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The (im)materiality of literacy in early childhood: A socio-material approach to online and offline events

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Abstract

Among the recent approaches to literacy incorporated into Literacy Studies, the concept of (im)materiality has enabled researchers to delve into the fluid and hybrid nature of contemporary literacy practices in early childhood. Our research explores the (im)materiality of literacy practices from the perspectives of space, screen mediation, artefacts and embodiment. The research focuses on the (im)material nature of the literacy practices carried out in different spaces, and its relevance in the making of meaning by children. The research method is based on an ethnographic approach. The results show the children's embodiment of their literacy practices, and the way in which they create and interact with space and make meaning from their (im) material practices. These practices raise questions about their inclusion in current literacy development in schools.

Keywords

community literacy, early childhood, ethnographic research, multimodal/media literacies, new literacies

Introduction

The recent changes in habits related to technological development, the multimodality of discourses and the emergence of new digital skills among children have transformed the way in which young people interact with their environment (Gillen, 2014). Recent research has investigated children's interactions with new technologies in their family settings, both from an international perspective (Chaudron, 2015) and from a national one. Likewise, other reports have delved into the differences between diverse European countries in relation to the management of digital devices at home depending on family income, educational level and parental style (Livingstone et al., 2015). All of

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this research has revealed the complex characteristics of current communicative practices in early childhood (Marsh, 2014), and has highlighted the need to expand the research on children's communication to include new perspectives where multimodality, linguistic innovation, re-mix, playfulness, participation and interaction acquire a new relevance (Merchant, 2013).

From this standpoint, the analysis of children's interaction with new technologies can be approached with its material and immaterial nature in mind (Burnett et al., 2014). This analytical perspective connects with the research by Burnett (2014) about the new dimensions of space in children's digital literacy practices. Furthermore, it allows the analysis of the bidirectional connection that exists in early childhood between the literacy practices developed at home and those carried out at school (Gillen and Kucirkova, 2018).

The current paper argues for the importance of analysing the meaning of everyday representational practices in schools. We assume that the meaning-making processes of children are conditioned by a cultural frame, which provides the social values of literacy, depending on the ways of knowing within a specific community. As suggested by Pahl (2014):

> Meaning-making practices such as skate park jumps, sewing, dancing and telling stories could be regarded as ephemeral within mainstream schooling, but often were sites of creativity, co-creation and possibility. The spaces of culture were infused with local and situated meanings that derived from the lived experience of those within those spaces. The different worlds of home, school and community were articulated within young people's meaning-making practices (p. 24).

The relevance of our research lies in the analysis of the children's literacies in the light of the children's social and cultural practices. Drawing on an analysis of children's in-school literacy practices, this article presents an analysis of these literacies' materialisations, focusing on those developed out of school and incorporated into children's daily life. We argue that the understanding of these processes and the way in which children make meaning from them may be key in children's literacy development in school.

Theoretical framework

Reconceptualisation of literacy practice

Literacy Studies describe literacy as a socially- and culturally-situated practice (Barton and Hamilton, 1998). This concept implies that literacy practices are purposeful and connected to the spaces in which they originate (Mills, 2016). However, criticism of the notion of situated literacy in the current communicative context has led to a reconceptualisation of practice, where practice is considered as events performed through space, and with interest in the way that space has been 'materialised' by events. The new concept of space proposed by Massey (2005) takes up the perspectives of Lefebvre (1991) and Soja (1996) and reinforces the concept of the creation of space through social interactions. This proposition leads us to conceive children's space as a sphere of multiplicity, where spaces are open and relational, and immersed in a continuous rebuilding (Comber, 2013). Ultimately, the social-material approach to literacy adopted in this paper follows the path charted by the New Literacy Studies in the first decade of the 21st century. In this path, researchers reflect on the creation of literacy events through the 'materialisation' of spaces, artefacts, screen mediation and embodiment. Massey's (2005) spatial perspective helps us to analyse how children make meaning from their out of school literacy experiences, and how these experiences interact with the school. Accordingly, the (im)materiality of a literacy event, as the sum of materiality and immateriality (Burnett et al., 2014), adds a range of dimensions in meaning-making, and a notion of multiplicity (Burnett, 2015). It also provides a diachronic perspective as soon

as immateriality relies on the experience of the present, but also on the memories and the recovery of the past, which become present through embodiment (Mackey, 2011).

The integration of Information and Communication Technology, networked videogames, and Web 2.0 in children's daily life has fostered the creation of new spaces that overlay the learning spaces found in the school and home settings. In our research, we depart from the statement by Leander and McKim (2003) about the false dichotomies between real and virtual, on-screen and off-screen, or digital space and physical space. Accordingly, online and offline practices interact with each other, as proposed by Brandt and Clinton (2002). The development of new identities among children drawing from their interaction in online and offline communities permits them to negotiate their experiences in diverse spaces, in and out school (Comber, 2016).

Our research focuses on how children articulate space as social practice, and how they build new social spaces through multimodal communication. Hybrid and fluid digital literacy practices arise through children's on/offline practices, involving interactions between materiality and immateriality, as described by Burnett (2015).

(Im)materiality of literacy

The (im)materiality of literacy enables us to conceptualise the study of the relation between the material and the immaterial, the role played by children's immaterial memories (Pahl, 2014), and the way in which they bodily interact with the materiality and develop imaginings. Our research adopts the concept of (im)materiality and its four components as described by Burnett et al. (2014). According to this framework, it may be approached from four different perspectives: the spatialisation of literacy, the mediation of reality through screens, artefacts and embodiment. Firstly, we consider that spatialisation is the frame in which the other propositions develop. Massey's (2005) concept of space enables the juxtaposition of material and immaterial spaces through interaction, characterised by fluidity and boundlessness. The (im)materiality of space allows children to integrate new spaces from home with those of the school, and to configure their identities through them. The (im)materiality of spatialisation of literacy makes use of artefacts, embodiment and screen mediation in order to articulate the (im)material experiences in a given setting (Burnett, 2015).

Secondly, the concept of screen mediation described by Burnett et al. (2014) focuses on the way screen texts (mobile telephones, iPads, laptops, etc.) are mediators of (im)materiality. Our conception of screen-mediated spaces implies knowledge of a logonomic system, which determines the children's negotiations around social, digital spaces. Screens are the means by which the digital literacy of children is established, and mobile technologies have become the main source of digital productions among children and teenagers (Ehret et al., 2016).

The development of literacy through screens is developed by children mainly out of school. During childhood, their interaction with screens is carried out mainly through videogames, children's Apps or YouTube channels (Marsh et al., 2017). The materiality of videogames generates a wide range of texts and artefacts around them (cards, shirts, bags, toys) with which children interact in their daily life, even when they may have no contact with the videogame itself (Marsh, 2013). These texts constitute a relevant part of popular culture (Marsh, 2010), and play an important role in the immaterial meaning making of children.

Thirdly, the experiences of children in different spaces are expressed through the artefacts they create, the meaning they build around these artefacts, and the conversations they maintain about them with other agents of the community (Pahl, 2014). The concept of artefact is by nature material and arises both in and out of school. Artefacts have physical characteristics, are built and transmitted through language, portray people, thoughts and stories and, finally, are carried out by an agent in a concrete setting. Children's experiences with artefacts are of a cultural nature, where

'[children's] early experiences of literacy and language are meshed with their own embodied and tacit experiences of care-giving and receiving' (Pahl and Rowsell, 2013: 235). Children interact with artefacts, and they become *representational resources* that relate to new immaterial meanings, within a transduction process in which children rebuild meaning inside a specific context.

Finally, our concept of embodiment is defined as the making of meaning through experience, be it physical (senses) or emotional (memories, feelings, etc.) (Mills, 2016). Embodiment aims to transcend the traditional boundary between mind and body. Our understanding of embodiment departs from Burnett et al.'s (2014) and draws on sensoriality, as described by Pink (2009), as well as attending to meaning-making through sensory perception far beyond the limits of multimodality. Other approaches to embodiment highlight the relation between the body and its place in the world. Through embodiment, children create spaces using their sensory bounds and their imagination, experience and memories of other spaces, whether digital or physical. Consequently, the immateriality of embodiment draws on the perception of environment 'from inside' (Burnett, 2015), and is built synchronically, involving past and present experience (Mackey, 2011).

Research questions

Our research questions apply the previous research on materiality and immateriality to a specific school context, and are as follows:

RQ1: What interactions take place among children between the material and the immaterial in space, screen mediation, artefacts and embodiment?

RQ2: How do children build their own space within a school setting, and how does this newly created space interact with the classroom?

Methodological framework

Research design

The concept of (im)materiality involves an implicit idea of multiplicity, which may be perceived through methodological approaches embracing a diversity of perspectives. The research on children's literacy does not merely analyse the literacy development processes, and it also addresses the multiple ways in which literacy is present in children's daily life, and the assumption of the social values of literacy through fluid and hybrid spaces. To this end, the current research has adopted an ethnographic approach (Campbell and Lassiter, 2014), which enables insight into the literacy practices developed in daily life (Dicks et al., 2011), considering the literacy event as the unit of analysis (Burnett, 2015).

The research took place in a school in the South of Spain during the academic year 2017–2018. The research sample consisted of 25 boys and girls aged 5 and 6. The participants in our research belong to families with Spanish as their home language, and a Spanish cultural heritage. The families and the school management gave their informed consent to take part in the research, which was approved by and adhered to the standards of the Social Sciences of the Ethical Committee of Experimentation of the University of Sevilla.

During the academic year, the research team, composed of four teachers and researchers, attended a 5-years old classroom one morning a week. Although at the beginning the researchers did not intervene in the classroom, as soon as the children gained confidence with them, all of them started to get involved in the learning activities. They played with the children, took part in the

Table 1. Nature, number and duration of the data gathered.

Data gathering	Number	Duration
Children's products	96	
Photographs	126	
Sets of notes containing field observation	20	
Co-analyses and sessions' reports	10	
Video and audio recordings	82	960 min.

read-aloud activities, assisted the teacher, helped the children with their tasks and spent many hours conversing with the children about their daily routines and literacy practices. They witnessed the children's attitudes towards Information and Communication Technology, the children's ease (and eagerness) in using the team's smartphones and tablets, and photographed and recorded the children's songs, conversations, stories and games. They took field notes in every session and, after each session, the team co-analysed their findings with the school teacher. The team met monthly in order to discuss their findings regularly. During these co-analyses, the team decided to focus on some of the children more attentively. The reasons were manifold, and included the children's literacy competences (or their difficulties in the development of school literacy), how easy it was to approach their families, the children's familiarity with at least one of the researchers, and their diversity of literacy practices at school and at home. The overall materials collected during the research period are compiled in Table 1.

Data gathering and analysis

This paper draws on a selection of all the materials (videos, photographs, field notes, conversations) obtained during the whole research period. The specific research described in this paper was intended to be a co-analysis with the children, presented in two vignettes. By the time this co-analysis took place, the research team was familiar with the children, and had collected a considerable amount of data about their literacy practices. However, it was important to perform a co-analysis with the children that explained these data and put them into a context.

The data for the current analysis were obtained during the classroom lessons that took place in June 2018. The children were asked to explain their different literacy practices and associate them to the spaces in which they took place. For this purpose, they were given an A3 size piece of coloured cardboard divided into four sections corresponding to home, school, community and neighbourhood spaces. They were also given a set of photographs taken from the internet and from the researchers' data gathered in the school. The photographs displayed typical home spaces (bedroom, dining room, kitchen), games, children's books, school and library scenes, their neighbourhood, daily routines, games and videogames. The children could identify themselves in the photographs taken in school and, for some of them, the library and the neighbourhood scenes were also familiar. As they were creating their map, they could chat and explain what they were doing to a member of the research team. These conversations were video recorded and transcribed. From all the conversations we have selected two according to the different approaches to literacy displayed in them. Both examples assist in portraying the way in which the (im)materiality of literacy is present in the classroom.

Each conversation lasted about forty minutes. They were transcribed and analysed from the perspective of conversational multimodal analysis. The transcription of the video-ethnographic classroom materials was carried out following the conventions described by Tanner (2017), and

may be found in the Supplemental Files accompanying this paper. Following Tanner's transcription system, descriptive elements and translation of multimodal communication features are displayed, as well as the ways in which children interact with the material objects. This system enables us to represent the subtle nuances of children's multimodal communication, embracing words, gazes, intonation, silences and stress. Regarding the occasional inaccuracies of children's oral speech, the correct wording is included between square brackets. The transcriptions have been translated into English, preserving the meaning and nuances of the original Spanish version. The transcriptions were carried out by the researcher who talked with the children during their task, and were reviewed by the rest of the research team.

Findings

The findings presented here are based on the analysis of the conversations held with two of the children, Hugo and Teo, as they were creating the map to describe their literacy practices. While they were performing this task, a large range of topics arose in the conversation with the researcher, Alejandra. In the chosen vignettes extracted from these conversations, the children describe their screen-mediated games at home. A network of meanings is displayed in the course of the conversations, intertwining space, embodiment, artefacts and screens.

Hugo

The first vignette shows Hugo after he has found a photograph of the videogame *Fortnite: Battle Royale* among the images he has been looking at in an attempt to document the screen technologies he uses at home. He had already completed the school, community and neighbourhood sections, and had almost finished the task. From the moment he discovers the *Fortnite* photograph, all his attention is captured by it. He takes the photo in both hands and points to it saying: 'Ah? Ruspolder'. Although Alejandra tries to take him back to the task, he remains still, holding the photo with both hands in front of his face, smiling. At one point he starts to move his fingers on the photo, making almost inaudible soft sounds with his voice. After a while, he looks more attentively at the photo and says: 'Ok, so he has] three of wood and:: ((looking more attentively)) and (.) <179 of bricks and 313> of: of: of iron.' For the first time since he found this photo, he looks at Alejandra, pointing at the photo, and says to her: 'This is the save-the-world This is the save-the-world'. Paying no attention to Alejandra's comments, he goes on deciphering the information displayed in the image: 'He has 1500 lives, the save-the-world'. Finally, Alejandra understands that the only way to go on with the task is to accompany Hugo through his experience of the photo, and asks him what the different symbols and icons in the image mean. Hugo begins to answer Alejandra's questions, pointing to the icons and explaining their meaning: 'Eh, these are the materials. ((He moves his hand as he speaks, while looking at her))'. While doing so, Hugo alternates between looking at the photo and at Alejandra, checking the effect of his explanations: 'This (.) this is when-this, this is when you're in Battle Royal. It says so in the save-the-world. ((he points at the photo)) And this is the shield, and these are the lives ((staring at Alejandra))'. Then, Hugo continues talking about the game, and about some other content of the game not present in the image, such as the outbreak of the zombies and the storm. After that, Alejandra moves the conversation to Hugo's plans for the summer, and then asks him whether he is going to glue the photo on the cardboard. Hugo stares at the photo, holding it vertically as if it were a screen, moving his fingers on its surface, pretending it is a gamepad: 'Like, I'm playing, but with this'. Alejandra then suggests that he glues it on the cardboard folding it in the same way, so the 'gamepad' part of the photo remains fixed on the cardboard, and the 'screen' is free to stand upright. Hugo smiles at it.

The interaction between Hugo and the photograph creates an immaterial space, grounded in Hugo's previous experience with the videogame. His memories of the game, the affective link established between him and the game established in the past, and his knowledge of the scene displayed in the photograph come to life as he looks at the image. This transformation of space is reflected in Hugo's body language, staring closely at the photo, and in his reactions, moving his fingers and murmuring. After this initial sequence, Hugo invites Alejandra to join his space. This space is hybrid and fluid, as shown by the interactions between Hugo and Alejandra. In this sense, his movements alternate between the immaterial recreation of the videogame and the interaction between Hugo and Alejandra, through gazes, laughs and gestures.

Hugo makes use of the screen as a mediator in the creation of this space. The screen mediation described by Burnett et al. (2014) has, in this case, the image of the screen as a reference, and Hugo accepts it as the screen itself. The material photo, in this sense, is transformed into the immateriality of the portrayed videogame. What enables Hugo to shift from the photo to the videogame is his knowledge of the different logonomic codes involved in both media. His present and past interactions with them are visually displayed when he holds the photo as he would a videogame, as he himself explains. In this part of the conversation, Hugo's body movements are the means that transform the figured screen into a physical one.

At the same time, Hugo conceives the image as a text he can decode and read in a semiotic way. When he deciphers the multimodal elements of the image and explains them to Alejandra, he reveals the notion of the text as a materialisation of literacy. The photo/text, despite its materiality, carries with it the *habitus* linked to it and his knowledge of the code (Pahl and Rowsell, 2013). Considering the photo/text as an artefact, he is able to speak about it as a constitutive element of his identity.

Hugo embraces the photo with joy and enthusiasm at the beginning of this vignette. The embodied emotions connected with the materiality of the videogame confer the image its immaterial dimension. Emotion and subjectivity overlay the image/screen/text he is 'reading', and become the basis for his meaning-making, which draws on Hugo's embodiment of this event and triggers, when he first encounters the image, bodily reactions such as the intensity with which he holds the photo as well as his gaze and his smile. When he transforms the image into an artefact, he connects the (im)material dimensions of the photo through his tactile sensoriality and his movement.

Teo

Our second vignette presents the conversation with Teo, and focuses on his experience of a virtual life videogame, *Roblox*. This videogame, similar to those mentioned by Marsh (2010), can be played individually or in a multiplayer version and is based on the creation of avatars or virtual selves. It is designed specifically for young children and guarantees parents a safe playing network for children (Marsh, 2013).

Unlike Hugo, Teo hardly interacts physically with Alejandra or with the objects around him. He rarely makes gestures or moves his hands as he speaks, nor does he look at Alejandra. His communication with Alejandra relies therefore on orality, including nuanced intonation, pauses and repetitions, noticeable when he talks about his videogames at home.

The vignette begins when Teo, unexpectedly, says to Alejandra: 'And you haven't come yet, home:'. Then, he continues gluing the photos. Holding the glue stick in one hand, and staring into space, he goes on: 'And (.) and I have Roblos [Roblox], and I have lots of videogames:'. Then he continues gluing. Alejandra agrees, and says she has not ever played Roblox. Then Teo looks up and offers to show her how to play. He starts to explain the game, with his hands under the table and looking to nowhere: 'You see, in the part of the small plants they're mine, and you can play

with, with friends and without friends'. As he continues his explanation, he goes on gluing the photos. He puts a big stress on the fact that the gamer may choose her character and gender, and explains how to download the game: 'You have to buy a computel [computer], you download, download Roblos [Roblox], ((as he speaks, Teo leaves the photo and looks away, but not directly at Alejandra)) and nau [now]? (.) you say, (.) girl or boy'. He explains that he has chosen to be a boy: 'I'm a boy, cause <I have blue skin>, with, with the (.) part drawn of (zoric), ((moving his hands as pointing his body))'.

Teo does not draw on any artefact to build his space. Instead, he departs directly from the immaterial interaction with his house. He invites Alejandra there, and through this interaction, the immateriality of his home experience becomes present. The fluidity between the material space of the classroom and the immateriality of the house takes shape as Teo explains to Alejandra his embodied practice with the videogame at home.

Teo's explanation around his videogame does not need any physical support, and he just describes how he creates an avatar. Teo creates his space by naming it, and his embodied experience of the videogame creates the immaterial space. Its immateriality overlays the virtual nature of the game, in which the gamer's materiality is merged with the immateriality of the avatar, in a process similar to that described by Marsh (2010).

Although Teo does not use a material artefact to create this space, he is aware of the material dimension of his game, as shown when he suggests Alejandra buys a computer for playing. As pointed out by Marsh (2010), the virtuality of videogames does not interfere with their existence and the interactions developed around them. Besides, we can assume that the absence of physical mediation is perceived by Teo as something positive and valued. Also, Teo's apparent absence of movement and sensory references in his interactions with both Alejandra and his physical environment lead to an embodiment, built, to a large extent, from his memory, experience and emotions, and their relation to the events described. Memory, experience and emotion are therefore the means he uses to create his immaterial space, overlaying the materiality of the classroom, which he shares with Alejandra.

Discussion

(Im)material literacy: Spaces, screen mediation, artefacts and embodiment

Our analysis of the conversations with Hugo and Teo shows their interaction with the space from an (im)material perspective, and how this interaction creates a new space overlaying the physical space of the school (Comber, 2013). The space built by Hugo and Teo emerges from their embodied experiences of the videogames they play at home, incorporating their memory, sensoriality and movement into their meaning-making process. This meaning-making process is developed by children through social and cultural codes unconnected with the school and continue once the online game has ended. As analysed by Wohlwend (2009), Hugo transfers his experience as video gamer from his home to the school through embodiment. This transferring involves the creation of a new space separated from the school space, where one of the (im)material relations described by Burnett (2015) is kept, as soon as the material conditions of one location immaterially remain in another. Our research has shown how the complex literacy experiences of Hugo and Teo, developed out of school, interact with the classroom space and create new spaces overlaying it.

The events of Teo and Hugo are fluid and unstable. They are sparked accidentally during a conversation, when Hugo fixes his attention on a photo or when Teo invites Alejandra to his house ('you haven't come yet, home'). The children go through them alternating between different communication modes, displayed through their interactions. The conversations of Hugo and Teo with

Alejandra, their artefacts and their bodies assist them in creating this space, in which their practices become meaningful. As soon as the new spaces allow them to make meaning of their embodied practices, they possess them, and invite Alejandra to join in. On the one hand, Hugo, after being absorbed by the image, invites the researcher to share the new space created through his interaction with the videogame. On the other hand, Teo invites the researcher firstly, and then he recreates his space making use of his immaterial experience. Hence, they establish a relation 'between embodied interactions with the material environment and immaterial imaginings' (Burnett, 2015: 525) of their literacy event, whether the material environment, the image or the researcher, for instance. Both children keep their spaces through their interaction with artefacts, screens and embodied experience and, in them, they reproduce the meanings, experiences, sensorialities, emotions and movements inherent in their games.

Our results highlight the interaction between the children and their creation of spaces through screen mediation, artefacts and embodiment. In this process, the complexity of the children's literacy emerges unexpectedly, leading us to assume that the material and immaterial experiences of children interact in the school, creating new spaces and meanings every day, and posing the challenge of incorporating these literacies into the school curriculum. This paper has highlighted the ways in which children can create – and take part in – new spaces. Therefore, we recommend that schools should incorporate the complex ways in which children create spaces, allowing teachers to propose new learning strategies based on the interaction of the child-created spaces.

Interaction spaces in the school: The (im)materiality of literacy

Our research has brought to the fore the relation between materiality and immateriality in literacy. In this respect, the analysis of Hugo and Teo's vignettes shows the way in which the space of social interaction is built through materials both physical (bodies, screens, artefacts) and intangible (feelings, imaginings, memories) (Burnett, 2015). Teo builds a space from the immaterial without any mediation of artefacts, just an emanation from his experience and memory. Hugo also draws on embodiment to construct his space but he makes use of a physical artefact, a photograph, that flows between the multimodal print text and the screen itself. His memory, emotion, and body interact with the material and the immaterial aspects of his practice in a fluid and hybrid space. Consequently, Hugo underlines the direct relation 'between material things and immaterial memories and feeling' (Burnett, 2015: 525).

Hugo and Teo make meaning out of their digital practices at home through embodiment, understood as the entanglement of sensoriality, memory and emotion (Burnett et al., 2014). Thus, both Hugo and Teo create, through the (im)materiality of their interactions, spaces that overlay the physical space in which they are present, in the sense described by Massey (2005). In this sense, their embodiment is a materialisation of a previous immaterial experience (through their memory and emotions of their videogame experience). Thus, the children play in an off-screen space what they had played previously onscreen (Giddings, 2007). For this purpose, Hugo and Teo create a new offline space through embodiment, connected to their emotions and experiences of the videogame, that overlays the learning space created by the school. The emergence of an offline space created by Hugo and Teo inside the school, and its subsequent analysis, are some of the most relevant findings of this paper. They have enabled us to identify not only the creation of new spaces, but also the complexity of the literacies developed by children out of school.

Our analysis reinforces the idea proposed by Mills (2016) about the making of meaning through embodiment. The notions of embodiment and space assumed in the current research enable the exploration of literacy's (im)materiality, and its diverse manifestations in both children. Accordingly, children's literacy is subjected to an overlaying of fluid and hybrid spaces consisting

of material and immaterial elements that teachers need to manage in the learning and teaching process.

Finally, our analysis shows that if children are supposed to make meaning of their literacy events in the classroom, then they are likely to achieve it in an embodied way. This materialisation of literacy becomes the basis of hybrid and fluid spaces relevant in early childhood classrooms. Our research points to the importance of paying special attention to embodiment as a means for the materialisation of literacy in young children's education. The (im)materiality of literacy in childhood implies the acceptance of the unpredictability of literacy in school. Furthermore, the use of digital media in Spanish schools by 5-year-olds requires fresh thought in order to incorporate contemporary multimodal literacy sources that draw on *emergent techno-literacy* practices (Marsh, 2004) developed in the family environment. Ultimately, teachers should be aware of the hybrid and fluid nature of child-created spaces. The meaning-making understood from an (im)material dimension is multiple and raises strong challenges for the way in which the school faces the development of literacy in early childhood (Kuby and Rucker, 2016).

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Supplemental material

Supplemental material for this article is available online.

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