and Ross, G. (1976) The role of tutoring in problem solving. *Journal of Child Psychiatry and Psychology* 17, (2), 89–100.
- Wood, E., Petkovski, M., De Pasquale, D., Gottardo, A., Evans, M.A. and Savage, R.S. (2016) Parent scaffolding of young children when engaged with mobile technology. *Frontiers in Psychology*, 7.
- Yelland, N. and Masters, J. (2007) 'Rethinking scaffolding in the information age. *Computers & Education* 48 (3), 362–382.