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# Digital pop-ups: Studying digital pop-ups and theorising digital pop-up pedagogies for preschools

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## Abstract:

Whilst a lot is known about the digital environments of preschools, less is understood about the emerging digital pedagogies of the teachers. This paper presents the findings of a cultural-historical study of the pedagogical practices of the teachers as they implemented a digitally enhanced play-based program where the MyCreate app was used to make an animation of a fairytale. Over a period of 5.4 weeks, digital observations (27.3hr) and interviews with 5 teachers and their 31 children (aged 3.4 – 5.5 years; mean age of 4.4 years) were undertaken. The central findings capture both the existing practices found in the literature and a new practice named as a digital pop-up. The microgenetic analysis identified that the same digital pop-up afforded very different actions by the teacher to realise the goal for making a digital animation. It is argued that the new pop-up pedagogy identified (*Person and digital intersubjectivity*, *Virtual-concrete combination*; *Virtual designing*; *Stimulating digital motive*; *Digital authenticity*; *Pop-up digital area*; *Digital imaginary situations*) could support educators wishing to plan and implement integrated digital practices into a play-based program. A digital pop-up is purposefully oriented towards the goals of traditional kindergarten education and its original institutional structure, but in ways that capture the digital dynamic world of the young child.

**Keywords:** cultural-historical, early childhood, digital, early years

## Introduction

The moral panic surrounding screen time (Walker, Hatzigianni, and Danby 2018) appears to

have positioned digital technology as an enemy of early childhood practice (see Plowman and McPake 2013 on myths). Yet it has been shown that digital technology gives new possibilities to children as they access print through voice activated software, document and magnify their surroundings, find much needed information during an inquiry, program toys to amplify their play, and more (e.g., Danby, Davidson, Ekberg, Breathnach, and Thorpe 2016; Knauf 2016; Marsh 2017; Marsh, Plowman, Yamada-Rice, Bishop, and Scott 2016; Plowman and McPake 2013; Stephen and Plowman 2014; Verenikina, Kervin, Rivera, and Lidbetter 2016).

We know from the growing body of research into digital tool use by preschool children, that digital tools appear to have become pervasive in the lives of many children. Danby, Fler, Davidson and Hatzigianni (2018) have introduced the concept of digital childhood to show the embeddedness of digital tools within the everyday lives of children, remarking on the everydayness of digital practices that work across home and preschool (Gillen and Kucirkova 2018), and Marsh, Plowman, Yamada-Rice, Bishop and Scott (2016) have studied how families use digital tools to support children's play and home activities. What these studies, and those similar to these have shown (e.g., Arnott 2016; 2017; Arnott, Palaiologou, and Gray 2018; Danby, Fler, Davidson and Hatzigianni 2018; Plowman 2016; Kumpulainen, Mikkola and Jaatinen 2014), is that digital tools are increasingly a part of the young child's life, and that when used in preschools and homes, they productively contribute to their play and learning. However, the deficit positioning of technologies in early childhood settings has meant less attention has been directed to the study of the new pedagogical practices of teachers surrounding their use (Arnott, Palaiologou and Gray 2018).

Relevant to the focus of this paper, is the important empirical work by Arnott (2017) who has captured new digital practices in preschools as an ecology, where the digital device is but one

tool among many for supporting the play and learning of children. These practices have also been termed as an amplification, where the tools enrich the play and learning experience of the child (Fleer 2019). Similarly, other scholars have sought to document and explain the complexity of digitally enhanced practices in preschools through concepts such as, digital play (Marsh, Plowman, Yamada-Rice, Bishop, and Scott, 2016), infused technological practice (O'Mara and Laidlaw 2011), interlaced social worlds (Knauf 2016), percolating spaces (Gillen and Kucirkova 2018) and a pedagogy of multiliteracies (Yelland 2018). What these studies collectively seek to overcome, is a digital binary when discussing the emerging pedagogical practices of preschool teachers who embark upon the use of apps and digital mobile devices in their play-based programs.

Whilst we understand a lot about digital environments, more research into the emerging digital pedagogies of teachers to support play and learning in preschools is needed. A focus on digitally embedded pedagogies (Kewalramani and Havu-Nuutinen 2019) should reveal how teachers are individually establishing new pedagogical practices and identifying new ways of integrating digital tools into the fabric of their centres. The current context signals that practice is possibly ahead of empirical research. Consequently, more analysis and theorising of the new practices is urgently needed if we are to confidently support teachers now, and in the future, with their pedagogical work. The aim of this paper is to contribute to this literature by studying practices and theorising these as pedagogical concepts in support of digitally enhanced pedagogies in early childhood settings.

To achieve this aim, this paper presents a case example of new pedagogical practices where digital tools were used to amplify learning and where digital tools were seamlessly integrated into free play practice. Acting as a digital coadjutant (Fleer 2019), the digital technologies illustrated through a series of examples, show how teachers used digital tools as part of their

everyday practices. The digital activity settings and the digital pedagogical practices shown through the examples are theorised from a cultural-historical perspective (Vygotsky 1997) as *digital pop-up* activity setting and an associated *digital pop-up pedagogy*.

This paper begins with a theoretical discussion of concepts that informed the research, where details of the study design are given, followed by the findings and an overall discussion of the outcomes. It will be argued, and in line with Arnott (2016), it is difficult to separate digitally oriented practices from the existing preschool programs, and therefore the practice examples illustrated in this paper form part of a holistic conception (Hedegaard 2014) of new pedagogy where the concept of digital pop-up pedagogies captures and names new observed practices of preschool teachers.

### **Study design and theoretical framework**

The focus of this paper is on analysing the pedagogical practices of the teachers as they implemented a digitally enhanced play-based program. The research question that is addressed in this paper is: ‘What are the unique pedagogical practices of teachers who use digital tablet technologies and virtual play in free play settings for making visible abstract concepts?’

The case study reported in this paper captures the dynamics and complexity of play-based settings where digitally enhanced practices were evident. The centre was selected because the educators were familiar with, and using a free standing computer, and were positive towards using a mobile digital device and an app called *MyCreate*. This free app is a digital animation tool, where children photograph objects, iteratively and incrementally move these objects whilst photographing them, and then prepare a digital sequence of these images so that they run together as an animation. Children also prepare voice over onto their digital

animation. The result is ‘a movie’.

### **Participants:**

The research was designed following approved university ethics protocols. Families consented for their children to participate in the study. A total of 31 children, who were aged 3.4 – 5.5 years (mean age of 4.4 years) were involved in the case study. The cultural heritages of the children that were known were: Anglo/Australian 15; Euro/Australian 2; Chinese/Australian 2; Japanese/Australian 1; Zimbabwe/Australian 1; Indian 2; Indonesian 1; Italian/Chinese 1; Mongolian 1; Vietnamese 1; Mauritian 1; Papua New Guinea 2; Saudi Arabia 1.

Five teachers consented to be involved in the study. Each held a technical or degree qualification in early childhood education and had cultural heritage of: Indian Australian (3), Sri Lankan Australia, and European Australian.

### **Procedure:**

Step 1: Consenting teachers participated in an initial professional learning session where the study goals were explained, and teachers had opportunities to learn how to use MyCreate.

The latter included a workshop where the teachers created their own animation, selecting a story or fairytale as the focus of the animation, and then presenting their final product to each other. Ongoing technical support for the use of the app was also provided in situ during data collection periods.

Step 2: The teachers selected the 3 Billy Goats Gruff and prepared a program that used this fairytale to introduce engineering principles and science concepts. Specifically, the teachers read and role-played the 3 Billy Goats Gruff, and they set up an animation space, where the children built a bridge as part of the set design for staging and preparing their animation.

They used an iPad and the MyCreate app to make a digital animation.

Step 3: After obtaining consent from families, two researchers visited the preschool for 5.4 weeks. Digital observations took place for a period of 2-5 hours over 8 data collection visits.

### **Digital observations:**

Two cameras were used for gathering the digital observations of practices, alongside of field notes which were made immediately after each data collection visit. One camera was positioned on a tripod to capture the full preschool context. The second camera followed the children as they participated in the program. A total of 27.3 hours of digital observations were made, and a total of 336 digital photos were taken.

### **Teacher interviews:**

During data collection visits the teachers were asked in situ about their program planning for that day (before the session) or at the end of the session where key moments were referenced as part of the interview. In addition, the teachers were interviewed on site at a pre-arranged time. All interviews were digitally documented. A total of 2.5 hours of interview data were generated.

### **Analysis:**

Central for both the research question driving the study, and the digital organisation of the observations, field notes, photographs and teacher interviews, were the Hedegaardian (2014) analytical concepts of ‘practice’ and ‘activity’. These concepts are located within a theoretical frame of societal perspectives, institutional practices, and the person(s) within the activity setting, where the values, motives and demands made upon participants are intermingled. For instance, at the societal level, the values of a particular community, such as wanting graduates of the school sector to be technologically literate, create curriculum

conditions that institutions operationalise through their pedagogical practices, such as using digital handheld devices and apps to support learning and play of children at free play time. The personal perspective as an analytical concept is determined through how the person enters into the activity settings, such as, group time, free play time, snack time, or block play. By following the person's intentions in the activity setting, it becomes possible to analyse the demands of the activity setting, such as the pedagogical demands on children as well as teachers when making a digital animation. This makes it possible to interpret how the persons contribute to, and are shaped by the corresponding digital activity setting. Hedegaard (2014) has shown how a teacher creates the conditions through both the practices and the organisation of the activity setting, and these support and develop the motivated actions of the child. This cultural-historical theorisation is operationalised through Hedegaard's conception of common sense interpretations, situated practices, and thematic/theoretical analysis (Hedegaard and Fleer 2008). In this study, a holistic methodology of the interpretation process meant that the raw data were kept intact, and organised as shown in Figure 1.



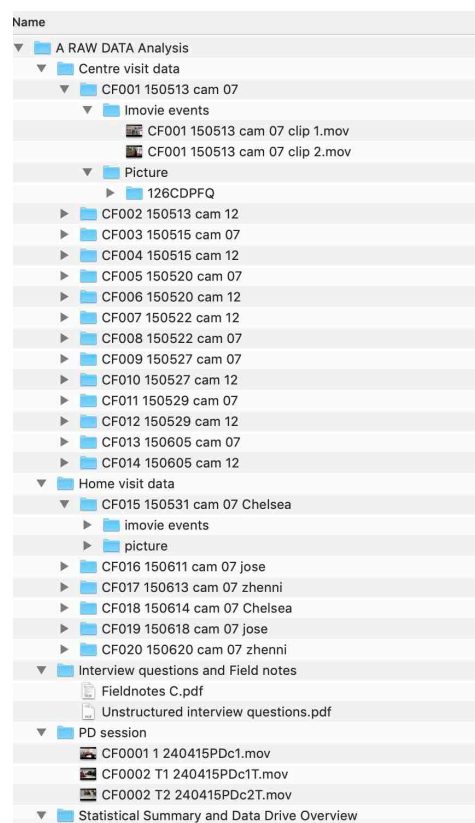


Figure 1. Holistic digital data and analysis system

In this cultural-historical holistic study, this meant formulating categories for analysis in relation to both the research question and the concepts informing the theorisation of the problem area, such as ‘practices’ and ‘activity’. The analytical frame involved is a three step iterative analysis process, as is shown through Figures 2 to 4 below with their explanation.

### Analytical steps:

*Common sense interpretation:* As part of the first analytical step, data were digitally copied from the raw data set (Figure 1) and made into clips of general practices that were found in relation to the overall goals of the study or which were appearing regularly in the centre practices, such as the categories of ‘centre interpretations, ‘home visit interpretations’ and ‘gender oriented interpretations.’ This constituted a common sense interpretation (Figure 2) and is closely tied to the practice context.

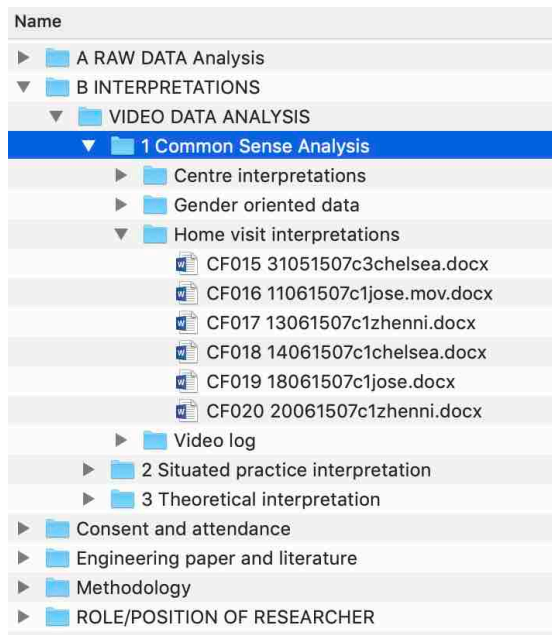


Figure 2. Common sense interpretation using digital techniques

*Situated practice interpretation:* The iterative process of viewing the data many times, allowed for additional coding and nuancing of interpretations. But digital editing goes beyond a simple scissoring of data, as the single situated practices that emerge during the common sense interpretation are always contextualised within a series of interrelated clips, and tagged to the overall raw data (i.e., holistic interpretation). To achieve a situated practice interpretation, this involved going across the folders as shown in Figure 2, and looking for emerging patterns. The density of data that emerged were put into a folder of activity settings (these were related to the central categories of the practice traditions noted in the common sense interpretation). The activity setting categories shown in Figure 3, such as, STEM activity setting, support a clustering of themes that can be further analysed as shown in Figure 4 and 5 and Table 1 where the theoretical concepts become the central analytical categories for understanding the interrelated practice traditions (common sense interpretation) and the diversity of activity settings (situated practice interpretation).

Name
▶ A RAW DATA Analysis
▼ B INTERPRETATIONS
▼ VIDEO DATA ANALYSIS
▶ 1 Common Sense Analysis
▼ 2 Situated practice interpretation
▶ Activity settings table
▼ Activity setting STEM
050815Caulfield.mp4
ARC Project in Caulfield 2015.mp4
Bridge making.mp4
Fairy tale, cultural tools and science n technology.mp4
Final ARC Project in Caulfield 2015.mp4
huffing and puffing.mp4
magnification.mp4
Making props.mp4
plant grass.mp4
Reading story.mp4
Self-reading n slowmation.mp4
twin brothersARC Project in C 2015.mp4
Twin siters ARC C.mp4
▶ Activity settings indoor free play
▶ Activity settings outdoor free play
▶ Activity settings transitions
▶ Activity settings whole group
▶ Digitallly oriented activity settings - all
▶ Gendered interactions
▶ Teacher interactions
▶ 3 Theoretical interpretation
▶ Consent and attendance
▶ Engineering paper and literature
▶ Methodology
▶ ROLE/POSITION OF RESEARCHER

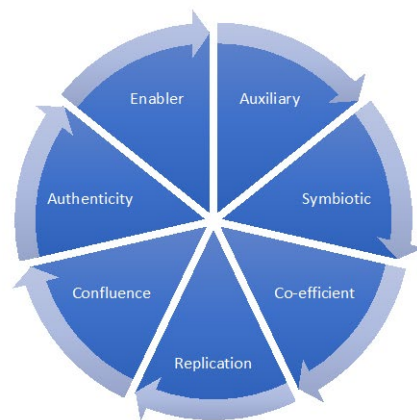
Figure 3. Situated practice interpretation using digital techniques

Table 1

*Situated practice interpretation*

The digital activity setting	Actions of participants	What the activity setting affords	Practice traditions being enacted
Interpretation	Interpretation	Interpretation	Interpretation

*Theoretical interpretation:* This final stage involved a conceptual synthesis and theorisation of the data. Here the synthesis and theorising is in relation to the research question, system of concepts and the relevant literature. However, the iterative analyses are all interconnected and holistic, and together (Figures 2 and 3) they support the answering of the research question of this study. The particular concepts of enabler, auxiliary, symbiotic, co-efficient, confluence, and authenticity were chosen because they emerged from previous research (Fleer 2019). These concepts caught the different characteristics of how digital tools were enhancing practices in preschool over 2 years in previous research (Figure 4). Therefore, this study sought to draw on these analytical concepts (Figure 5) to support better understanding the new pedagogical practices that emerge when the MyCreate app and a mobile digital device are used to make an animation.



*Figure 4.* Theoretical interpretation - Digitally enhanced practices acting together with a multiplier effect (Fleer 2019, 12)

Figure 4 shows how the relational linking is presented in the digital analysis system and Figure 5 shows how the interpretations were digitally organised.

Name
▶ A RAW DATA Analysis
▼ B INTERPRETATIONS
▼ VIDEO DATA ANALYSIS
▶ 1 Common Sense Analysis
▶ 2 Situated practice interpretation
▼ 3 Theoretical interpretation
▶ Authenticity
▶ Auxiliary
▶ Co-efficient
▶ Confluence
▶ Enabler
▶ Symbiotic
▶ Consent and attendance
▶ Engineering paper and literature
▶ Methodology
▶ ROLE/POSITION OF RESEARCHER

Figure 5. Theoretical interpretation using digital tools

## Findings and discussion

In keeping with the aim of the paper and the theoretical perspective drawn upon, a holistic presentation of the practices in the centre are introduced, followed by an overview (Table 2) of the activity settings and what these afforded, in relation to the new practices for the integration of digital resources within the case example. This is followed by a discussion of the emerging practices, clustered under the headings of previously identified practices, and the new integrated pedagogical practices of a pop-up digital activity setting, as identified in this study.

*Previously identified practices:* The institutional practice context was made up of the usual activity settings found in preschools, such as meal time, block play area, construction play area, table top activities, home corner, etc. Within these activity settings, it was possible to determine that these activity settings were infused, interlaced or percolating with digital tools, which appeared to amplify (Fleer 2019) the play and learning of the children, and which

together appeared to represent an ecology of digital practices (Arnott 2016). Those activity settings where the digital tools were used are shown in Table 2 Column 1.

Table 2

*Activity settings where digital tools appear to amplify children's play and learning*

<b>Activity setting (data referenced)</b>	<b>Teacher's action in the activity setting</b>
Animation space (CF001)	Children photograph the role-playing of the 3 Billy Goats Gruff
Animation space (CF002)	Children photograph the role-playing of the 3 Billy Goats Gruff
Animation space (CF003)	Children photograph the role-playing of the 3 Billy Goats Gruff
Animation space (CF004)	Children photograph the role-playing of the 3 Billy Goats Gruff
Circle time (CF005)	Animated story of 3 Billy Goats Gruff – YouTube
Animation space (CF006)	Children photograph the role-playing of the 3 Billy Goats Gruff
Circle time (CF007)	Time lapse images of grass growing. Lap top screen is used to show and discuss images to the children in the context of 3 Billy Goats Gruff crossing bridge to eat the juicy long grass.
Circle time (CF008)	Demonstration and discussion of wireless printing of google images. Children and teachers press print command and retrieve from another room the images from the photocopier.

Table top with lap top (CF009)	Educator D shows child J a digital animation previously created by the children.
Animation space (CF009)	Child J and Educator D digitally animate story of the 3 Billy Goats Gruff. Child A and Child K join them to make a movie.
Animation space (CF010)	Children role-play, animate, narrative and view the 3 Billy Goats Gruff
Circle time (CF0011)	Children view one of the animations of the 3 Billy Goats Gruff
Animation space (CF012)	Children role-play, animate, narrative and view the 3 Billy Goats Gruff

What this table shows, is how the educators had within the institutional practice of the preschool, organised a specific activity setting of an animation space with digital goals in mind, such as making a movie of the story of 3 Billy Goats Gruff. They also had general activity settings, such as circle time, where digital tools were also used, and which were dedicated to enhancing the play and learning of children for making the animation. Acting as coadjuvants (Fleer 2019), the activity settings of circle time (story of 3 Billy Goats Gruff-YouTube cartoons; animated story-YouTube; printing-everyday use of wireless technology; fairy tale enrichment-time lapse) and tables (watching animations made-MyCreate app) illustrate how traditional activity settings can be digitally enhanced, and this is in keeping with the findings from previous researchers who have studied, captured and named the new practices, as infused technological programs (O'Mara and Laidlaw 2011), interlaced social worlds (Knauf 2016), and percolating spaces (Gillen and Kucirkova 2018), thus demonstrating an amplification of the goals of the preschool through the use of the digital tools (Fleer 2019). In line with Arnott's (2016) metaphor of an ecology, this study found that the activity setting also acted together as an ecology rather than as disparate activity settings

in which the digital technologies were used.

*New pedagogical practices:* What was different from the previous research, is that in this study of the preschool the new activity setting of an animation space organised by the teachers revealed a dynamic set of pedagogical practices. The new activity setting was specifically organised for making a digital animation of the fairy tale of the 3 Billy Goats Gruff. This is shown in Figure 6 where there is both an area for the digital tool (foreground) and an area of the set design (background).



*Figure 6.* Activity setting for making a digital animation

However, when this activity setting was iteratively and dynamically analysed, it was found that it had multiple and integrated layers – first for making a bridge, second for capturing the fairytale as an animation, and third for role-playing with the props of the fairytale in preparation of narrating the digital animation. How the teacher and the children enter into this same activity setting changed based on the layer of meaning and therefore the motivated actions of the children (see below). The change in actions in the same activity setting (see Figures 6-11), provided a rich microgenetic analysis for understanding the new integrated pedagogical practices of the teachers who were using digital technologies in their play-based program (see further below in Table 3) as illustrated through the following vignette of different pedagogical practices within the same activity setting that emerged (across the



weeks of the study period). The vignette that follows summarises the actions of the teachers and children within the activity setting of the digital animation space.

*The teacher has read a book of the fairytale of the 3 Billy Goats Gruff to the children during circle time. After some discussion of the new activity setting of the animation space where the goal of the activity is presented, the teacher invites the children to select what they would like to do during free play time. The children disperse into all the areas of the preschool, and a small group of children (with others joining later) follow one of the teachers into the animation space. (CF001).*

*The teacher holds the book, and invites the children to discuss their set design for making a movie of the 3 Billy Goats Gruff. The children move back and forth between the block area and the animation space, building a bridge (Figure 7). They find near the animation space a collection of large plastic goats, and after making the bridge, the children with the support of the teacher test the bridge (Figure 8). At the same time, another teacher with support from the research assistant Shukla (Figure 6), begin to prepare with some of the children the digital device and app ready to take photos of the set design and scene that is emerging. But many of the children are standing in the way of the camera, and there is a lot of discussion and moving of the children away from the set design, so that in the end the iPad is brought closer to the scene and the children begin taking photographs whilst telling the story of the fairytale with support of the teacher, each time moving the goats and pressing a button to take a photograph (Figure 9). There are some technical problems, but this is solved. (CF001).*

*On a subsequent day, one of the teachers shows some of the children the movie that had been made on a centre lap top, and invites the children to work with her on creating the voice over for their movie. The children follow her into the animation space, where they first watch the movie again and talk about the sequence of the photographs (Figure 11a), followed by role playing with the plastic props the story, and then record their voice over (Figure 11b) with support of the teacher (CF009).*

## 1. Pedagogical actions in the activity setting of an animation space: Bridge making

Children build a bridge and re-tell the story using plastic characters. They use these materials and their experience of role-playing the characters to create a digital animation of the fairy tale. The teacher broadens the children's circle of experience and makes available/accessible new meanings of everyday practices with the MyCreate app. The pedagogical actions in the activity setting of the animation space are oriented towards building a scene for both the role-play and digital animation of the 3 Billy Goats gruff, as are shown in Figure 7.



*Figure 7.* Motivated actions of bridge building for the 3 Billy Goats Gruff: Set design and build

The pedagogical practices of the teachers orient the children's actions to testing the bridge for its strength by placing the goats onto the constructed bridge (see Figure 8).



*Figure 8.* Engineering motivated actions of testing the bridge for the 3 Billy Goats Gruff:  
Engineering practices

## **2. Pedagogical actions in the activity setting of animation space: Capturing the fairy tale as an animation.**

During the process of making an animation, the teacher supports the actions of the children by coordinating props and people when photographing the fairy tale of the 3 Billy Goats Gruff. The children take photographs of the object, ensuring no one is standing in the way. Through these actions, the children's motivated actions become oriented learning how to make an animation. Photographs capture both the reality of the experience (what is really visible), and the imaginary situation, supporting new design solutions.

What emerges is a digital imaginary situation (Figure 9) where children create a digital imaginary scene and digitally move the characters and their images to re-enact digitally the fairytale with digital props.



*Figure 9.* Motivated actions of making a digital movie of the fairytale: Digital animation

### 3. Pedagogical actions in the activity setting of an animation space: Role-playing with the props the fairytale

Interestingly, in this study the pedagogical practices of the teachers over the period of the study featured at different points the children role playing with the props, acting out the narrative of the story, and with the active support of the teachers, re-telling the fairytale of the 3 Billy Goats Gruff – as shown in figure 10. *The teachers' actions appeared as co-actors for the successful creation of an animation with the children.*

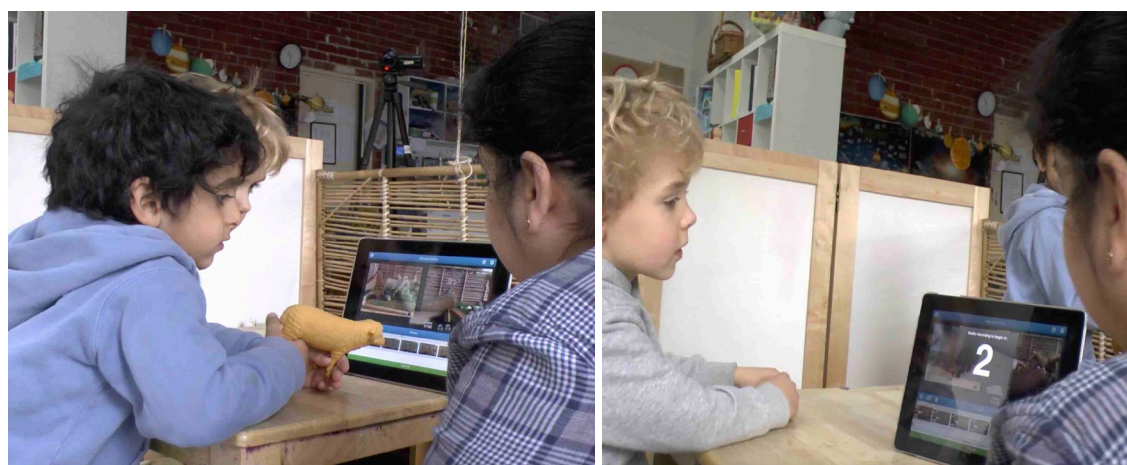


*Figure 10.* Motivated actions of role-playing a digital movie of the fairy tale of 3 Billy Goats Gruff: Retelling story in sequence



#### 4. Pedagogical actions in the activity setting of an animation space: Narrating the animation

Creating a *digital animation* of a known fairytale appears to be a new activity setting for the children in the preschool. The children incorporated into the imaginary play situations the use of digital technologies to develop the story line. They used *new kinds of tools*. The digital device and app were used as a tool for making a movie, where new competencies were being developed by the children. The task of narrating the digital sequence of images involved first viewing on the laptop the completed movie. This was followed by re-enacting the storyline of the fairytale, followed by them sitting and viewing the animation and recording live the narration as a voice over. This is shown in the two images in Figures 11 below. *The teachers' actions appeared more as co-directors for the successful creation of an animation with the children.*



*Figure 11a & 11b.* Motivated actions of adding sound to the movie: Reviewing animation and beginning narration.

The activity setting of the animation space, appeared to mirror in the centre authentic real world technological practices for a real purpose. Children had viewed cartoons and YouTubes of animations made by professionals. Therefore, having access to real tools to do

the same work, gives a level of authenticity to the new activity setting, as something related to their real world. *The teachers' actions appeared as leading children's conceptual development of what is an animation and how to make an animation through setting up an authentic real-world tool space for them and by acting as co-animators.* This activity setting is different to simulations of objects and tools, found in the preschool, such as the home corner, where the props and play activity are substitutes/replicas rather than authentic real-world tools for children.

In summary, what we learn from this microgenetic analysis of the same activity setting at five different moments, is that the introduction of an authentic digital activity setting needed different pedagogical actions by the teachers. The study found that teachers needed to manage and coordinate social relations and technical support when photographing the scene and teachers needed to actively tune children into negotiating these – as a form of intersubjectivity. The digital device combined with the props gave the possibility for re-telling a familiar story in a new way. The teachers created new conditions for children's play actions and narrative for making visible in digital imaginary situations the need for concepts, actions and new ways of working/playing in the preschool. Teachers used the app with the children to authentically design an animation. Therefore, it can be argued that teachers now have additional tools for play and learning that were not previously available at the time of conceptualising the traditional Froebelian Kindergarten.

Table 3 summarises the motivating conditions experienced by the children (Figures 6-11), whilst foregrounding the dynamic pedagogical practices of the teachers for realising digitally enhanced actions in the activity settings.

Table 3

*Microgenetic analysis of same activity settings with different pedagogical actions of the teachers in the context of the traditional institutional practices of a preschool*

<b>Analytical concept to capture the practice</b>	<b>Explanation</b>	<b>Actions in the activity setting</b>	<b>Pedagogical practice</b>
Social problem is a <i>co-efficient</i> for learning how to make an animation	Developing a motive orientation to learning how to make an animation	<i>Coordinating props and people</i> when photographing the fairytale of the 3 Billy Goats Gruff – how to make a digital animation	<i>Person and digital intersubjectivity:</i> Social problem and technical problem for photographing the scene
Technology acts as an <i>auxiliary device</i> for supporting the cultural development of the child	Allowing children to do more than if they have to rely upon their memory	<i>Preparing the narration</i> of the story and recording it over their digital animation	<i>Virtual-concrete combination:</i> Digital device combined with the props give the possibility for re-telling a familiar story
The digital practices are interrelated, but act in a <i>symbiotic</i> relation	Photographs capture both the reality of the experience (what is really visible), and the imaginary situation, supporting new design solutions	<i>Photographing and sequencing images</i> of the fairytale of the 3 Billy Goats Gruff	<i>Virtual designing:</i> Photographs and app support new design practices – making a digital animation of a familiar story
Digital tools act as a <i>confluence</i> of what	Broadening the child's circle of experience and	<i>Building a scene for role-play and</i>	<i>Stimulating a digital motive:</i>



children need to know and what they experienced physically	make available/accessible new meanings of everyday practices	<i>digital animation:</i> Children build a bridge and re-tell the story using plastic characters. They use these materials and their experience of role-playing the characters to create a digital animation of the fairytale.	Teacher creates conditions for children's play actions and narrative for making visible in digital imaginary situations the need for concepts, actions and new practices
<i>Authenticity</i> of tool use – genuine use of technologies to support activities	Mirroring in the centre authentic real world technological practices for a real purpose.	<i>New kinds of tools:</i> The digital device and app are used as a tool for making a movie	<i>Digital authenticity:</i> Teachers use the app with the children to authentically design an animation
Digital <i>enabler</i> of new imaginary situations	Children incorporate into the imaginary situations the use of digital technologies to develop the story line	Creating a <i>digital animation</i> of known fairytale – new activity setting in a preschool	<i>Pop-up digital area:</i> Teachers have additional tools for play and learning not previously available in the traditional Froebelian Kindergarten

Digital <i>replication</i> of existing imagined concepts and interactivity to explore concepts	Mirroring virtually concepts in child-friendly digital games	<i>Digital imaginary situations:</i> Children create a digital imaginary scene and digitally move the characters and their images to re-enact digitally the fairy tale with digital props	<i>Digital imaginary situations:</i> Teachers use app and mobile device to facilitate new kinds of re-presenting of practices in children's play, but are realised in a modified form through their imagination
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## Conclusion

The study identified two main findings. First, and in line with previous research, this study found that the identified digital practices, such as, infused technological activity (O'Mara and Laidlaw 2011), interlaced social worlds (Knauf 2016) and percolating spaces (Gillen and Kucirkova 2018) were evident in this study – as noted in Table 2 and Figures 6-11. This finding contributes to scholarship because the results confirm previous research undertaken in preschool settings where the digital technology forms part of the ecology of the preschool (Arnott 2016). Within this ecology, it was noted in this study that the activity settings of circle time, table top space and the animation space, with their integrated digital practices, contributed to the overall goal of making a digital movie. The pedagogical practices appear to be in line with previous digital activity settings already identified, such as, the integrated practices of Skype, robotics, Google Earth, digital games, etc., found in some preschools. Therefore, the study results confirm previous research in preschool settings, but for the area

of digital animation.

Second, the study found that the teachers created a new activity setting of an animation space for making a digital movie of the fairytale of the 3 Billy Goats Gruff. This represented a new area within the preschool that appeared to be integrated, but at the same time it was specifically a new activity setting for the children which afforded equal status with the other areas in the preschool, such as the home corner. The term *digital pop-up* captures the new integrated practice. Different to a free-standing computer area, was how the dynamics of the digital pop-up reciprocally created motivated action of the children for bridge building for the set design of the 3 Billy Goats Gruff, whilst at the same time creating motivating actions for digitally animating the scene as a movie. That is, the same activity setting of a digital pop-up afforded new motivated actions of children and the teachers alike. Teachers used different pedagogical actions (co-actors, co-animators, co-directors, authentic real-world tool use) within the same activity setting of the digital pop-up to meet the goal of making an animation. The 7 moments of the same activity setting of a digital pop-up, also identified new pedagogical actions of the teachers (*Person and digital intersubjectivity, Virtual-concrete combination; Virtual designing; Stimulating digital motive; Digital authenticity; Pop-up digital area; Digital imaginary situations*) and these have not previously been noted in the literature.

Together, these pedagogical actions act as *foundational pedagogy* for a digital pop-up. A digital pop-up needs a digital pedagogy to support teachers with their planning and actions, but also this is important for theorising the new practice traditions that are emerging in our preschool settings. A digital pop-up with its associated pedagogy offers one way forward for

educators as they push against a generalised view of what is meant by screen time to reveal a multiplicity of uses for digitally amplified play-based programs in early childhood settings. Perhaps the concept of a digital pop-up might be more palatable to a community consumed with the moral panic of screen time. Clearly more research is needed to progress understandings in our quest to support the pedagogical practices of preschool teachers.

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