

Digital education through guided pretend play

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ABSTRACT

Background: The importance of play for children and its potential for learning are widely recognized. However, it is contested whether teachers should guide play, particularly pretend play, and how guided pretend play supports children's agency and learning. In this study, pretend play is employed in (unplugged) digital education and the teacher's guidance and children's involvement are examined to answer the following questions: what roles do teachers take on during guided pretend play and how do they enable children's learning about digitalization and digital transformation?

Aims: This qualitative study examines how teachers guide pretend play in ways that support learning, focusing on the topic of digitalization and digital transformation.

Sample: Fifteen teachers took part in the study and implemented the pretend play suggestions in their kindergartens with children aged from four to six years.

Method: The pretend play was filmed. The video data were structured and sequences of teachers joining in the pretend play and guiding from within were selected. These sequences were analysed in-depth using multimodal interaction analysis.

Results: The results indicate that teachers guide pretend play from within by taking on different roles (play leader or co-player). Teachers model within pretend play, for example, by assigning tasks or thinking aloud, and provide scaffolding, encouraging children's learning about digitalization and digital transformation.

Conclusion: Through co-playing and leading, teachers support a prolonged and in-depth joint focus, as well as the agency of the children. Such guided play is termed "sustained shared playing" and has great potential for learning.

1. Introduction

It is well known that young children learn through play: they discover the world around them and develop fundamental skills (Hirsh-Pasek & Golinkoff, 2008; Whitebread & O'Sullivan, 2012). Playful learning is recognized as an important pedagogical approach in early childhood education (ECE) (UNICEF, 2018). Playful pedagogies are rooted in a long-standing tradition of instructional design, especially for ECE (Lillard & Taggart, 2019; Lino & Parente, 2018; Samuelsson & Carlsson, 2008).

Whilst pedagogies for early childhood emphasize play, to what extent play can and should be guided is contested. Stances emphasizing free play, as a solely child-led opportunity of exploration, urge teachers to refrain from seeking to guide play, whereas exclusively teacher-led activities focusing on instruction might not meet the criteria for play. Integrated approaches seek to combine the benefits of adult-directed and child-initiated activities (Wood, 2010), bringing together the

advantages of both free play and instruction (Zosh et al., 2018). Such integrated approaches are termed "guided play" (Hirsh-Pasek & Golinkoff, 2008).

The present study examines the teacher's role in guided play and the potential for children's learning regarding digitalization and digital transformation using qualitative multimodal interaction analysis. In focusing on the topic of digitalization and digital transformation, this research goes beyond the focus of previous works on children's digital play, which is understood as play with digital devices, such as touch screen devices or smart toys (Arnott et al., 2019; Arnott et al., 2020; Edwards et al., 2017; Fleer, 2016). These approaches often emphasize user skills. In contrast, pretend play focusing on the processes of digitalization and digital transformation emphasizes making sense of the digital world (Grassmann et al., 2021).

Digitalization refers to the use of digital technology to render former analogue processes digital, whereas digital transformation encompasses the strategic and organizational change of integrating digital technology

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into new processes (Schallmo et al., 2017; World Economic Forum & Accenture, 2017). Digital transformation will become important in children's future lives, in everyday routines as well as in their careers. It is therefore essential that they are given the chance to obtain the necessary competences to envisage themselves as actively shaping digital transformation in all areas of life. From an early age children are able to explore concepts and digital processes such as installing, programming, developing, debugging and connecting, as well as forming an understanding of data exchanges between two devices or microchips.

1.1. The six pillars of playful learning and pretend play

Hirsh-Pasek et al. (2015) identified four pillars of learning: children should be (1) active (minds-on) and (2) engaged, while learning needs to be (3) meaningful (applied to prior knowledge and transferred to the outside world) and (4) occurring in a social interactive environment. Zosh et al. (2018) expanded these four pillars of learning to six pillars by adding that learning should be (5) joyful and (6) iterative. Guided play in particular harnesses these six pillars of playful learning and helps to maximize learning (Zosh et al., 2018).

Playful learning settings are found to be highly motivating for children, as found by one experimental study of 38 children aged three to five. Sawyer (2017) compared children's motivation and private speech in a playful situation (pretending to be fishing) and a non-playful one (task: catching as many fish as possible to earn stickers) and concluded that children are driven by an inner curiosity and enthusiasm, as they try harder, persist for longer and think more deeply in playful settings than in non-playful ones (Sawyer, 2017).

Playful learning involves various types of play. According to Pellegrini (2009), different forms can be distinguished: object, locomotor, social and pretend play. The present study focuses on pretend play, which describes activities in an "as if" mode. For example, familiar activities may be performed in the absence of the necessary materials, others may not be carried through to their usual outcome, objects may be substituted for another, or a child may perform an activity usually done by someone or something else (Fein, 1981). A variety of terms have been used to refer to this type of play behaviour (e.g., imaginative play, make-believe play, fantasy play, dramatic play). Consequently, the term pretend play will be utilized in this paper, to emphasize the importance of "pretending as if".

Pretend play is how young children make sense of society. As children observe adults utilizing digital technology in their everyday life, and as they also have access to many digital devices themselves (Johnston et al., 2018; Nikolopoulou & Gialamas, 2015), it follows that children include digital technology in their pretend play, as studies have shown (Arnott et al., 2020; Bird, 2020; Vogt & Hollenstein, 2021). In light of the great and rapid changes occurring in society through digitalization, making sense of the digital transformation processes is important for young children. Children might pretend to have a certain role (for example, as an information technology (IT) expert) and to handle objects without using the real ones (such as pretending a wooden object in the form of a tablet is a tablet), and in these ways appropriate digital technology in pretend play (Arnott et al., 2020; Bird, 2020; Vogt & Hollenstein, 2021).

When engaging in pretend play, children mostly pretend what they know (Vygotzky, 2004). Children rely on adults as well as other children to expand their imagination in play (Veraksa et al., 2022). They therefore rely on teachers' guidance to learn new content during pretend play. If the six pillars of playful learning are realized in guided pretend play, this could contribute to children's learning about digitalization and digital transformation.

1.2. Guided pretend play and the potential for children's learning

Guided play means that the ideas, contents and the responsibilities for advancing pretend play are initiated by the children, and they retain

agency in directing the activity even when the teacher is involved (Sandberg, 2002; Zosh et al., 2018). The teacher's involvement in guided play mainly structures the activity and centres it around a learning goal. For guided pretend play, this means that the teacher offers an environment, for example, an IT centre, where the children can learn about digitalization and the processes of digital transformation. The children pretend to be IT experts and are actively engaged as they explore digital content and processes when playing with or without the teacher. The teacher joins in, for example, by pretending to be a customer or a fellow IT expert, thus playing together with the children (Vogt & Hollenstein, 2021).

Several studies have found that children's pretend play benefits from teacher guidance, as they play more often, for longer and in greater depth (Gaviria-Loaiza et al., 2017; Gmitrova, 2013; Perren et al., 2019). Moreover, the quality of play generally increases with teacher guidance (Kalkusch et al., 2022; Perren et al., 2019; Weisberg et al., 2013). Meta-analyses have compiled evidence that guided pretend play has positive effects on children's learning, e.g., in mathematics and computer skills (Alfieri et al., 2011; Skene et al., 2022). These meta-analyses do not differentiate between different play types (competitive, physical, constructive or pretend play) or take into account how teachers guide the play. The following question therefore remains: how can teachers guide children's pretend play to encourage learning about digitalization and digital transformation?

1.3. Teachers' roles during guided pretend play and cognitive apprenticeship

Different models exist regarding how teachers can guide play. In general, the literature specifies that the teacher can be a play leader, a co-player, a stage manager or an onlooker, or can also be uninvolved (e.g., Gaviria-Loaiza et al., 2017; Ivrendi, 2020; Von Felten & Tuggenier Lienhard, 2018).

Considering the guidance of pretend play in light of the cognitive apprenticeship phases (Collins et al., 1989), the teacher's role during the guidance of pretend play constitutes a dynamic switch between four different roles (Vogt, 2020). When the teacher guides pretend play from within (playing with the children and taking on a specific role), the teacher can be (1) a play leader in the modelling phase or (2) a co-player in the scaffolding phase. When the teacher directs it from outside (without having a specific role in the pretend play), the teacher is (3) a tutor or director in the scaffolding or coaching phase, or (4) an observer in the fading phase. Fig. 1 shows the different roles and phases.

Several studies have shown that teachers often guide play from the outside as tutors, directors or observers, and only rarely from within as play leaders or co-players (e.g., Gaviria-Loaiza et al., 2017; Ivrendi, 2020). In contrast, children accept teacher guidance in play more easily when the teacher takes the role of co-player or play leader rather than directing from the outside, as found by Gaviria-Loaiza et al. (2017), who categorized the video data of 11 teachers, coding teachers' roles and children's responses (ignoring/rejecting, evaluative or acceptance behaviours).

Teachers foster experiences of agency when joining in as co-players, carefully adjusting the degree of guidance provided and seeking to navigate their playful engagement with the children, finding the right balance of guiding and enabling the children to lead (Bubikova-Moan et al., 2019; Pyle et al., 2018; Rentzou et al., 2019). Inappropriate or too much teacher engagement can disrupt children's play (Fleer, 2015; Hakkarainen et al., 2013). During scaffolding processes, teachers should not provide either too much or too little support, which demands considerable skill from them (Hermkes et al., 2018; Radford et al., 2015). Sustained shared thinking was identified as occurring during interactions between the teacher and children when they "work together" in an intellectual way to solve a problem, clarify a concept, evaluate activities, or extend a narrative" (Siraj-Blatchford & Sylva, 2004, p. 718). Teachers are required to support children's engagement

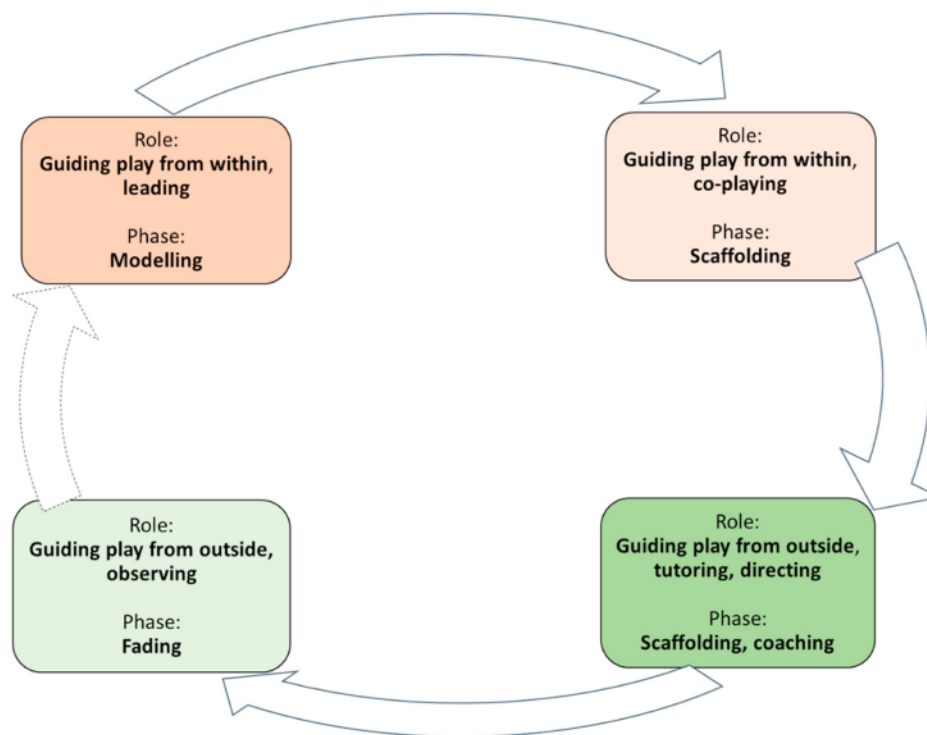


Fig. 1. Teachers' roles during guided play (English adaptation from Vogt, 2020; following Collins et al., 1989 and von Felten & Tuggener, 2018).

and focus learning, as well as ensuring that children regulate their own learning (Radford et al., 2015).

Considering that children accept teacher guidance better when the teacher is co-playing (Gaviria-Loaiza et al., 2017) and enabling the joint processes of sustained shared thinking (Siraj-Blatchford & Sylva, 2004) between the teacher and the children, it is evident that the roles which involve the teacher joining in the play and guiding from within have the most potential for learning in guided pretend play. Nevertheless, guidance needs to be balanced carefully, as strong teacher involvement can lead children to lower their engagement, thus jeopardizing their play.

1.4. The present study

This paper examines the roles taken by the teacher in guided pretend play within the curricular area of digital education using a qualitative methodology. Previous analyses showed that children explore the topics of digitalization and digital transformation within the pretend play opportunities provided by the project “we play the future” (Vogt & Hollenstein, 2021). Teacher guidance has been found to be relevant, as the analysis of play sequences pretending to solve digital problems revealed that problem solving was more extended when the teacher joined in the pretend play compared to the children playing on their own (Hollenstein et al., 2022). Having established the potential for digital learning and the scope of the teacher guiding from within, the analysis in this paper seeks to understand precisely how teacher guidance works when engaging in guided pretend play. The present paper focuses on the different roles teachers take when providing guidance from within, how they expand children's understanding of digitalization and digital transformation and what the guidance of the teacher means for children's engagement and learning with regard to the six pillars of playful learning. The following research questions (RQs) are examined:

RQ #1: What roles do teachers take on during guided pretend play from within and how are the phases of cognitive apprenticeship integrated in their guidance?

RQ #2: In what way does teacher guidance from within enable children to learn about digitalization and digital transformation through play?

2. Method

2.1. Sample and study design

The data analysed stem from the “we play the future” qualitative explorative intervention study. Participation in the study was invited through mailings and adverts in teacher media. The teachers were self-nominated and participated voluntarily. Fifteen kindergarten teachers actively participated in this exploratory intervention study and implemented the guided pretend play in their kindergarten. It is worth noting that the kindergarten is an integral part of the compulsory education system for children aged four to six in Switzerland. The kindergarten curriculum in Switzerland is competency-based, with information technology and media education recognized as an interdisciplinary area (D-EDK, 2023).

Eight different pretend play resources for digital transformation were developed. The scope of the project was to (i) extend the existing corners of pretend play (Vogt, 2021) with regard to the theme of digital transformation (the home corner becomes a smart home corner) and (ii) develop new pretend play corners, such as an IT centre, a robot factory, an online shop or a food laboratory.

As part of this study, the kindergarten teachers first participated in half a day of professional development and then introduced at least three of the eight pretend play suggestion of “we play the future” in their kindergarten. This professional development focused on the introduction to the pretend play and content knowledge about digitalization and digital transformation. Teachers were also made aware of gender-sensitive guided pretend play. They were asked to introduce the scenarios through guided pretend play, playing with the children in the respective play corners. The teachers were encouraged to guide play as well as ensure that the children played independently. This teaching approach is in line with the pedagogical approach commonly used in

Swiss kindergartens, where children are given a daily period of (free) play.

2.2. Data collection and analyses

The kindergarten teachers implemented the pretend play in their kindergartens for at least four months. Video observations of the children’s play were conducted twice over that period. Most of the video observations had a duration of 1.5 hours. The observations involved recording the children’s independent play activities, as well as play with the teachers’ guidance. Permission to record was obtained from the children’s parents and guardians, as well as from the teachers. On the day of filming, the children were free to decide whether they wanted to participate in the play and be filmed or engage in other play areas and activities.

In total, 45 hours of video data were collected. These were qualitatively analysed using multimodal interaction analysis, following the methods outlined by Goodwin (2018) and Mondada (2014). Multimodal interaction analysis is based on ethnomethodology and phenomenology (Knoblauch & Tuma, 2019) and extends conversation analysis by also considering the non-verbal aspects of an interaction (Mondada, 2014). In this study, the multimodal interaction analysis revealed the various ways in which teachers guided the pretend play to expand children’s comprehension of digitalization and digital transformation.

Video data provide a lot of information about the non-verbal aspects during an interaction. In the context of ECE in particular, the analysis of non-verbal communication in addition to the verbal communication is crucial, as some children mainly interact non-verbally. Subsequently, it is important to consider the multimodality in order to describe and explore sense-making in the interaction, in this case, between the teacher and the child(ren) (Knoblauch & Tuma, 2019; Mondada, 2016). Interaction analysis allows for capturing the children’s sense-making in a given moment of interaction but does not provide information about the performance of each child as measured against a set competency in the way a standardized competency test would.

This multimodal interaction analysis is aligned with the procedure suggested by Knoblauch and Tuma (2019). First, relevant situations were identified through ethnographic sampling. The first structuring coding process provided an overview of the video data. In total, 941 sequences of pretend play interactions were identified. Each sequence was then summarized and categorized based on the extent to which digitalization and digital transformation were the main theme of the sequence. In 128 sequences digitalization and digital transformation were highly relevant, as they involved, for example, programming a robot or installing microchips. Another 457 were categorized as partially relevant, as the sequences included aspects of digital transformation, but these were not the main focus, such as when the play involved pretending to make a mobile payment or checking smart home systems. Finally, 356 were not relevant at all, meaning that the pretend play sequences focused on topics other than digitalization or digital transformation.

The teacher was involved in 68 instances of the 128 highly relevant sequences in which the pretend play sequences focused on digital transformation (53% of the highly relevant sequences) and 170 times of the 457 partly relevant ones (37% of the partly relevant sequences). Of the 356 which were not at all relevant, the teacher was involved 88 times (25% of the irrelevant sequences). The higher percentage of teacher involvement in the sequences in which digital transformation was highly relevant, in comparison to the partly relevant and irrelevant ones, indicates that teacher guidance helps make the digital transformation relevant in pretend play.

The 68 sequences in which digital transformation was highly relevant and the teacher was involved originated from 12 kindergartens. In the next step, 12 sequences were selected for in-depth multimodal interaction analysis. These 12 sequences were chosen because they represented recurring play scenarios in a variety of pretend play corners.

The 12 sequences came from nine kindergartens and lasted between 50 seconds and four and a half minutes.

Several researchers participated in data sessions in which they analysed detailed transcripts of these selected sequences. One researcher had prepared the transcript of a selected sequence and, therefore, was familiar how it unfolded. This researcher led the interpretation session. The other two to three researchers joining the interpretation session had not seen the video or the transcript. The researcher leading the session presented the transcript of one turn and asked the others to express their observations, interpretations and hypotheses. Two questions were central to the interpretation of a given turn: (1) which interpretations of a person’s verbal and non-verbal action are feasible in the situation and in the context of the persons involved, and (2) what could happen next? Interpretations of what could happen next allow for finding several plausible alternatives and widening the scope of interpretations; these alternatives are then compared to the unfolding of the next turn. As the interaction analysis is multimodal, the verbal communications as well as the actions and gestures were interpreted, and their possible meanings explored. After these interpretations had been provided, the next turn was displayed by the researcher leading the session and the interpretation continued, discussing the above questions turn by turn. The interpretative data sessions were recorded and the interpretations transcribed. An example of this process is described in Table 1.

The detailed interpretations of each sequence, as derived from the data sessions, were compiled and analysed in order to formulate an interpretation of the whole sequence. Where required, the video was consulted again to decide upon the most potentially accurate interpretation. Based on the turn-by-turn multimodal interaction analysis, the following research questions were addressed: in what ways do the teacher’s guide play in the sequence, what roles are they taking on and how are they supporting children’s learning through cognitive apprenticeship and playful learning? So, the axes of analysis are the guidance of the teacher and the pillars of playful learning.

3. Results

To describe the results of the multimodal interaction analysis, the interpretations and analyses of three sequences, as examples of the 12 analysed sequences, are presented in this paper. The sequences represent the various ways in which the teacher expands the children’s exploration of digital transformation by providing guidance from within (RQ #1) and how the pillars of playful learning are met (RQ #2), as found in the 12 sequences analysed in detail (for the other sequences, an

Table 1
Example of the transcript and interpretations of one turn.

Turn	Time	Child 1 (IT expert)	Child 2 (IT expert)	Kindergarten teacher (ice cream shop owner)
6	00:31–00:32	<i>Out of the video.</i>	<i>Ok. Takes the tablet and leaves the ice cream shop to go to the IT centre.</i>	<i>That would be great. Looks to child 2.</i>

Interpretations (excerpts) – what can be observed:

- The kindergarten teacher finishes ordering a new app for her ice cream shop.
- Child 2 confirms the order and leaves the situation.
- Child 1 is next to child 2 but in that sequence, he is not seen in the video.

Interpretations (excerpts) – what could happen next:

- Child 2 knows what the ice cream shop owner wants and starts programming the app, and it is (a) highly challenging or (b) very easy for the child.
- The same possibilities also apply for child 1.
- Child 2 and child 1 develop the app together.
- One of the children needs to program the ice cream machine.
- Child 2 does not know what to do and asks child 1.
- The children ask the teacher how they should develop the app and the teacher switches to an IT expert role and (a) leads the sequence or (b) stays in a co-playing role.

overview is provided in the additional material). The 12 sequences derive from nine different kindergartens, but the three sequences selected as examples come from two different kindergartens (sequence one and three are from the same kindergarten).

3.1. Sequence 1: modelling the development of an app

This sequence has been selected for this paper as an example for five of the 12 sequences in which the teacher guides the children as a play leader. In this sequence, the teacher and two children pretend to be IT experts working in an IT centre. When there are no other demands from customers at the IT centre, the teacher presents the idea of developing a clothing app. The teacher asks the other two children whether they want to help. The children (both pretending to be IT experts) confirm (turns 1–2). The teacher starts the development process by pretending to think aloud. The teacher involves and addresses each child individually by directing her gaze (turns 4, 7 and 8). The sequence is 1 min long in total (Table 2).

3.1.1. Teacher roles during guidance

During this sequence, the teacher stays in a play leader role as an IT expert. She models the process of app development and initiates the sequence by saying that she wants a “clothing app”. In that moment, no customer needs help from the IT centre. She models an app development process, mentioning different aspects to be taken into account in the digital transformation of choosing clothes: the app needs a design (turn 5), as well as information about the weather (turn 7) or the activities planned for the day (turn 9). It is relevant that the child is using the pronoun “we” (turn 4) – this reveals that the child sees herself as being part of the IT team, together with the teacher. The teacher follows the suggestions of child 1 and draws a sign – this is a way of pretending to develop an app. The teacher continues with specific ideas (turns 7 and 9) and child 1 executes the programming by typing on the keyboard. Child 2 wants to say something on two occasions (turns 5 and 8), but the teacher does not react and asks child 1 to program the app.

The teacher models the process of developing an app, utilizing IT technical language like “app” or “programming”. In turn 7, she emphasizes the need for programming. The teacher uses tentative expressions but does not leave much time for the children to join in. In turns 7 and 9, the teacher models her reflections by thinking aloud, only pausing briefly at turn 8, possibly seeking to involve child 2. The teacher leads the sequence, involving the children by focusing on either one of them. The children join in, looking at the teacher or their digital devices (computer, mobile phone or tablet).

3.1.2. The potential for children’s learning

Regarding the six pillars of learning, the following aspects can be observed in this sequence: the teacher helps to structure the process of developing an app by modelling it. The children seem to be less *active*, but they follow the lead of the teacher within the sequence, so they are *engaged*. The teacher initiates the idea of developing an application in relation to her problem of not knowing which clothes to choose. The children both look at the teacher and laugh about the suggestions (turn 1), so the setting seems *joyful*. However, during the sequence, the children’s turns are very short. It could be interpreted that this topic is not *meaningful* for the children. It could also be that the teacher is not giving the children enough time to think and talk. The teacher probably inhibits the children’s contributions by asking the next question (turns 7 and 9) in order to continue the development process. Despite their more passive role, the children remain in the interaction with the teacher. In turn 8, child 1 reacts to the teacher’s suggestion of programming by starting to type on the keyboard. Thus, child 1 non-verbally plays out what the teacher suggests. She shows her understanding of how programming is done. Therefore, the children and the teacher are *interactive*. There is *iteration* in programming the different aspects typing on the keyboard (turns 7–8).

Table 2

Transcript: Sequence 1 - Initiating and modelling the development of an app.

Turn	Time	Child 1	Child 2	Teacher	Teacher role
Turn 1–2 The teacher says that she would like to have an app to help her choose which clothes to wear.					
3	00:06–00:11	Looks at the tablet.	Tries to connect the mobile to the PC.	Well. Places her head on her hands and looks at the tablet.	Play leader
4	00:11–00:12	We have to draw clothes on here.	As above.	Looks at child 1.	
5	00:12–00:18	Looks at the tablet.	But. Looks at the teacher.	Drawing clothes. Then that would be the sign for clothes.	
6	00:18–00:20	Hmm. Nods and looks at the tablet.	Looks at the tablet.	Draws something on the tablet.	
7	00:20–00:33	Looks at the tablet. Nods. Turns to the PC and types on the keyboard.	Connects the mobile with the PC, taps on the mobile.	But what would we have to programme? Maybe the weather or – because I cannot wear the same in winter as in summer. Would you enter ... weather we would need to enter, wouldn't we? Looks at child 1. So that it always links with the weather Looks at child 2.	
8	00:33–00:34	Types on the keyboard.	Weather. Looks at the teacher.	Looks at child 2.	
9	00:34–00:59	Stops typing. Nods, turns to the PC and types on the keyboard.	Looks at the mobile and taps.	Precisely, so that it checks the weather forecast to see whether warm or cold rain clothes should be worn. What else would we have to enter with the clothes? Hmm ... maybe whether it's for work or for going out. So, on Monday, when one works, clothes more for work and on Sunday, more beautiful clothes. Could you programme this?	

A third child comes to the IT centre as a customer and needs help from the IT experts. At that moment, all three IT-experts (teacher and both children) stop developing the app and turn to the customer, still in their roles and co-playing.

The teacher offers the opportunity to learn about the process of app development. The children interact with the teacher, but it is questionable whether the children are active and whether the situation is meaningful for them. It is possible that the teacher needs to model such a process again in another sequence and possibly with another topic which is more meaningful for the children and then adopt a co-playing role, scaffolding app development.

3.2. Sequence 2: modelling and scaffolding the development of an app

In this sequence, which lasts almost one and a half minutes, the teacher is pretending to be an ice cream shop owner and the two children are IT experts (Table 3). Child 1 initiates the situation by asking “Do you have a problem?”. Based on that question, the shop owner orders an app to manage her ice cream machine remotely. Beside this one, there are three other examples in the 12 sequences in which the teacher switches between leader and co-player.

3.2.1. Teacher roles during guidance

While the sequence is initiated by the children, the teacher is taking the lead in the moment of defining the needed specification and models the definition of the problem (turns 1–6), thus modelling the digital transformation and the first steps in app development. The teacher maintains the play leader role and insists that child 1 stays and listens (turn 4). Following this introduction, the teacher switches to a co-playing role (turn 7 and the following ones). She clearly does not need to model the process of programming a new app on the tablet or the

process of connecting, as the children swiftly pretend to do this (turns 6 and 7). Child 2 stays in the ice cream shop and tells the teacher what he is doing, also using the word “programming”, which the teacher previously used in her explanation (turn 7). The teacher listens to the child’s explanations and supports him by repeating and expanding some of his sentences (turns 7–10). Child 1 has a question about an app, because there are already apps drawn on the teacher’s tablet (turn 11). The question could indicate the child’s understanding that the newly programmed app could possibly be interacting with other apps or that it is important to check the relevance of an app before deleting it from the tablet. In her response, the teacher employs the word “re-program”.

At the end of sequence, the children explain all the functions of the app to the teacher. The teacher again scaffolds this process by asking questions and repeating the explanations of the children, asking whether she understands correctly. The teacher remained in the pretend play role during the whole sequence and addressed the children in a polite manner, as a shop owner would address IT experts.

The teacher recognizes the possibility of pursuing a learning objective around digital education in the moment the child asks her, while in her role of an IT expert, “Do you have a problem?” The moment of defining a problem, which could be solved through digital transformation, is crucial for the understanding of digital transformation. In view of curricular content, digital transformation focuses specifically on thinking through procedures and processes, so the clear definition of goals and the precise demands are crucial for the development of a new app. The teacher models the complexity of digital transformation and introduces several aspects for which digital transformation should be an

Table 3

Transcript: Sequence 2 - Modelling and scaffolding the development of an app using the initiative of a child.

Turn	Time	Child 1	Child 2	Teacher	Teacher role
1	00:00 00:02	Do you have a problem?			
2	00:03–00:14	It would be ... I would have to do 10 [o'clock] and not 11.	<i>Runs to the teacher and child 1.</i>	<i>Holds a tablet.</i> Yes, you understand, it is like that. That I always have to get up so early in order to come and make ice cream. I don't like having to get up so early all the time.	Play leader
3	00:15–00:18	<i>Takes the IT centre case and moves the weight from one foot to the other and looks at teacher.</i> <i>Moves hand to take the tablet which the teacher holds.</i>	<i>Looks at the teacher.</i>	Actually, I have a question. Could you programme this here, for me, and connect it?	
4	00:19	<i>Turns to the teacher.</i>	<i>Takes a step back.</i>	Please wait a minute.	
5	00:20–00:30	<i>Stands directly next to the teacher.</i>	<i>Stands opposite the teacher.</i>	So that I could enter into the tablet from home which ice cream I would like and then it would make it automatically.	
6	00:31–00:32	Ok. <i>Takes the tablet from the teacher and goes in the direction of the IT centre.</i>	<i>Not on video.</i>	That would be wonderful.	
7	00:32–00:37		<i>Takes a micro-chip sticker out of his folder and goes to the teacher and to the ice cream machine.</i> Now I have to once more – if you want both to be programmed, then I have to stick one of these on.	Are you sticking one of these on once more?	Co-player
8	00:37–00:42		Yes.	That is great.	
9	00:42–00:47		With that, with that. <i>Looks in the direction of the IT centre, goes towards the IT centre, at your iPad.</i> <i>Stands next to child 1 in the IT centre.</i>	<i>Looks at child 2 and listens.</i>	
10	00:47			Ah, are you [checking] my iPad?	
11	00:47–00:49	Apologies, but <i>Looks at the teacher, holds the tablet high and shows it to the teacher.</i> What have you got here? <i>Points to the apps on the tablet.</i> <i>Have you made something here?</i>		<i>Goes to child 1</i>	
12	00:49–00:50			Yes, you can re-program this anew, by all means.	

After the development, both children in their role as IT experts explain the function of the app in depth. They also program a help button in case the shop owner cannot handle the app correctly. The teacher listens to the explanations and thanks the children.

optimization.

3.2.2. The potential for children's learning

The children are *active* and “*minds-on*”, as well as *engaged* during the whole sequence. The children listen carefully to the teacher's order for her ice cream shop. After taking the teacher's order, the children start their work immediately. It seems that this situation is *meaningful* for the children. The children probably apply prior knowledge about programming apps and connecting devices, which they transfer to this sequence. They are also *socially interactive* during the play, as they communicate with each other and with the teacher. The situation seems to be *joyful* as the children are motivated to help the teacher, as the ice cream shop owner, to solve a problem. During this sequence, the children probably engage in *iteration*, as the process of app development seems familiar to them.

To conclude, this sequence contains many opportunities for learning. The children are offered technical language (programming, re-programming, connecting) and concepts of how to technically further digitalization (digitizing a machine and connecting with one's own tablet to remotely control that machine). They also experienced learning opportunities regarding the advantages of the digital world (app development for making production and business easier, as well as enhancing effectivity through automatic production).

3.3. Sequence 3: scaffolding debugging

The third sequence is an example of a total of four sequences from the 12. It has been selected to illustrate how teachers scaffold the problem-solving process of a digital problem as a co-player. The teacher and two children (child 1 and child 2) pretend to be IT experts. One child is a customer (child 3) and initiates the sequence (Table 4).

Table 4

Transcript: Sequence 3 - Scaffolding debugging.

Turn	Time	Child 1 – IT expert	Child 2 – IT expert	Child 3 - Customer	Teacher – IT expert	Teacher role
At the beginning of this sequence (turns 1–3), the teacher asks child 1 whether she also has nothing to do. Just as the teacher proposes to go to the family corner to ask if everything is in order, child 3 comes to the IT centre saying, “the laptop is broken”.						
4	0:10–0:12	Looks at child 3.	Looks up from phone at child 3.	Stands in front of child 2.	Look, now someone is coming. Leans back. Okay.	Co-player
5	0:13	Looks at child 2.	Yes. Stands up and bends slightly over the laptop.	As above.	Looks at child 2.	
Turns 6 and 7: Another child approaches the teacher with a question, the teacher answers briefly.						
8	0:25–0:29	Looks at the teacher and child 2. Gets up and looks at child 2.	Turns to the teacher. I have to install an app. Takes the tablet.	Stands in front of child 2.	Do you need the iPad? Okay. Passes the laptop to child 2, moves the laptop slightly to the side. Aha.	Co-player
9	0:30–0:31	Looks at the laptop.	Holds the tablet and looks at the laptop.	Looks at child 2.	Have you asked what is broken yet? Addresses child 2, looks at the laptop.	
10	0:32–0:35	Looks at child 2.	What is broken? Looks at child 3, then to the iPad.	Looks at the laptop.	Looks at child 3, then at the iPad.	
Turns 11–25: The customer explains the problem that the language is wrong when watching films. The teacher asks which language the customer speaks at home. Child 2 assumes that the hard disk is broken. Child 3 asks which one. The teacher involves child 1 by giving the task to log-in to the computer.						
25	1:39–1:44	Looks at the tablet. Turns to the PC and types.	Holds the tablet in hand, looks at it.	Looks at the teacher.	That you have to enter these letters there, and then one can probably enter. Looks at child 1, points at the laptop.	Co-player
26	1:45–1:51	Turns to child 2, looks at the tablet.	We can do it, I believe. I notice it here, here it is written. Points at the tablet.	Looks at child 2 and the teacher.	Looks at the tablet and child 2.	
27	1:52–1:55	Looks at the laptop.	Here it says. It is not the language they speak. Looks at the teacher.	Looks at child 2 and the teacher.	Looks at the tablet.	
28	1:55–2:00	Looks at the PC screen.	Looks at the PC screen.	Looks at child 2 and the teacher.	Oh yes, this a different language. And here, there is also an error message. Yes, we can see it here. Points to the PC.	

Turns 29–49: The teacher tries to solve the problem via remote access. Child 1 cannot solve the problem. The teacher pretends to solve the problem and then pretends to have made a mistake: everything now appears in Chinese. She passes the task to child 1, asking her to help. Child 1 can solve the problem by typing on the keyboard. The teacher initiates payment with the credit card.

3.3.1. Teacher roles during guidance

As the prospective customer approaches, the teacher is leaning back to signal to the two children pretending to be IT experts that they should deal with the customer (turn 4). Although the customer is positioned in front of child 2, child 2 first turns to the teacher. The teacher interprets this as a signal that child 2 might need the tablet (turn 8) and does not take on a leading role. Child 2 says that he wants to install an app on the tablet, thus using specific language (turn 8). The teacher asks child 2 whether he has already asked the customer what is broken (turn 9), thus scaffolding the importance of identifying a problem first before installing an app. Child 2 asks the customer the suggested question (turn 10).

In the following turns (turns 11–25), children 2 and 3 and the teacher engage in an exchange to figure out that there is a problem with the language settings. The teacher is actively participating, but not leading the conversation. With specific questions, such as asking the customer what language is spoken at home, the teacher is scaffolding the gathering of information to further specify the problem. In turn 25, the teacher seeks to involve child 1 and asks her to log in. At the same time, child 2 joins in and announces that he has discovered something (turn 26). Child 2 initiates the idea that he has access to information remotely on his screen (turn 26) and that the language settings are not correct (turn 27). The teacher confirms this, rewording that the error message is visible on the screen (turn 28).

The teacher integrates these initiatives and oversees a prolonged session of playing, remaining in the role of IT expert and emphasizing the need to think to find a solution. She continues in her role of co-playing and scaffolding for a long period. She asks to use the keyboard, pretends to enter something, then pretends to be shocked, saying that she has made things worse. She asks child 1 to help her and positions her as the expert.

The teacher succeeds in engaging both children at different levels. Child 2 contributes digital knowledge on hard drives and error messages, whilst child 1 types on the keyboard, pretending to log on and solve the problem. Although child 1 does not contribute a great amount verbally, the teacher engages her in the pretend play as much as the other children.

3.3.2. The potential for children's learning

The children are *active* and *engaged* in the problem-solving process. Several times, the teacher holds back, by simply leaning back and not taking the initiative, as well as by supporting the ideas of the children and scaffolding their thinking. It can be assumed that the process is *meaningful* for them. They are *socially interactive* and appear to be *joyful*. Sequence 3 reiterates the processes of problem solving and debugging several times: many of the interactions focus on identifying the problem, finding the bug, realizing that a mistake has occurred and needing to debug this, readjusting the solution and checking the needs of the customer. As a result, *iteration* contributes to a more in-depth understanding of debugging. The teacher enables iteration, for example, when pretending to make a mistake and asking the children to solve the problem. The teacher scaffolds the technical language and the problem-solving process. The children initiate solutions as well, using technical language (such as programming, connecting and hard drive).

4. Discussion

This qualitative analysis, based on multimodal interaction analysis, allows for exploring scenarios involving initiating pretend play situations, with the potential for digital education, modelling digital transformation processes, supporting children's thoughts and ideas in play and giving children the lead. It focuses on the role of the teacher in guided pretend play from within and on examining the potential of children's learning regarding the six pillars of playful learning. In all the 12 sequences analysed, the children accept the teachers' guidance from within. Our results support the findings of Gaviria-Loaiza et al. (2017), who concluded that children accept teachers' guidance more from within than from without. Guiding play from within can be realized in two different roles, play leader and co-player (Vogt, 2020). As has been shown in this analysis, both roles offer the potential for playful learning.

In the role of play leader, the teacher provides information about the process of digital transformation, as in sequence 1, in which the teacher models the processes of developing a new app by thinking aloud. Such short sequences of the teacher taking the role of the play leader are important for modelling new processes and initiating new topics, thus bringing instruction (Zosh et al., 2018) into play from within it. Nevertheless, the findings also indicate that such modelling situations need to be short sequences and address children's interest. In Sequence 1, the children are less engaged and it seems that the topic of developing a clothing app is not meaningful to them. The sequence ends very quickly. In contrast, in Sequence 2, the teacher leads the play for a very short phase only and then switches to co-playing and scaffolding. Sequence 2 continues for much longer and the children stay engaged.

This analysis highlights the importance of teachers taking the role of co-player and engaging in scaffolding. The role of co-player ensures teachers' guidance from within as well as supporting children's agency. It enables the teacher to find the right balance of guiding and enabling the children to lead, which has been found to be vital for playful learning (Bubikova-Moan et al., 2019; Pyle et al., 2018; Rentzou et al., 2019). A great variety of strategies are used by the teachers to guide play in the role of co-player and to scaffold, for example, asking questions, expanding children's inputs or pretending to make a mistake or not to know what to do next. The multimodal interaction analysis employed in this study reveals that the role of co-player and the scaffolding phase are particularly relevant for children's learning, for example in sequence 3 when the teacher first leans back to signal that the children are the experts and then scaffolds when a child looks at the teacher. The analysis

reveals several moments in which the teacher, in the role of co-player, ensures children's active engagement and at the same time scaffolds their learning. This is in line with findings regarding scaffolding in teaching and learning processes which also highlight the need to balance children's activity and the teacher's instruction (Hermkes et al., 2018; Radford et al., 2015).

Guiding play from within enables the teacher to switch between leading and co-playing, as well as between modelling and scaffolding. In particular, co-playing and scaffolding are important to allow children to contribute their thoughts and ideas to the play, enabling minds-on and active learning. The analysis also shows how the teacher's guidance – mainly in the role of co-player, as well as switching temporarily to play leader – enables more sequences of sustained shared thinking within the play. We suggest conceptualizing these interactions as “sustained shared playing”; as the teacher and the children mostly co-play, the children are active in providing their own contributions and the teacher scaffolds the joint playful learning process. As with sustained shared thinking (Siraj-Blatchford & Sylva, 2004), sustained shared playing is based on dialogue, joint exploration and a focus on learning. Fig. 2 depicts the roles, phases and strategies used by teachers.

The high demands placed on teachers' competency in relation to guided play and sustained shared playing need to be noted. Joining in as co-players, carefully adjusting the degree of guidance provided, seeking to navigate their playful engagements with children and finding the right balance (Bubikova-Moan et al., 2019; Pyle et al., 2018; Rentzou et al., 2019) all require a high competence. With regard to guided pretend play on the theme of digitalization and digital transformation, a demand is also placed on the teacher's content knowledge. Although guided pretend play leaves room for fantasy, and suggestions do not need to be fully comprehensive or correct, teachers must have some understanding of this rapidly changing subject. Further research is needed to develop teacher competency for guided play. The teachers in this study volunteered to take part and were open to the idea of using pretend play for digital education, and therefore were probably skilled in guided play.

The limitations of this study include the lack of longitudinal data in relation to the learning processes of the children. The data collected did not allow for examining the development of children's pretend play from one session to the next. Therefore, individual learning processes could not be described longitudinally. The potential for learning processes on the topic of digital transformation was observed through the multimodal interaction analysis in the children's verbal (i.e., using specific words) and non-verbal (i.e., connecting devices) play actions. The results show the great potential of guided pretend play in supporting learning about digitalization and digital transformation (e.g., app development or debugging). The analysis based on the six pillars of playful learning (Hirsh-Pasek et al., 2015; Zosh et al., 2018) demonstrates the potential of guided pretend play for children's learning, as it enabled active, minds-on, engaged, meaningful, socially interactive, joyful and iterative learning. In order to determine the effects of guided pretend play from within on children's learning, the findings from this qualitative study would need to be replicated in a quantitative way to test the effects compared to other approaches.

Guided pretend play is first and foremost play and is thus related to fun, as well as the self-direction of the children and collaboration between players. Based on this analysis of guided pretend play in digital education, the concept of sustained shared playing has been suggested. Sustained shared playing enables children to act confidently and safely and allows engagement without pressure (Samuelsson & Carlsson, 2008; Zosh et al., 2018) to acquire new knowledge or expand their existing understanding and to experience being active agents in a digital society.

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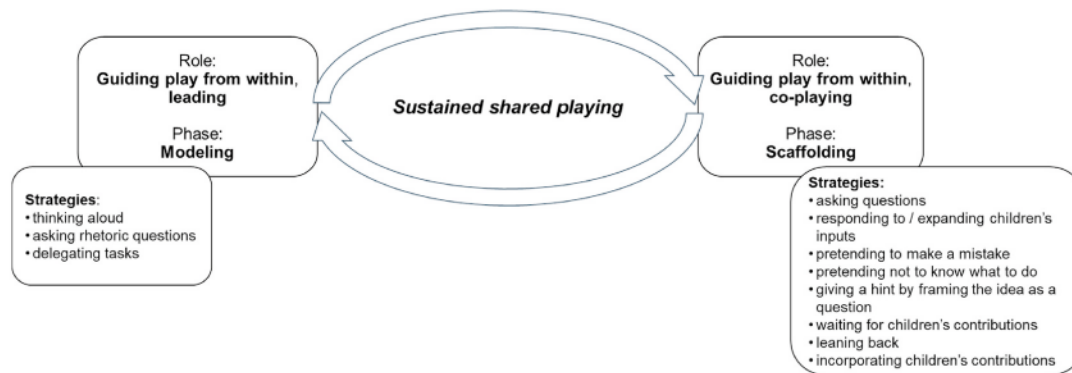


Fig. 2. Sustained shared playing while providing guidance from within.

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Appendix A. Supplementary data

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