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Digitally animated play practices: New conditions for children's development in play-based setting

Marilyn Flear
Monash University, Australia

An Abstract:

There is increasing recognition of digital childhoods (Danby, Flear, Davidson & Hatzigianni, 2018), and a corresponding body of research into young child's engagement with digital devices (Marsh, Plowman, Yamada-Rice, Bishop & Scott, 2016). What is missing from the literature is a holistic conceptualisation that takes into account the child's perspective in the context of the digital pedagogical practices of teachers (Arnott, 2017). In drawing upon Vygotsky's (1966) conception of play as the leading motive of preschool aged children, the study reported in this paper seeks to address this gap. Video observations of children (3.3–5.8 years) and teachers digitally engaged across 5 sites during free play time (413.8h of video observations) were studied using the concept of subject positioning (Kravtsova, 2009). The findings show that digital animation in a free play program can enrich the play opportunities of children which in turn promote play complexity and increase social and cognitive demands on children, which together act as a positive force for children's development. These developmental conditions emerged as a profile of 5 key digital pedagogical practices, adding to our understandings of digital play in play-based programs.

Biography:

Marilyn Flear holds the Foundation Chair of Early Childhood Education and Development at Monash University, Australia, where she has been the research leader since 2001 for Child and Community Development. She was a former President of the International Society of Cultural-historical Activity Research (ISCAR) and is currently an honorary Research Fellow in the Department of Education, University of Oxford.

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Introduction

The pervasiveness of apps and touch screen handheld devices with accessible interface (Marsh, et al., 2016) have created new conditions for young children's learning and development that many are seeking to better understand. Their design and production have outpaced research into what they can afford for learning and development in early childhood settings (Stephen & Plowman, 2014). This paper seeks to address this research need by presenting the findings of a study that sought to investigate how children and their respective teachers experience handheld touch screen technologies using a *MyCreate* app (digital animation tool) as part of the broader play-based program. The focus of this paper is on the relations between the digital play of the children and the digital pedagogies of teachers when using animation apps in early childhood settings. Through this, insights into contemporary play practices and affordances of digital technologies enacted each day in early childhood settings can be better understood.

To achieve the goal of this paper, we begin with a cultural-historical discussion of what is meant by digital play in the context of the broader literature on the psychological development of play, followed by details of the study, the findings, and the implications for practice.

Theoretical foundations – a cultural-historical conception of play development

Play is the leading activity of a child during the early childhood period (Kravtsova, 2009). As such, two key cultural-historical characteristics of the psychology of play are briefly introduced in the context of the digital play literature, which together act as a backdrop to the present study.

First, central to Vygotsky's (1966) conception of play is the creation of an imaginary situation. He argued that in the early childhood period, play creates new conditions for children's development. In the preschool period children's play takes a developmental turn, because children begin to show the ability to separate the visual field from the sense field. That is, when a child takes a stick and places it between his or her legs, and begins riding it as though it was a horse, the object is no longer a stick (visual field), but now has a new sense (horse) – and new meaning through the imaginary situation is created (riding a horse). The ability to do this, "marks a new level of abstraction, voluntary behaviour, and freedom" on the part of the young child (Vygotsky, 2005, p. 90). The child learns through imaginary play "to act in a cognitive and not visual situation" (Vygotsky, 2005, p. 91). Consequently, imaginary play is conceptualised in the psychological literature as a situation in which play themes are reflective of the lived experiences of children (Elkonin, 2005) and where substitutions in play act as a "prototype of every cognitive process" the child is reliving in play 'as if' it is real (p. 91).

Substitutions are also found in digital games (Bjork-Willen and Aronsson, 2014) and when apps are used in homes (Marsh, et al., 2016). Research has shown how children go beyond the rules and fixed design features of digital games, using them in unintended ways, behaving towards games characters 'as if real', and recycling game character talk and response cries in non-digital contexts (Bjork-Willen & Aronsson, 2014). Marsh, et al., (2016) found that in families, "children pretend that things are otherwise" and this is something that their research showed "was a common feature of digital play with apps" (p. 248). Additionally, Marsh et al., (2016) found that 'what if' play was evident in digital play, describing how "children treated digital pets as 'real' animals and pretended to care for them when using the 'Talking Tom' app" (p. 249).

Second, there is a paradox in a cultural-historical conception of play that supports children's development. Vygotsky (2005) argued that in play there are also affective substitutions. Imaginary play is a situation in which "the double nature of the effective [affective] flow in play" is consciously enacted (Vygotsky, 2005, p. 91). That is, "the child cries in the role as patient (to show someone how to cry is difficult) and is happy as a player" (p. 91). Children live the experience in play with contradictory emotions – happiness and fear. The dual nature of emotions in children's play has also been reported in digital play by Marsh et al., (2016). They found that when 3-year-old April was playing Temple Run, that "April had previously played this game and stated that she found it scary, so it is of interest that she wanted to play it again" (p. 249).

In cultural-historical theory, these paradoxes noted in play are described as dialectical (Vygotsky, 1966). Dialectics capture the dynamic tensions or paradoxes in play that acts as a force for the development of the child. That is, "Play is the source of development and creates zones of proximal development" (Vygotsky, 2005, p. 91). Consequently, the contradictions in

play (emotion substitutions; object substitutions), and how they are resolved in digital contexts, becomes an important psychological and theoretical point that this study needed to consider. Therefore, it is argued that in order to capture the complexity of digital play, it becomes necessary to examine the whole play-based program (Arnott, 2016) in which the *MyCreate* app was introduced.

What is known about digital play

An examination of the relevant literature shows that first, the concept of digital play has only recently emerged, with no clear consensus about what it is (Stephen & Plowman, 2014). For instance, digital play has been described within a digital consumerist frame (Edwards, 2013), categorized into a digital play framework (Bird & Edwards, 2015), has been organised into a digital play taxonomy (Marsh et al., 2016), and presented within a techno-ecological framework that goes beyond screen-based media (Arnott, 2016).

Second, what is known from studies, as well as reported anecdotal accounts, is that new practices and new ways of interacting with others in the context of using handheld touch screen devices is evident. For instance, Stephen and Plowman (2014) point to the fact that digital products, “combine virtual and real worlds so that touchable toys use tags to communicate with each other both on and off screen. ... design materials that children can touch, feel, move around and share; developments which are likely to stimulate the more imaginative, exploratory and physical aspects of children’s play” (p. 338). But these researchers do not generally theorise these design features in relation to the psychological characteristics of play and affordances for young children’s development. Closest has been the research of Verenikina and colleagues who have over a series of studies evaluated app use in homes for their capacity to support children’s imaginary play, revealing that particular apps do facilitate digitally mediated make-believe play (Verenikina, Herrington, Peterson & Mantei, 2016).

Third, despite seminal research being undertaken, most of the key studies into digital play relevant to this paper appear to be about children in families in relation to app use and imaginary play (Marsh et al., 2016; Verenikina et al, 2016), how families support children’s imagination through tool use, such as, skype, robotics (Danby, et al, 2018), and Google Earth (Danby, Davidon, Ekberg, Breathnach & Thorpe, 2016), where curiosities about why teachers do not draw upon these tools in educational settings have been voiced. With the exception of Arnott (2016), most studies in educational contexts appear to not capture all of the play practices within play-based settings, and some note the disconnect between what children do at home and in preschool (Edwards, Henderston, Gronn, Scott & Mirkhil, 2016).

Fourth, less is known about teachers’ digital pedagogy practices in free play settings. What is known has come from seminal research by Arnott (2016) who found that teachers were distally present when digital play was being enacted, and the traditions in place in preschools to socially structure and support free play, gave a good context in which digital play could take place. Most research into digital play in educational settings focuses on the device and whatever app is being used, with Marsh and Burke (2013) arguing that educators are challenged, “to find a delicate balance between the digital and the concrete worlds of play” (p. 5). In line with the goal of this paper is Arnott’s (2016) view that, “practitioners need to carefully construct playful experiences in a manner that positions technologies as facilitating or contributory tools that

may enhance the play, rather than viewing digital play as a central activity in itself” (p. 286).

Finally, and of direct relevance to this paper, is previous research into the nature of preschool children’s digital play with animation apps, theorised from a cultural-historical perspective. Several key studies that are the background to the research reported in this paper have been undertaken. The first study sought to examine from the child’s perspective the use of MyCreate for making animations during free play time in a child care centre. It was found that when children have a leading motive to learn how to use the app and device in free play settings, that it can be challenging to make an animation because other children have a tendency to take the objects away for their own role-play (Fleer, 2014). But, this study only examined the demands and motives of the children and did not report on the pedagogical practices of the teachers. In a follow up study, however, how children and teachers in free play settings negotiated and interacted when using MyCreate was studied. It was found that the differing motive orientations of children and teachers appeared to have a bearing on how children pay attention to, or engage with, the learning goals set by the teacher (Fleer, 2017a). The third study looked closely at the pedagogies of 6 teachers, and found technological intersubjectivity in which a shared understanding between teachers and children featured. In that study, the concept of digital pivots and virtual placeholders was introduced to name how children changed the meaning of objects and actions in their animated digital play (Fleer, 2017b). However, this study did not report on the broader play practices that were taking place in the different centres. Finally, a recent and holistic study of the digital play practices of children and the broader pedagogy of the play-based program found the pedagogical practices associated with introducing MyCreate, included, peer-initiated play, adult-initiated play inquiry, adult in the imaginary play situation, digital placeholders and virtual pivots in meta-imaginary peer play situations, and peers in role or as the narrators of the digital play (Fleer, 2018). In that investigation, it was argued that the complexity of digital peer play had to be understood as a collective activity over time, rather than as single moments of children playing together with a digital device and animation app. However, the research was in one site only and therefore a broader sample is needed in order to determine from the perspective of children and teachers, the nature and affordances of digital play when using MyCreate. Within a holistic framework of a play-based program insights into the digital childhoods of children in educational settings can be better understood.

Method

The study sought to understand the relations between the play activity of children in early childhood settings where digital handheld devices with MyCreate were introduced for the first time, and the digital pedagogical practices of the teachers in the context of the full play-based program.

Participants and data generation

Digital video observations of 16 teachers digitally engaged with children (3.3–5.8 years) across 5 sites during free play time (413.8 hrs of video observations) were gathered (see Table 1). Data were collected in each site using 2 and sometimes 3 digital video cameras. One camera was placed on a tripod to primarily gather overview data of the activities in the centre. The other camera(s) followed the focus children or sought to primarily capture the play activity settings in the centre where the digital device was being primarily used. Both indoor and outdoor play were captured. In addition, teachers were interviewed either in situ at the

conclusion to the preschool day. Still photographs were also gathered throughout the observation periods and field notes were made after each data collection day to give context to the digital video data.

Table 1. Overview

| <i>Context</i> | <i>Data gathering period</i> <i>Weeks</i> | <i>Preschool digital video observational data</i> <i>Hours</i> | <i>Photos</i> | <i>Teachers</i> | <i>Children</i> |
|----------------|--|---|---------------|-----------------|------------------------------------|
| Dragon City | 5 | 55h | 2,923 | 2 | 18 (5.6-5.7 yrs; mean age 5 yrs) |
| MM rural | 31.9 | 232h | 1,960 | 3 | 53 (3.3-4.4 yrs; mean age 3.8 yrs) |
| C City | 5.3 | 74h | 1,332 | 5 | 30 (3.3-5.3 yrs; mean age 4.2) |
| PH | 27.4 | 29.3h | 580 | 4 | 18 (3.0-5.8; mean age 4.5) |
| M | 6.6 | 23.5h | 348 | 2 | 27 (1.6-5.3; mean age 3.5 years) |

Analysis

Data analysis was informed by Vygotsky's (1966) cultural-historical conception of play, Kravtsova's (2009) concept of subject positioning, and the pioneering holistic methodology of Hedegaard (2014) for capturing the motives and demands of participants within play-based settings. Subject positioning foregrounds how teachers in dialectical pairs take particular pedagogical positions in relation to each other, and how children are positioned in relation to each other and their teachers. The categories are conceptualized as 'above the child/teacher', 'equal with the child/teacher', 'below the child/teacher', and the 'primordial we' (Kravsova, 2009). The categories can be determined within data sets when one teacher is equal with the children, and the other teacher is above the children or even below the children, asking for help. It is also evident when the teacher is above, equal or below the child or the other teacher. The

position of ‘primordial we’ can be seen when a teacher or child actively models to another a particular practice. For instance, data sets can be examined to see adult modeling in relation to digital devices, such as when an adult sits with a child, whilst using a digital device, and narrates to the child what they are doing. ‘Primordial we’ positioning allows children to be inside of an activity setting, being swept along with the dominant motives and demands inherent within the practice traditions, but these children may not understand or be able to participate in the practices. Using these dual positions in analysis allows for a close examination of the relations between the child’s intentions as well as the practice traditions of the setting (Hedegaard, 2014), where teachers are introducing for the first time, handheld digital devices with MyCreate app for making animations.

Results

The main pedagogical finding was that making and playing with a digital animation appeared to enrich play-based programs and this created new developmental conditions for children (Table 2). Due to word limitations, examples from one site are used to illustrate the pedagogical and developmental characteristics identified across sites summarized in Table 2.

In each preschool, imaginary play was collectively promoted by the teachers through the carefully planned play-based program of introducing a common story or fairytale, then reading, role-playing and providing pops for free play make-believe, and in this context introducing the making of a digital animation. In each early childhood setting an area for role-play and a space for making an animation was provided.

Table 2. Characteristics of the dialectical relations between digital play and digital pedagogy

| Preschool | Overview of play-based program | Child’s digital activity and intentions | Digital pedagogical practices | Key characteristics of digital play and digital pedagogy |
|-------------|--|--|--|---|
| Dragon City | <p><i>The 3 billy goats gruff</i></p> <p>The story is read and told. Small groups re-tell story with support. Bridges are made from pop sticks and used for animation. Outdoor role-playing of story with teacher.</p> | <p>Children regulate each other to take photographs of the scene. Children role play scenes, directing each other to capture the sequence accurately.</p> <p>Different children at different times</p> | <p>The digital device is placed on a small table adjacent to the 3 billy goats gruff table. Teacher is at the table and regulates children to take turns.</p> <p>Storyboarding is used as prompt.</p> <p>Digital recording of role-play to capture narrative</p> | <p>Fairytale gives common purpose and structure.</p> <p>Self and other regulation.</p> <p>Motives of children is for play.</p> <p>Making voice over is challenging.</p> |

| | | | | |
|-----------|---|---|--|---|
| | | take the objects from animation table. | for voice over. | Digital play enriches play-based program. |
| MM centre | <p><i>Goldilocks and the 3 bears</i></p> <p>The story is read, told, and role-played. A play table is set up for the children at free play time, which is also used for animation.</p> | <p>Some take bears from table into the centre and continue to play with objects, incorporating new actions into their play plot.</p> <p>Children show each other how to take the photos and how to retrieve and swipe. Some are confused between the real objects on the table and if the photographic image on the digital device.</p> | <p>Teacher uses light board and children make puppets for re-telling.</p> <p>Teacher supports voice over on a one-to-one and collectively using musical instruments.</p> | Same as above. |
| M Centre | <p><i>The 3 Little pigs</i></p> <p>The story is read, told, and role-played. A play table is set up for the children at free play time and also used for animation.</p> <p>Face masks of the characters are provided for the children to use at group time and during free play time.</p> | <p>Children re-tell the story and also add their own story lines. The story plot carries over into other imaginary play situations.</p> <p>Children show each other how to take photographs and to sequence the felt pieces to tell the story.</p> | <p>Working in small groups, the teacher shows the lead child how to make animation.</p> <p>Children re-tell story and take photos in small groups.</p> | Same as above. |
| PH Centre | <i>Alice in</i> | Children make different sized | Animation is used as a culmination | Same as above. |

| | | | | |
|-----------|--|--|---|--|
| | <p><i>Wonderland</i></p> <p>The story is read, told, and role-played.</p> <p>The props are made available during free play time, and with teacher support, children re-tell the story.</p> <p>Animation is supported across time in pairs and whole group.</p> | <p>rabbits to show shrinking in animation.</p> | <p>of the playworld project to present to families.</p> <p>Teachers take a role in the children's play.</p> | |
| C Centre. | <p><i>Jack and the beanstalk</i></p> <p>Children planted beans in small cups.</p> <p>Corner is set up for free play of story.</p> <p>Animation occurs in small groups.</p> | <p>In small groups, children use plasticine to show plant growth that they have observed, and make a movie of the fairytale.</p> | <p>An additional device is available for child with visual impairment. Teacher in a one-to-one situation or in small groups makes animations.</p> | <p>Inclusion through access to digital device and app for making an animation is a priority.</p> <p>Same as above.</p> |

Figures 1 and 2 show examples of the make-believe space and creation space that were made available to the children and which were also used for storyboarding (Figure 3) and digitally capturing the narrative of the fairytale or story shown in Figure 4.

Figure 1: Alice in wonderland free play – getting ready to go down the rabbit hole (make-believe space)



Figure 2: Making the animation characters - a shrinking rabbit (creation space)



Figure 3: Storyboarding – deciding upon the scenes and storyline of the animation and voice over



Figure 4: Creating an animation



In make-believe play children have to negotiate the story line and build intersubjectivity between players about objects and the narrative (Göncü, 1993). To understand how the digital animation is enacted in the overall program, a study of free play practice was needed. In the example of Alice in Wonderland (Figure 1) that follows, evidence of the negotiation of the storyline and object substitution that was collectively agreed upon is presented. As will be shown further below, role-play during free play time was directly related to making an animation.

The children have made a rabbit warren with blocks. The opening to the rabbit hole is at the top of the structure, as this visually captures the idea of the ‘tunnel’ that both the rabbit and Alice go down (see Figure 1). On this particular day, eight children are freely playing with the block rabbit hole to begin their play of Alice in Wonderland. Rebecca the teacher is standing close by, following the play, and Oriana her co-teacher is interacting with other children in the classroom, but she also follows the play script of

the children from a distance. Tamara is holding a small block, cradling it carefully as though it were made of glass (possibly the bottle of drink me potion). She observes the actions of a group of children, who are adding more blocks to their tunnel. Also observing is Emelia, who holds a strip of paper ready to label the structure. Two children are playfully disputing if Alice falls or is pushed down the rabbit hole, alternating “No she didn’t”, “Yes she did”, whilst another child, Ben, drops blocks into the rabbit hole. Rebecca asks, “Who goes down the Rabbit hole?”, to which a chorus of “Alice” is heard. Rebecca then asks, “Who else?”. Ben and Caterina respond, “The rabbit”. Both children take a stuffed rabbit from the home corner, looking intently at each other as though checking that the chosen agreed object is suitable. Ben lifts the rabbit in the air and says, “The rabbit can go down now”, as he moves close to the rabbit hole. Rebecca says, “Maybe have a chat to Emelia” who appears to be positioned as the director of the play. Ben takes the rabbit over to Emilia seeking her agreement as he asks, “The rabbit can go down now, into the rabbit hole?”. Emilia agrees, and looks closely as Ben deposits the rabbit into the hole. The other children move in and observe, appearing to follow the narrative that is evolving (PH15 12V3).

Building intersubjectivity between players is observed through how children negotiated the storyline, as was seen when the two children entered into a playful “No she didn’t”, “Yes she did” dialogue. In free play, this is not surprising. But when considered in the context of making an animation, new psychological understandings become evident. First, negotiation of the storyline in free play supported the children later when doing the voice over for the animation. When children worked together to do the voice over, the script had already been rehearsed in play and this made it easier to re-tell the story over the animated images. Second, coming to an agreed position about objects, such as what could represent the white rabbit in free play, had already been negotiated, and this meant that later when making a series of shrinking white rabbits, the focus could be on the animation process rather than on the specific object negotiation. Third, free play of the storyline appeared to make conscious the different parts of the story structure, that later were made into a storyboard (Figure 3), which then allowed for the creation of story scenes (Figure 4) that framed and gave structure to the creation of the animation. In the next extended example of making an animation, these characteristics are shown.

Lunch time has finished and the children are free to play in the classroom. At the animation table is a tray of objects previously made by the children (Figure 2), representing characters for the story of Alice in Wonderland. There is also a pile A4 sized board which holds the child’s drawing of a particular scene in the story that they made in preparation for their animation (Figure 4). Rebecca is seated behind the digital device with MyCreate app open (Figure 5). As she adjusts the device ready for making an animation, children begin to move towards the table. Emelia discusses with Angela the story plot, alerting everyone to the *drink me potion* that will shrink the rabbit and Alice. Rebecca goes and retrieves the signs the children have made in relation to the specific scenes (potion, wonderland), and asks the children if they would like them included in the animation. The children vote and decide to include them. At this time 8 children have gathered around the table, with several finishing their lunch by looking on from a distance or by taking their food to the animation table.

Figure 5: Collective sense and purpose for making an animation



Rebecca asks, “Who would like to be the first photographer?”. A chorus of “me” is heard. Rebecca says, “Let’s take Angela. She is in the chair (in front of the digital device)”. Angela photographs the scene as Rebecca says, “Remember we take quite a few” to which Angela presses the button a few times. Rebecca says, “Yes, that’s it.”. They discuss the particular scene, and movement of the objects. Jamie moves the objects, whilst Angela takes the photographs. Alex says, “There’s the white rabbit”. For the first scene, the children select the right sized rabbits and they are placed by the children and photographed one by one by Angela. Jamie says, “Can I do the second one?”. Samantha moves away from the table and brings back plasticine objects previously made by the children, predicting the next scene. Rebecca does not initially notice, saying, “Now we need the flowers (for Wonderland)”. She laughs when she is instantly given the flowers by Samantha. The children discuss what each of the plasticine objects represent in their story, and then select those relevant to the next scene. The children comment on the objects as they are placed in the scene, “How about Alice in blue?”; “What’s this for?”; “OK, go!” Let’s get all the ones that are orange”. At this time Tommy takes a Christmas decoration and places it in the scene saying, “That can be the raindrop on him” adding an additional dimension to the story, that the others accept and immediately stroke (Figure 6) (PH15 21V6).

Figure 6: Collectively changing the meaning of objects in digital imaginary situations



In these digital imaginary situations, the children appear to have a collective sense and known purpose for reproducing a particular storyline which the overall program supported. But also, new psychological demands emerged when changing the meaning of objects when animating. In the above example, the shrinking dimension of the rabbit meant the children had to produce in an animated form a shrinking action, and this placed new cognitive demands upon the children – it was not just one object in the visual field that changed its meaning, but it was a collection of 3 objects all related to each other in size and motion. The digital activity made more concrete the concept of shrinking, enriching the play-based program. That is, from changing the meaning of objects and actions in embodied imaginary play to conceptualising virtually the animation process, where children gave new meaning to objects and actions in digital form.

Discussion

The digital activity of the children framed through the digital pedagogical practices of the teachers, appeared to create new developmental conditions for the children. Three central pedagogical practices were found to contribute to the children's development. First, the study results suggest that children were more deliberate in the selection of objects in digital play because they were making an animation and because they had already negotiated in free play their choice of objects. Further, the use of storyboards for planning the animation structure and the drawing of digital scenes together gave a new sense to the imaginary situations. They were making an animation of their play. Additionally, the object movement within a digital scene needed to be deliberate, thereby potentially making explicit and conscious the concept of a story structure to children. It can be argued that, these new cognitive demands produced different developmental conditions for the children. That is, they are different to storytelling and role-playing in free play situations. This finding builds upon previous research that has shown that 'what if' play is evident in digital play, by explaining how digital play affords new thinking for children.

Second, the process of making a digital animation appeared to promote self-regulation and other-regulation because the children needed to set up and photograph a scene in a particular order. In free play time, children join in and leave a play activity when they wish. To achieve the goal of making an animation, teacher support was needed for turn taking with photographing scenes, and with producing the voice over for the animation, and with coordinating the sequence of objects for photographing. Both self and other regulation are modelled and regulated by the teacher and enacted in different ways by the children as they meet these new social demands. Self and other regulation are key psychological dimensions of children's development in the early childhood years and they appear to be featured more explicitly when making a digital animation.

Third, common across all the sites were the technical demands of making a digital animation which appeared to be ameliorated because children already knew the story structure of the fairytale or story. Repetition of storytelling and role-playing in a variety of forms, meant that the children could focus on the making of a digital animation rather than needing to negotiate a storyline and play plot. Negotiations and the building of intersubjectivity of play partners had already taken place in free play moments. As such, the technical dimensions of placing objects within the photo frame, moving these to create the animation, and producing a voice over, were actively supported through the overall play-based program. This is supportive of Arnott's (2016) claim that teachers need to "carefully construct playful experiences in a manner that positions technologies as facilitating or contributory tools" (p. 286).

The theoretical implications of these pedagogical findings potentially give new insights into how animation apps change the developmental conditions of children. Theoretically, the leading motives of children is for play during the early childhood years. In line with this, the study has shown that children learning to make a digital animation of their role-play appeared to be highly motivating. This new practice gave new possibilities because children could reproduce their imaginary role-play into a digital form. This suggests that the use of digital animation in a free play program can enrich the play opportunities of children. This in turn can promote play complexity and increase social and cognitive demands, together acting as a positive force for children's development.

Conclusion

The study examined the relation between the children's digital activity and the teachers' digital pedagogical practices in the context of the full play-based program where digital devices with MyCreate app were introduced. In sum, the pedagogical practices and developmental conditions that emerged from this study appear as a profile of 5 key digital pedagogical practices and related play activities of children. They can be summarized as:

1. The leading motives of children for play seem to contribute to how children experience making an animation. Making an animation appeared to be highly motivating for the children, and this gave new possibilities for reproducing imaginary play into a digital form.
2. Self-regulation and other-regulation as key psychological characteristics of children's development in the early childhood years appear to be foregrounded when making a digital animation.
3. The common experience of a storytelling gives a structure to producing the narrative

- and plot for collectively making a digital animation.
4. Technological challenges associated with narrating a storyline over an animation as a problem of software design were overcome through previous free play role-playing.
 5. The process of making a digital animation foregrounds the idea of an audience and this in turn appears to enhance play complexity because children think about their play as a digital meta-imaginary digital situation, where they change the meaning of objects and actions for this virtual context.

Like Arnott's (2017) ecological conception of digital play, this study found that digital play when considered from the perspective of the children and the teachers, needed to be systematically theorised to take account of the full play-based program. The resultant digital profile of activities and practices embedded in the preschool program, is suggestive of new conditions for children's development in play-based setting. This study contributes to understanding the fast-paced changing nature of technologies and the dynamic nature of digital childhoods that evolve over time.

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References

- Arnott, L. (Ed.). (2017). *Digital technologies and learning in the early years*. London, UK: Sage.
- Arnott, L. (2016). An ecological exploration of young children's digital play: framing children's social experiences with technologies in early childhood. *Early Years An International Research Journal*, 36(3), 271-288. Doi: 10.1080/09575146.2016.1181049.
- Björk-Willén, P., & Aronsson, K. (2014). Preschoolers' "animation" of computer games. *Mind, Culture, and Activity*, 21(4), 318-336. doi:10.1080/10749039.2014.952314
- Danby, S., Flear, M., Davidson, C., & Hatzigianni, M. (Eds.). (2018). *Digital Childhood*. Amsterdam: Springer.
- Danby, S., Davidson, C., Ekberg, S., Breathnach, H., & Thorpe, K. (2016). 'Let's see if you can see me': making connections with Google Earth in a preschool classroom. *Children's Geographies*, 14(2), 141-157. Doi:10.10814733285.2015.1126231.
- Bird, J., & Edwards, S. (2015). Children learning to use technologies through play: A Digital Play Framework. *British Journal of Educational Technology*, 46(6), 1149-1160. Doi: 10.1111/bjet.12191.
- Edwards, S. (2013). Digital play in the early years: A contextual response to the problem of integrating technologies and play—based pedagogies in the early childhood curriculum. *European Early Childhood Education Research Journal*, 27(2), 199-212, Doi: 10.1080/1350293X.2013.789190.
- Edwards, S., Henderston, M., Gronn, D., Scott, A., & Mirkhil, M. (2016). Digital disconnect or digital difference? A socio-ecological perspective on young children's technology use in the home and the early childhood centre. *Technology, Pedagogy and Education*, 26(1), 1-17. Doi: 10.1080/1475939X.2016.1152291.
- Elkonin, D. B. (2005). On the Historical Origin of Role Play. *Journal of Russian and East European Psychology* 43, 49-89. Doi: 10.1080/10610405.2005.11059246
- Flear, M. (2018, under review). Digital peer play: Streaming in and out of supported meta-imaginary peer play in early childhood settings. In A. Ridgway, G. Quinones, & L. Li (Eds.). *Peer play and play development in early childhood: International research narratives*. Springer: Dordrecht, The Netherlands.
- Flear, M. (2017a). Digital role-play: Creating new conditions for children's play. *Mind, Culture and Activity*, 24(1), 3-17. Doi: 10.1080/10749039.2016.1247456
- Flear, M. (2017b). Digital pedagogy: A cultural-historical study of how teachers support digital play in the early years. In L. Arnott (Ed.), *Digital technologies and learning in the early years* (pp. 114-126). UK: Sage.
- Flear, M. (2018, under review). Digital peer play: Streaming in and out of supported meta-imaginary peer play in early childhood settings, In A. Ridgway, G. Quinones, & L. Li (Eds.).

Peer play and play development in early childhood: International research narratives. Dordrecht, The Netherlands: Springer.

Fleer, M. (2014). The demands and motives afforded through digital play in early childhood activity settings. *Learning, Culture and Social Interaction*, 3(3), (Special themed issue), 202-209. Doi: 10.1016/j.lcsi.2014.02.012

Göncü, A. (1993). Development of intersubjectivity in social pretend play. *Human Development*, 36, 185-198. Doi: 10.1159/000278206

Hedegaard, M. (2014). The significance of demands and motives across practices in children's learning and development: An analysis of learning in home and school. *Learning, Culture and Social Interaction*, 3(3), 188–194. Doi:10.1016/j.lcsi.2014.02.008.

Kravtsova, E. E. (2009). The cultural-historical foundations of the zone of proximal development. *Journal of Russian and East European Psychology*, 47(6), 3-18. Doi: 10.2753/RPO1061-0405470501.

Marsh J. A., & Burke A. (2013). Introduction: The changing landscapes of children's play worlds. In J. A. Marsh & A. Burke (Eds.), *Children's Virtual Play Worlds: Culture, Learning and Participation*. (pp. 1-8). New York, USA: Peter Lang.

Marsh J. A., Plowman, L., Yamada-Rice, D., Bishop, J., & Scott, F. (2016). Digital play: A new classification, *Early Years*, 36 (3), 242-253. Doi: 10.1080/09575146.20161167675.

Stephen, C., & Plowman, L. (2014). Digital play. In L. Brooker, M. Blaise & S. Edwards (Eds.), *The SAGE Handbook of play and learning in early childhood*, (pp. 330-341). London, UK: Sage.

Verenikina, I., Kervin, L., Rivera, M. C., & Lidbetter, A. (2016). Digital play: Exploring young children's perspectives on applications designed for pre-schoolers. *Global Studies of Childhood*, 6(4), 1-2. Doi: 10.1177/2043610616676036.

Vygotsky, L. S. (2005). Appendix: from the notes of L.S Vygotsky for lectures on the psychology of preschool children. *Journal of Russian and East European Psychology*, 43(1), 90–97.

Vygotsky, L. S. (1966). Play and its role in the mental development of the child. *Voprosy Psikhologii*, 12(6), 62– 76.