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The future-gazing potential of digital personalization in young children's reading: views from education professionals and app designers

Natalia Kucirkova  and Rosie Flewitt 

UCL Institute of Education, London, UK

ABSTRACT

This paper reports on UK primary school teachers' and children's app developers' views about the potential of using personalized digital resources to promote young children's reading and play with 'smart toys'. Many existing digital resources are 'personalised', that is, the content of a story or game is tailored to an individual child, and the content is adjusted to the needs and preferences of a specific user (either by an adult, such as a parent, or through algorithmic calculation by digital software). In this study, we focused on the role of digital personalization in children's play with smart toys and in early reading with personalized books. Focus group interviews were conducted with 10 primary school teachers and 14 book and digital industry professionals, and the resultant audio-recordings were analysed using inductive thematic analysis. A dominant theme was participants' association of digital personalization with the potential both to enhance and to jeopardize children's and adults' agency. Overall, the convergence of the digital and personalized aspects in some books and toys constituted a source of concern, with different views offered by the teachers and designers.

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Teachers' personal attitudes towards technology directly influence their practice and have been proposed as the key variable to address in professional development concerning educational technologies (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013; Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). Diverse theoretical lenses have been adopted to understand barriers to effective technology integration in the classroom pedagogy and innovative technology-mediated instruction, including ecological perspectives (Zhao & Frank, 2003), business world inspired perspectives (e.g. the technology acceptance model, Davis, Bagozzi, & Warshaw, 1989), Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh, Morris, Davis, & Davis, 2003) and quantitative path models (Inan & Lowther, 2010), but a core component of all these explanatory models are teachers' attitudes towards technology.

Attitude has been defined as 'learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object' (Fishbein & Ajzen, 1975, p. 6). However, in some studies, as for example in Jones and colleagues' (1997) research into teachers' attitudes towards family involvement in children's school education, teachers' attitudes were conceptualized as 'a teacher's emotional response in support of or against parental involvement practices' (Jones,

CONTACT Natalia Kucirkova  n.kucirkova@ucl.ac.uk

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White, Aeby, & Benson, 1997, p. 154). Individuals' attitudes can therefore be conceptualized as comprising both cognitive and emotional dimensions, and reflect societal, moral and cultural values. Teachers' attitudes towards technology use by young children are informed by children's age: Mertala (2017) studied Finnish trainee teachers' perceptions of the role of digital technology in early years education and concluded that technology-related concerns for the youngest children were related to the children's physical health, whereas for older children it was their intellectual health. Hannaway and Steyn (2017) emphasise that teachers' perceptions of technology influence their pedagogy and the ways knowledge is created in a classroom.

In addition to teachers' attitudes, there are also practical issues that can enhance or impede technology integration in education. Based on an extensive literature review of surveys, questionnaires and interviews about teachers' attitudes towards the use of technology in schools, as well as a survey of 170 UK teachers conducted by British Educational Communications and Technology Agency (BECTA), Jones (2004) concluded that there are five principal external barriers that impede technology integration: lack of teacher confidence and skills; lack of time; lack of effective training; lack of well-organized access to resources; and technical problems. In addition to practically addressing these barriers, Jones (2004) recommends studying teacher confidence, resistance to change and negative attitudes in relation to specific technologies. For the latter, there is an established tradition in educational technology research that has studied teachers' attitudes in relation to specific devices, such as interactive whiteboards (e.g. Moss & Jewitt, 2010) and tablet PCs (e.g. Twining, Evans, & Cook, 2005). In our own previous work, we examined the uptake of iPads in three different settings (a children's centre nursery, a primary school reception class and a special school) (Flewitt, Messer, & Kucirkova, 2015). Based on extensive classroom observations and interviews with the participating teachers, we concluded that practitioners' confidence and careful planning are essential for the effective integration of iPads in early childhood education, and to avoid their potential being reduced to 'no more than a device for delivering repetitive curriculum content, albeit with added interactive multimedia appeal' (p. 304).

Building on this work, we aimed to extend the literature in two important directions. Firstly, we focused on teachers' attitudes towards a specific *feature* – digital personalization – rather than a specific technology device or its use. Secondly, we investigated teachers' attitudes towards digital personalization in conjunction with the views of digital designers, app developers and literacy specialists. These aims were pursued within the context of the ESRC-funded project 'Supporting early language development and interest in reading with digital personalised books'.

Digital personalization

Digital personalization is a 'nexus of practices, products and processes (...), which can take various forms and formats and fulfil various purposes in early childhood' (Kucirkova, 2017a, p. 9). Personalization is a frequent feature of learning mediated by mobile technologies and together with authenticity and collaboration is a key component of pedagogy with mobile technologies (Kearney, Schuck, Burden, & Aubusson, 2012). It has also been identified as one of the six core facets of reading in the twenty-first century, brought to the fore with the advent of multimedia technologies (Kucirkova, Littleton, & Cremin, 2017). In this study, we were interested in how digital personalization features in young children's books, including e-books available on touchscreens, paperback books created with personalized story apps, and toys that are connected with an online activity – also known as Internet of Toys or smart toys (Holloway & Green, 2016).

Personalized or personalisable books are digital or print books that have been altered in response to individual readers' needs and preferences. Personalized print books can contain story plots adjusted to a child's name (e.g. the *Lost My Name* title by Wonderbly Ltd.) or the child's name features in the story illustrations (e.g. the personalized version of *Cinderella* by I Just Love It Ltd.). With e-books and apps, current personalization features take three key forms, where children can personalise books using: (1) their own audio-recordings (voice-overs); (2) their own written texts; or (3) their

own images/pictures. For example, with the Our Story app¹ children can create their own multimedia stories by selecting and sequencing images, and adding written or spoken narratives, with no limitations to story content. With the template-based Mr Glue Stories app², children can add their own voice-overs or drawings to a story template and replace the main story characters with their own names. The finished personalized Mr Glue stories can be read on screen or ordered in paperback and enjoyed as a traditional printed story.

With smart toys, personalization occurs through machine learning algorithms, where, for example, computer programming enables a device to learn and predict individual usage. Children can ‘train’ their smart toys to recognise their voice through embedded voice recognition features or to respond to their commands with a selected option. For instance, the developers of the Fisher-Price Smart Interactive Bear claim that the toy ‘adapts to developmental changes while remembering your youngster’s name, favourite colours, foods and more. The toy suggests adventures that they should go on together, along with stories and games’³.

Smart toys are a relatively new addition to the palette of technologies available to children of pre- and primary school age, with a worldwide revenue forecast at \$11.3bn by 2020 (Sorrell, 2015; cited in Corbyn, 2016). Personalized print books enjoy a rising popularity, for instance, those designed by the children’s book start-up Wonderbly have sold 2 million copies in over 135 countries between 2012 and 2017 (Neely, 2017). Some smart toys penetrate the school market in the form of robotic technology (see e.g. Fridin, 2014), and books, especially digital books, represent a cross-over marketing opportunity for home and school consumer markets (Harvey, 1995). There is thus a potential for smart toys and digital personalized books to influence the school socio-technical environment, but as yet, there is little evidence to suggest that digital personalization has entered the UK primary school market. Our aim in the research reported in this paper was to contribute to knowledge about teachers’ and digital designers’ and app producers’ attitudes towards the future-gazing potential of digital personalization to enhance early reading and play. Unlike previous research, our interest lay in garnering the perspectives of teachers in comparison to the views of designers, literacy specialists and publishers. This aim was explicitly established through our previous work that involved workshops with industry partners working in the area of digital personalization and that suggested a lack of mutual perspective awareness concerning educational technology and early childhood education (Kucirkova, 2017b). Research into the relationship between the perspectives of teachers and industry representatives has tended to focus on higher education students and workplace learning, and students’ future employment prospects (e.g. Ball, Jones, Pomeranz, & Symington, 1995; Smith, 2012). In this study, we were interested in exploring app designers’ views about the potential future adaptation of personalized technologies in early education. Our overarching research question was: ‘What are teachers’ and designers’ attitudes towards digital personalization in smart toys and children’s digital books and what is its potential for future use in early childhood education?’ We were not interested in quantifying or generalizing participants’ answers as might be the case with larger population studies (Cargan, 2007), but rather to investigate the subtle variations in participants’ perspectives and attitudes.

Methodology

In relation to technology, design-based research has been viewed as a suitable methodology for encouraging a dialogue between classroom professionals and the design and development of technologies (e.g. Wang & Hannafin, 2005), and documentation combined with interviews has been used to explore teachers’ and preservice teachers’ understandings of using digital media in the classroom (e.g. Ifenthaler & Schweinbenz, 2013). These methodologies, however, are arguably more suitable for implementing change in the classroom environment and for developing practitioner reflective practice rather than probing for future possibilities. We therefore used qualitative focus group interviews, which are a particularly useful method where ‘the goal is to elicit

perceptions, feelings, attitudes, and ideas of participants about a selected topic' (Vaughn, Schumm, & Sinagub, 1996, p. 5).

Participant recruitment

Focus group interviews were held in two research sites, one in London and one in a primary school in a relatively affluent area in English Midlands, with a total of 10 primary school teachers and 14 industry professionals. Eight of the teachers were based in the English Midlands and taught 4- to 11-year-old children from Foundation class to Year 6. They were approached as they had taken part in a previous project with the researchers (Kucirkova, 2014) and were known to have some experience of using digital media in the classroom. Two teachers were from London; one teacher taught 3–5-year-old children in a London school and one participant was a former, London-based early years teacher, who had recently begun to design digital apps for use in the classroom and by parents. The industry professionals were all from the south of England and included six book publishers, six children's app producers and two literacy experts from national literacy charities. Several of the participants were parents of young children, and spoke during the focus group interviews as parents as well as educators, publishing or digital media professionals. The sampling was purposeful as we aimed to include participants from the teaching profession who had some experience of using digital devices in their teaching, as well as children's digital book and app design industries who were specifically targeted for their work in the area of digital personalization and children's publishing industry. All participants were invited to attend via email. Further information about the participants is presented in Table 1.

Study procedure

In London, 16 participants (14 industry professionals and 2 teachers) were invited to an extended breakfast meeting on the university premises of the UCL Institute of Education. The meeting began with short presentations on digital personalization, including two short videos of a commercially available personalized digital toy and a paper-based personalized book. The technical mechanisms behind digital personalization were discussed to ensure that all participants had occasion to ask questions about diverse features of digital personalization and the algorithms embedded in digital personalized resources. Participants were then split into three focus groups, each with a researcher facilitator and a mix of early years teachers and publishing and/or digital industry professionals. In the English Midlands, similar presentations were made about digital personalization, followed by two focus group interviews with four teachers per group, led by the first author. These interviews took place on school premises. All interviews followed the same interview protocol, all participants gave signed consent for the interviews to be audio-recorded and later transcribed. Participants were made aware that they could withdraw from the study at any time and that their answers would be anonymized, unless they wished to be explicitly named as representatives of their company/literacy charity or school. The interview facilitators probed for areas of agreement/disagreement to better understand the reasons behind participants' beliefs and attitudes. The study was approved by the UCL Institute of Education Ethics Committee and followed BERA (2011) ethical guidelines for educational research.

Table 1. Descriptive information about the focus group interviewees.

	Teachers		Industry professionals	
Gender	8 females	2 males	9 females	5 males
Age	Age between	No of participants	Age between	No of participants
	20–30	3	20–30	2
	30–40	4	30–40	10
	40–50	2	40–50	1
	50–60	1	50–60	1

Data analysis

There was no prior hypothesis, theory or research literature that guided the analysis, although we acknowledge that participant responses were shaped by the semi-structured nature of the interview protocols. Nonetheless, participants' diverse responses to the preset questions and their willingness to contribute new ideas and perspectives led to our analysis being by and large inductive, informed by the themes that were derived from the data rather than our prior research knowledge. Braun and Clarke (2006) suggest that thematic analysis is suitable for focus group interviews in a data-driven approach, as it can 'offer the systematic element characteristic of content analysis, and also permits the researcher to combine analysis of their meaning within their particular context' (Vaismoradi, Turunen, & Bondas, 2013, p. 401). We followed the procedures of an inductive thematic analysis described in Guest, MacQueen, and Namey (2011), which include the following stages: first, we examined the data to see if the participants in the individual groups agreed on key issues, and we brought together responses that were similar, developing codes as we worked through the data. We then categorized the responses into overarching themes of perceived benefits and concerns, and distinguished between responses relevant for children and those for parents or teachers. Second, we labelled these themes with draft second-level themes, cross-verified the themes and individual examples and agreed on the labels for all second-level themes. We developed detailed descriptions of individual themes and through discussion, revised some interpretations. Third, overlapping themes were reviewed and either merged or renamed as appropriate. Any remaining codes were re-examined, and in each of these instances, their examples were examined for relevance to the study. Through this process, we derived a third-level, superordinate category of 'agency', which encompassed all second-level codes. Finally, we searched through the data to ensure all instances had been accounted for, and any analytic gaps were resolved through rich and rigorous discussions between the authors. A sample of data was shared with an independent postgraduate researcher who checked a subset of the interview data (one third) against the second-level categories. Inter-rater reliability was high, with overall Kappa coefficient 0.7500, with a Fixed Marginal Kappa 0.7104.

Findings

A salient theme running through *all* the participants' responses was the agency afforded to users by the diverse features of digital personalization. By 'agency', we mean the features and affordances of digital personalization that the participants perceived as either enabling or disabling for children and adults, permitting them (or not) to make choices, to add content, to adopt active and interactive roles with digital features and to (re)negotiate identity. This conceptualization of agency aligns with the literature on the mobile, shifting and multiple identities children and adults form as they are positioned and position themselves in the social world (Walkerdine, 1997, 1998) and 'push back curtains that reveal who they are in terms of such aspects of identity as social class, religion, ethnicity, race, gender' (Genishi & Goodwin, 2008, p. 278). It also builds on Dyson's (1997) work on the ways in which children's identities shift as they 'play around' with language, images, drawings and cultural objects in their worlds, and on Sipe's (2002) observations of how children instantiate their identities as readers and writers when they read aloud (e.g. through their use of dramatization, commenting/ critiquing, adding asides and content). Also relevant for the concept of children's agency is Comber's (2003) work, which argues for 'open spaces' in the literacy curriculum that enable children to shape literacy practices through their own narratives and dramatic performances and where children's 'identity work and their literacy work fuse' (p. 362).

In our data, we categorized participants' discussion of 'agency' into subordinate themes (second-level codes), including: content curation, creativity, imagination, motivation, engagement, authorship, data safety and security, attention, story ownership and marketization. These second-level codes were all mentioned and recognized by the participants for their agentic potential as well as limitations. Although the digital and personalization features of a resource (e.g. a digital toy or app

that includes personalized features) are experienced simultaneously by the user, the focus group participants distinguished between the digital and the personalized in children's play and reading. We therefore discuss these separately, noting their merging points. While some respondent comments related to digital technologies and personalization more broadly, in this paper, we foreground participant responses that were pertinent to reading and play, as these were our key foci of interest. We outline participants' perceptions of the agentic role of teachers and parents/main caregivers as reading mediators and content curators, on children as consumers and content makers, and we report on participants' visions and concerns in relation to the affordances of digital personalization that may enable or constrain user agency. We do not quantify the occurrence of individual themes as our analysis centred on probing the significance of the themes to the teacher or app designer participant groups.

Adults as reading mediators and content curators

Recognizing the many interaction possibilities available with multimedia technologies, participants shared the view that parents/carers have a responsibility to mediate children's use, but are not adequately supported in this role and find it difficult to curate children's access to media content:

Because the device an e-book, an iPad, it's a sweet shop. You've got generally speaking a lot of stuff on it and parents' ability to curate content on that is an issue. It's not talked about much. [designer]

Parents care about this stuff, but they generally don't take agency in it. [teacher]

With regard to sharing digital books with children, some participants suggested (and others agreed) that parents' active participation and agency tended to be reduced as compared with shared print book reading. For example, one publisher commented on her own personal experience of technology-mediated reading with her child at home, where tensions arose between the child's desire to hold the digital device and the parent's uncertainty about her own mediating role:

... the child wants to be in control of it. More than they do with a book ... I realised that I was actually not doing anything. I was sitting there and he was doing all the work and I could have been more interventionist but whereas if I was reading a book I would have been reading them [the books] so there would have been more interaction between us.

Some participants suggested that parents needed to reclaim or redefine their role by either abandoning digital books in favour of printed books or let a shared reading activity become a child-led or independent reading activity, as 'the problem of encouraging the interaction between parent and child digitally in my experience, that hasn't been cracked'. [designer]

A teacher reminisced about how her own experience of sharing digital books with her son at home had been less than successful: 'So we were drawn in but then we didn't get back to it because our first experience just didn't set us up for success to use it again.' In this regard, a designer suggested that the design of digital books needs to address the fine balance between a parent leading the reading experience by reading aloud versus supporting children's independent reading:

I mean what's lovely about a book is if the child can't read they need you. So you have a lot of value. Because you come in and you can read the story to them. You can read the words. Or you can add stuff. If the technology is doing all that I think it's a really important design question, how you design something that is really individual and allow children to sort of have the ability on their own but also welcomes an adult.

Similarly, a children's publisher maintained that their digital books can further enhance, not diminish, a parent-child reading experience:

of course the features on the iPad mean that the child can be left on their own with it perhaps if you want to have them occupied on their own but what we do is that it can be shared between a child and an adult just like a printed book can.

Another tension in perspectives related to parental attitudes towards new technologies as new devices to keep a child occupied, as one publisher commented: ‘a lot of the parents that we have seen use the device [iPad] as a babysitter’. Participants suggested this might be a particular feature of digital usage, but also because not all parents identify with their own role in supporting children with educational activities, as one publisher mentioned:

the idea is that the teacher will encourage the children to talk about what might be happening, encourage the conversation. But the parent was saying that for them that was an absolutely terrifying prospect to come home after work and be presented with a book with no words to read to their children that is not the route they wanna go. [sic].

On the other hand, a literacy charity representative commented that for less confident parents, digital books can help to counter this effect, and ‘might enhance the confidence of the parent so I guess confident book sharing great rich experience but if a parent struggles with that a bit they might be more comfortable with a few prompts and questions.’

With these perceptions in mind, when the conversation turned to the affordances of digital personalization, the teachers expressed concern about technology threatening adults’ agency and reducing human interaction:

I think it’s important to stay up to date with technology but it is just important to ensure that human contact, socialisation and communication is just as important. If not more important.

Some teachers took this concern further by claiming that technology could act as a parent replacement: ‘there are some children for whom it will be a ... a substitute parent. And that’s, that’s not right.’ However, the designers offered a different framing for this concern, arguing that digital books can offer pragmatic solutions for parents who may not always be available or able to read regularly with their children at home:

So in terms of digital (...) when the parent is away, they can record the story, they can interact with the child through the platform, that’s sort of how we approached it digitally.

For book reading specifically, there was overall agreement amongst the participants that the interaction patterns between parent and child could be negatively affected by the design of many digital books. There was a shared perception between designers and publishers that to date, the design of digital books is inferior to the potential offered by printed books in terms of promoting collaboration and scaffolding during parent–child interaction in shared book reading. One app designer recognized that digital book design has not yet responded to this challenge: ‘now go and talk to your parent or guardian, show them what you’ve learnt, tell them a story etc. in a way that kind of encourages that involvement, we are still working on that.’ Another publisher confirmed ‘I haven’t seen how it can engage parents and children work together better.’ However, one publisher of personalized books disagreed with this group consensus by arguing that the digital books published by his company are designed specifically to enhance a shared reading experience: ‘Our books are slightly different we are seeing the book as a prop to bring the adult and the child together.’ The differences of opinion expressed here suggest that designing for dialogue and collaboration is not yet widely recognized as an essential or even important feature in the digital book industry.

There was a strong, shared view among teachers and designers that digital personalization can take away parental agency in shared reading, because parents’ role in book reading is to personalise the reading experience, i.e. to link the story content to the child’s personal experience and bring the book to life. Teachers as well as some designers thought that personalized books are not necessary, given that parents already personalise reading both by selecting books and highlighting information they feel is pertinent to their child:

I have seen like mums appropriating existing books and like I saw one mum how she was talking about a book because it touched on her issues that she wanted to instil in her child so I think people connect to different sentiments. They are not personalised to them but pertinent to them.

Similarly, the teacher participants felt strongly that if personalized resources were used in schools, then their role as educators would be undermined. When asked how they would manage children's interactions with personalized resources, the teachers responded:

TeacherB: I quit!
TeacherA: then we wouldn't be needed, would we?
TeacherD: [[laughs] we would be an app! Never mind doing English [[laughs] maths. Teaching would be a lot easier
TeacherC&TeacherA: [[laugh]

Children as consumers and creative content makers

The participants recognized several potential benefits of digital books and smart toys for children's creativity, engagement, story ownership and motivation to read, as mentioned in the following illustrative quote from a publisher:

It's about engagement, yeah, I think it captures their attention and they can relate to and make meaning their level of concentration is more you know I know myself when testing some of the books we have kids are just amazed when they see themselves in pictures.

A teacher who encouraged children to create their own digital stories and printed books commented on the impact this had on children's sense of ownership: 'the ownership of it was completely theirs and the finished product they were proud of { ... } to make their work more worthwhile and valuable and more similar to what they're seeing at home.'

Another point of consensus among the participants emerged in relation to how children's authorship can be enabled through personalization. In this regard, they defined personalization as being 'more about encouraging children to go on their own personal journey'[teacher] and 'about encouraging children to go away and make their own stories'[designer] and there was broad agreement about the importance of children writing their own stories and being creators rather than 'just consumers'.

A teacher perceived the 'tremendous importance' of authorship in relation to communication: 'authorship is extremely important because they need to be able ... to retell a familiar story', while another teacher emphasized authorship as an important counter-response to the increased marketization of children's reading experiences: 'because otherwise they are just consumers of other people's stories you know in the literal or abstract sense'. However, these potential benefits of personalization required child agency in choosing to author content from an attractive array of other engagement possibilities: '[the] iPad is a book within a massive surrounding game arcade of YouTube, everything.' The plethora of digital reading options requires 'high skills and we expect young children to manage that'.

While the importance of children authoring their own content was acknowledged by most participants, it was also problematized in relation to the narrative quality of personalized stories. A digital book publisher considered that personalization can sometimes compromise the narrative:

As a publisher our stories have a narrative, kind of this is deliberately structured with a beginning, middle and an end and as soon as you take away some of the parts for children to put in things themselves you have lost something from the quality of the story to be read, the experience, so I think they have different values these experiences.

To support children's imagination, participants seemed to assign an agentic role to teachers and designers, who they saw as essential in mediating content and offering choices to the child:

The importance of digital (is) that it leaves some gaps for the imagination, for individual personalisation I suppose, the opportunity for imagination to kick in is a really important part of it and challenging when teachers want more content as a springboard. [teacher]

This signals potential tensions for teachers who on the one hand appreciate the creative potential of digital apps and narratives that enable children's creative input, and on the other hand feel they have a limited amount of time to deliver curriculum content. Despite potential benefits, there was a strong concern shared by the teachers and designers about the potentially negative effects of technology on young children's learning and development more generally:

And I can see how older children how that is easier they are totally engaged with technology aren't they, so I can totally see but at this age it frightens me. [teacher]

The teachers maintained that the learning value of many digital tools is poor and that they distract children from learning: 'because it's available because they can do it they are so confident with the technology doesn't mean they should do it.' Most of the teacher participants expressed doubts about the potential for digital formats to promote children's social skills:

TeacherC: Yeah, they have trouble with social skills and i'm not sure a digital resource will

TeacherA: Teach them that

TeacherC: Or make it any better

Some participants considered the affordances of many personalized books as negatively affecting children's independent self-discovery and authoring possibilities, and many teacher participants questioned the value that digital media might add to children's learning opportunities. For example, teachers cautioned that increased engagement does not translate to increased learning:

they like seeing pictures of themselves. They like their learning journeys. This is me. This is what I've done. And they like seeing that. Rather than the abstract princess or the knights coming to rescue them. They like them being part of everything, but it is the case that if they just become everything will they ever learn ... ?

Another teacher added, when contemplating how personalized books might be used in the classroom: 'I think they would really like it and enjoy it. But I wonder how much more beneficial it would be to their learning. What would be the educational benefit?'

Designers perceived naturally occurring personalization to be superior to any engineered in personalized book design: 'you create a little animal character and the child really identifies with it and feels part of the story.'

The self-centredness of personalized designs was debated in one focus group:

TeacherF: So everything you see is very structured, is very engineered to you and it's difficult then to break out of that. So maybe if a child is looking at a particular game or book then everything they see is kind of connected to that so I think they then start to see the world as different, I don't know

Interviewer: yes, this comes back to the point we were making before you know everything being about yourself

TeacherF: Yeah, kind of egocentric

In addition, participants recognized that the design of personalized books could be developed both to promote social interaction, as previously discussed, and also to embrace empathy for others and promote social and cultural heritage and values:

I think the social aspect of reading books that are not personalised is as important as some kind of personalised story. [TeacherG]

If the purpose is not only to read and write but is to become a good citizen then we may need to do it differently in regard to personalisation. [TeacherD]

Some teachers thought that current personalization features are too basic in terms of design: 'it's a new way in and at the moment it's quite a boring way in because personalisation is sort of you know once a child got used to that specific aspect of reading they turn off.' One teacher suggested that future personalization design needs to address both reading and writing and go beyond simple engagement:

so that personalisation is a two-way thing so that it's not simply just a name or setting that is known to the child. And I think there is a concern that if personalisation does just become an egotistical sort of invitation it needs to be part of a process that we engineered to ensure that children are becoming individual readers and writers.

Different concerns and perspectives on the potential of digital personalization

Major concerns emerged when the participants considered the potential of personalized and digital aspects together. In these discussions, the teachers' and designers' views differed and were clearly distinguished. Some teachers, but not all, viewed the combination of the digital medium with personalized features as 'scary' with regard to their effect on adult-child and child's independent reading, while some designers voiced the strongly held view that the digital aspect of personalized books can enhance the potential for designing for learning: 'So you can do adaptive learning with the digital medium in a way you can't do with the printed book'.

The teachers were principally concerned that digital personalization might replace the role of parents in the home: 'I did think it's outsourced parenting!' which they associated with socio-emotional implications: 'think the danger, the danger because relying on digital environment and storytelling and it's losing the personal contact and already children's time with parents is kind of diminishing.'

Another major teacher concern regarding the design of digital personalized books was the risks associated with personal data about individual children. Current measures for data storage and public awareness of the risks of sharing personal data were perceived as inadequate: 'so there might be a child where a personalised picture is taken but somebody could misuse that. And that's part of where the worry is.' The teachers were also concerned about the ethical implications of children using digital personalized products: 'It comes to children who are not in a position to give consent you know at that age when parents make decisions on their behalf you know this information being shared about them and as they grow older they don't have control of their information.'

By contrast, designers saw stronger potential to engage children in reading with digital personalized books than with non-personalized digital books or with personalized (printed) books:

DesignerA: I think it would make them more engaged. Would it help your lower ability.

DesignerB: Or the ones who are absolutely disenchanted with reading.

DesignerA: That's it, yeah. It is very stereotypical, but your typical boys who are not into reading as much but if it's about them.

DesignerC: And I think anything digital, iPads, cameras, involves the boys in particular straight away, whatever it is.

Moreover, the designers thought that creative approaches to combining personalization features with digital technologies meant that the children could experience something 'magical'. Similarly, the designers perceived the potential of digital personalization as something that can 'give adults creative superpowers', with the most 'magical' potential perceived as being achievable when technology subtly serves children's creative expression, leading to the production of a book that is personalized to an individual child:

And because children go like oh, I'm in it, it's not, it's because they don't expect something physical to have been customised simply because of their lack of knowledge of the world, so it's actually quite magical, hang on how did I, but with an iPad they play games, yeah, yeah, they understand.

Discussion

From a user perspective, digital personalization presents a seamless design and reading experience. For the focus group participants, however, the digital and personalized aspects of digital books and smart toys represented different opportunities and different challenges to adult and child agency, depending on how digital resources are curated by adults, and how their use is mediated, particularly when engaging in shared reading and story writing. There was a broad agreement that the primary

role for parents and teachers is to curate and mediate the content children receive via technology, and to personalise their reading experiences, but the concern was expressed that digital personalized technologies take away the adult role in personalizing reading, particularly when digital and personalized aspects are combined. Despite these concerns, teachers and industry professionals strongly recognized that combining digital reading materials and personalized aspects offered promising potential for learning, although there was recognition that the full potential had not yet been realized in what is a comparatively new field of design and development. Teachers' concerns became heightened and designers' recognition of potential benefits stronger when they considered the digital and personalized aspects together, in the forms of digital personalized books and personalisable smart toys. Children, on the other hand, were perceived as enthusiastic users of digital books and smart toys, who with appropriate support and resources could become agentive and creative content makers rather than passive consumers of pre-existing materials.

We converted the participants' response patterns into a graph (see Figures 1 and 2), representing the key themes that we noted in participants' accounts. The figures illustrate that as the digital and personalized aspects became more strongly intertwined, the participants' perspectives on their

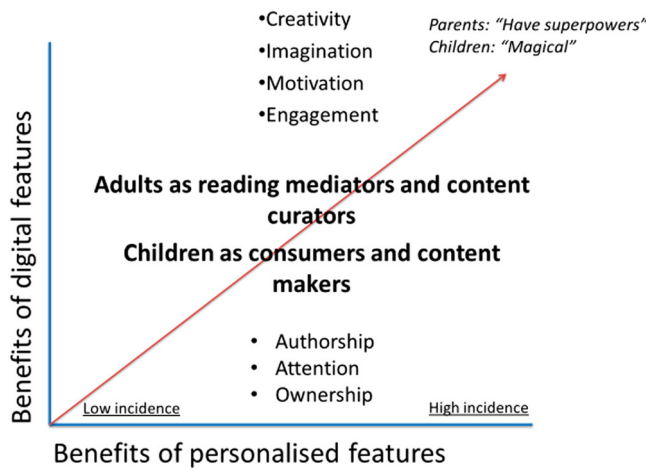


Figure 1. Graphical representation of participants' perception of main benefits of personalized and digital features.

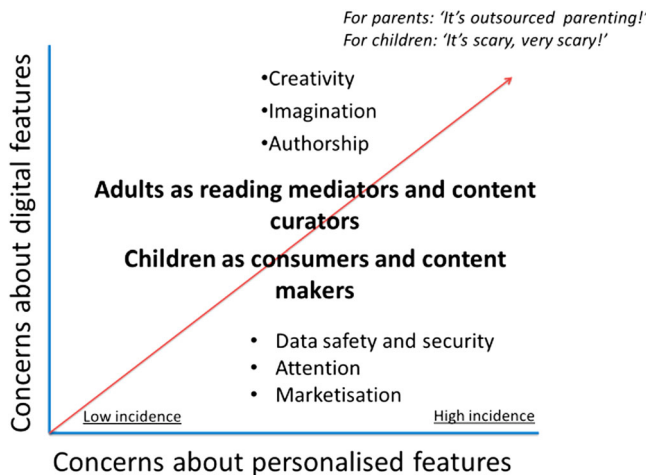


Figure 2. Graphical representation of participants' main concerns about personalized and digital features.

benefits and limitations became more strongly aligned or divergent with the agentic roles they assigned to children and/or parents/teachers.

Study implications

Our study makes two novel and important contributions to the literature concerning educational technology and, more specifically, the future design of digital personalization. Firstly, it focuses on convergences and divergences in the attitudes of teachers, designers and literacy specialists towards digital personalized technology which, for the most part, is not yet being used in schools. The focus group interviews brought to the fore perspectives that drew on hypothetical scenarios of potential use, allowing participants to identify aspects of digital personalization that reflected their personal views. To a certain extent, teachers' and designers' *personal* perspectives were similar with regard to how digital and personalized aspects of digital books and smart toys influence children's and adults' agency. However, when participants considered the digital and personalized aspects together, their perspectives tended to differ and became more profession-dependent. Whilst all participants recognized the possible future strengths of combining the digital with the personal in creative ways that promote adult–child interaction, the teachers were very concerned about personalized technologies replacing the instructional and social role of teachers and parents. Conversely, the designers were very enthusiastic about the unprecedented possibilities of personalized technologies for children's content production, and were enthused by the as yet unrealized potential of digital personalization to promote early reading development.

Secondly, the study highlights participants' perspectives in relation to a specific feature rather than a specific technological device. This broadens the applicability of our findings since digital personalization can be embedded in interactive whiteboards, laptops or touchscreens and technologies with virtual reality, such as the augmented reality personalized book *Amazing Alphabet* by Tinyme Ltd. Focusing on a specific feature is important because it unites the heterogeneous and complex nature of technologies, and provides a focussed assessment of professionals' perspectives on particular features of the design. We found that the participants' main association with digital personalization concerned children's and adults' agency when using digital devices, and the degree of freedom offered to them by the affordances of the digitally personalized resources they were using. This is different from previous research that foregrounds teachers' perceived competences or external factors affecting teachers' attitudes towards technologies (e.g. Hernwall, 2016). In the context of digital reading with young children, it has been suggested that rather than a crude categorization of formats being either digital or paper-based, researchers need to focus on specific, narrowly defined features of digital books to understand their effects on children's reading experience (Zipke, 2016). Our study design was based on this latest work and offered a fruitful lens to explore the connections between diverse participants' current perspectives and imagined future possibilities.

Our findings also add to the broader literature on teachers' attitudes towards new technologies. A recent study of 22 primary school teachers found that teachers' attitudes towards technology and their teaching efficacy significantly influence teachers' actual use of mobile technologies in the classrooms (Zhu, Qiu, Yang, & Zhang, 2016). The teachers who participated in our focus group interviews clearly expressed the view that digital personalization would undermine their role as educators and if they had the choice, they would not want such technologies to enter their classrooms:

TeacherA: So it's using the technology that is there but is it creating more confusion,

TeacherC: Problems

TeacherD: It's confusing for the teachers as well

TeacherC: Yeah, they would be managing the technology rather than teaching and talking to the children in small groups. Because that's what we do in lessons as well. Obviously when they have their reading group but we do our own assessments, based on what we know about the children. But if we were just managing technology I mean

TeacherA: We would be administrators

We suggest that teachers' potentially negative attitudes towards digital personalization are important considerations for future design, which could fruitfully focus on supporting the mediating role of adults to support young children's creative engagement with digital texts.

Our findings are snapshots in time that respond to the rapidly developing field of educational technologies and have the potential to inform the longer-term nature of effective technology integration. Orlando (2009) studied the use of technology by five Australian teachers over five years and found that their knowledge, learning organization, pedagogy and core approaches to teaching, changed substantially over time. Our findings could be extended through a longitudinal design examining change in perspectives as well as actual use of digital personalized technology in the classroom. Although digital personalization is a comparatively recent field of development, adults can mediate children's interaction with personalized resources; for example, they can provide templates for children's digital books or they can give specific commands to a smart toy from a distance, using the toy's accompanying app. These features in use might alter participants' perspectives regarding children's and their own agency with digital personalization. For this to happen, however, our study implies there needs to be sustained dialogue between teachers, parents, app designers and publishers.

In conclusion, this study examined teachers', literacy experts' and publishing and digital industry perspectives on one feature of children's reading and play in the twenty-first century – digital personalization. The industry and teacher profession converged toward a common vision in relation to the agentic roles they assign to children and adults in respect of digital personalization but not in respect of the combined influence of technology and personalization on these agentic roles. The key theme of children's and adults' agency as a point of synergy and divergence in teachers' and designers' accounts enriches current and future prediction models as well as practical design concerning digital personalization.

Notes

1. <https://itunes.apple.com/gb/app/our-story/id436758256?mt=8>
2. <https://itunes.apple.com/gb/app/mr-glue-stories/id916219468?mt=8>
3. see: <http://www.toysrus.com/buy/interactive-stuffed-toys/fisher-price-smart-toy-bear-dnv31-65244526>

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Notes on contributors

Dr Natalia Kucirkova is a Senior Research Fellow at the University College London. Natalia's research concerns innovative ways of supporting children's book reading, digital literacy and exploring the role of personalisation in early years. Her research takes place collaboratively across academia, commercial and third sectors. She co-edits the Bloomsbury Academic Book Series 'Children's Reading and Writing on Screen' and chairs the UKLA Children's Digital Book Awards.

Rosie Flewitt is Reader in Early Communication and Literacy at UCL Institute of Education, and a member of the Centre for Multimodal Research. Her research and teaching focus on young children's communication, language and literacy

development and inclusive education, with expertise in multimodal, ethnographic and participatory approaches to the study of early communication and literacy and inclusive pedagogy.

ORCID

Natalia Kucirkova  <http://orcid.org/0000-0002-2805-1745>

Rosie Flewitt  <http://orcid.org/0000-0003-1986-0644>

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