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How parents read young learners' digital engagement: a posthumanist inquiry into the temporality of co-evolving learning practices in AI game space

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ABSTRACT

Much research on children's digital gameplay focuses on measuring detrimental effects, excluding more complex relational dynamics of family literacy practices. Approaches that focus on how families adapt available resources in novel and resilient ways to suit their own socio-cultural aspirations are under-utilised. We partnered with game developers to investigate how parents view emerging AI capacity within games for young children, particularly the degree to which technology increasingly constructs a digital self of users. A story-based learning game with machine learning capacity that adapts to children's skills and interests was trialled with 11 families. Observations, focus groups and exit survey gave important insight into the ways families adapt traditional literacy practices in game space, and their understanding of AI developments including the tensions they felt between concerns about surveillance, on the one hand, and their desire that children not miss out or fall behind their peers' developing digital literacy.

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Introduction

Whilst new digital affordances, particularly those that incorporate modes of AI, increase educational opportunities (Billington 2016; Gee 2007; Luo, Yang, and Berson 2024), they also pose a range of risks not least the perceived risk of missing out (Liu et al. 2024; Vartiainen, Tedre, and Valtonen 2020). AI advances pose the likelihood that children enter formal learning with a digital self that educators can engage with to a much greater degree than previously and, thus, widen the disparity between households with differing access to and understanding of digital technology (Gennari et al. 2023). AI enhancement means that the technology itself is increasingly an agentive actor. Negotiating the terms and limits of engagement with this level of technological sophistication are significantly different than those parents are more familiar with from their own childhoods or their more recent adult experience. There are increasing calls to incorporate AI literacy into all levels of education with an emphasis on functional competence and critical evaluation (Casal-Otero et al. 2023; Undheim 2021); however, the role of parents and their own AI

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literacy are under-researched (Korat and Segal-Drori 2016; Liu et al. 2024; Marsh, Hannon, and Ritchie 2017). This article delves into this topic in depth to tease out the life experience parents bring to efforts to educate themselves on the impact of AI for themselves and their children.

In order to set the scene for the study, it is important to clarify key terms. Whilst there are many ways to engage in game-based learning (Ai, Cross, and Bignell 2023), at its most basic, it is learning that incorporates a competitive or goal-driven element, is interactive, and enables learners to have fun while acquiring knowledge or developing skills (Gee 2007).

Defining AI is becoming more complex. Various forms of artificial intelligence (AI) have become prominent that rely on large language modelling (LLM), such as generative AI, which can mimic human capacity to search for information and synthesise it, or produce a replica of similar products. Machine learning generates not a product but enhanced experience within gameplay and can be adapted for learning games. Machine learning does this through programming that is able to learn and adapt without following explicit instructions, by using algorithms and statistical models to analyse and draw from patterns in data (Kreuzberger, Kühl, and Hirschl 2023).

Digital gameplay and AI both have an impact on how literacy practices can be understood, and how families experience and negotiate these practices. Kress's (Kress 2003) early work has alerted us to changing literacy practices. A socio-cultural reframing of agency is a crucial part of this reconceptualisation (Lankshear and Knobel 2003). Marsh's (2016) work usefully applies these insights to the early years context:

> Stemming from New Literacy Studies work in the 90's, literacy can be viewed as a situated social practice that is shaped by specific social, cultural, economic and political contexts and is always ideological, that is, always carries particular meanings and is imbued with power. In this view of literacy context matters: texts and artefacts cannot be fully understood without taking account of the circumstances in which they were produced. The context of digital literacies is one of multiliteracies and multimodality. (Marsch 2016, 199–200)

However, recent advances in the kinds of data AI can synthesise and thus the systemic shift in artefacts that can be reproduced and exchanged, mean, once again, literacy practices and aspirations of families negotiating them needs further inquiry.

Shared sustained thinking is an important dynamic of family literacy. By shared thinking, we mean episodes in which two or more interactors 'work together' in an intellectual way to solve a problem, clarify a concept, evaluate activities, or extend a narrative. This kind of genuine dialogue requires the deliberate creation of opportunity for initiative-sharing and collaboration (Siraj-Blatchford 2009). Can AI facilitated animated characters within a game enter into the shared sustained thinking? These questions invite us to explore posthumanist reconceptions of families and literacy enactors. Murris, Kuby, and Spector (2019, 165) encourages a reconceptualization that moves from a substance ontology to a relational ontology, thinking with Barad's notions of temporal and spatial diffraction. The emerging work on machine learning co-design, in which software learns from children, who in turn learn how machine learning software learns, indicates the intricacy of the interactions that redefine learning relationships and cultures (Toivonen et al. 2020; Vartiainen, Tedre, and Valtonen 2020). As Barad has argued the internet connectivity that our technical engagement relies upon itself depends upon atomic

clocks which function at the level of Quantum Field Theory (Barad 2017), and yet, our social imaginaries remain stubbornly fixated within Newtonian terms with its presumption of discrete entities, linear logic and empty space. Barad further argues that it is incumbent upon us to acknowledge the frames that govern our choice of analysis are choices, agential cuts (Barad 2014), which allow us to see facets of reality, while prohibiting our engagement with others. Word choices have material consequences. Rather than seeing only one interpretation, Barad invites us to set alongside each other a number of possible views of material interactions and the different temporalities that cohere in each. There are multiple causes across multiple time frames that all leave material traces sedimented upon each other. Posthumanist perspectives seek to understand the distributed capacity of mind across intra-acting components that materially impinge upon each other within interactions, be they child, tablet, software, operating system, soft toy or parent.

Methods

Our work with game developers, supported by (Scottish Government), gave us the opportunity to observe the sense-making families do around AI affordances in order to better understand their experience of learning, and the role of critical digital literacy within this. Within this we focussed on parents and carers' views on the risks and benefits of this emerging AI capacity. Although research goals of the workshop had technical and feasibility components, in this article we focus on families' game practices and parents' views sensitised by this interaction. Families trialled for 20 minutes a story-based learning game for young children that was in construction to include a machine learning capacity that adapted to children's skills and interests. We were interested to see what relational configurations would emerge as families played together with the app and managed other relational needs at the same time. Key within this were parents' shaping of the experience. Their understanding of the game's capability framed how they prompted their children's engagement and learning. Families with children under 7 years of age were recruited from a state primary school located in moderately affluent peri-urban community in Scotland. Eleven families with a total of 20 children ranging from an age of 8 months to 7 years chose to participate. Families were from a range of ethnic backgrounds with two families identifying as having children with learning support needs.

The use of multiple methods was used to develop a comprehensive understanding of parent and carers' views on the game design, enabling the team to test validity through the convergence of information from different sources (Denzin 1978). In this case study design (Creswell 1998), we directly observed families interacting with the AI supported game that invited exploration of differing characters and scenarios that could unfold largely following an RPG (role-playing game) model. The observation schedule enabled the team to observe from different perspectives in the room the same focussed set of activities.

A 'learning buddy' function that reported on the skills players evidenced and related these to possible learning goals parents may have for their child, along with a report of the interests indicated by the child's exploration of the game was also under development. The game play experience was too brief for data to be collected that could be useful to the machine learning aspect of the game. However, the focus

group aspect of the workshop asked specific questions about the kinds of information parents would value, as well as their concerns about the collection of this data such as the potential to harvest and store visual as well as keystroke data about their child. The focus group enabled parents to share informally their views without having to adhere to a strict sequence of questions (Adler, Salanterä, and Zumstein-Shaha 2019; Krueger 1994), and to compare and distil their impressions. It also allowed us to compare observations with parents' own articulation of their family literacy strategies and the understandings and concerns that underpinned them. This collective sense-making on these topics was a particular feature the research team were interested to examine. Learning about digital technology rarely takes place in formal conventional classes but relies much more on the tangential learning of comparing experiences (Max and Moreo 2012) relying on a diffusion, or diffractive models of innovation dispersal. Within the focus group care was taken to allow a full range of parents to be heard. Participants were divided into two focus groups to facilitate interaction and to provide contrasting views within conversations that explored experience through developing trains of thought. The exit survey confirmed the prevalence of some key perspectives parents held and also allowed dissenting voices a say.

The University of the West of Scotland's ethical procedures were followed, with informed consent of parents gained and continually monitored assent of participating children. Appealing options for children such as art supplies, soft toys and building materials were provided to give children a viable choice to support their right to choose not to participate.

Following shortly after the workshop, researchers shared field notes of observations, the transcripts of the focus groups. Through an iterative process the draws on Braun and Clark's (Braun and Clarke 2019) reflective thematic analysis, the contrasting views of parents were compared to distil key themes, with codes and their thematic relations being revised as the relational aspects amongst them were considered. This developing understanding was then compared to observations and survey results to develop a composite picture of emerging family practices and perspectives.

Findings

First, we focus on our observations of the embodied family interactions, before focussing in on the particular engagement strategies of families and tablet, and, when left to their own devices, child and tablet and, in some cases, stuffed gorilla. The observations provide important context to understand parents' views expressed in the focus group on the possibilities of digital learning technology, not only in this particular instance, but their views on how families are reading the rapidly evolving digital landscape as a whole.

Embodied family digital interactions

Observations yielded a rich set of findings that revealed families are blending traditional literacy practices with new forms of engagement in ways that are similar to the findings of previous research (Druga, Christoph, and Ko 2022; Gadsden 2000; Stephen and Edwards 2018). However, they are making new adaptions to digital resources and agentive capacities. As reported elsewhere (Marsh, Hannon, and Ritchie 2017) there is a wide

variance in how families situate themselves around digital devices which instantiates a wide variance in how parents support their child's interaction with the game.

Parents seemed to be engaging in established practices of moderating turn-taking and encouraging younger siblings to tangentially participate and thus learn from older siblings. Shared tablet use seemed to already be incorporated into lived family experiences.

In some cases, we saw families adopting very similar embodied relations to those that sharing books have inculcated. In one instance a parent sat at the centre of a couch with three children nestled in close or draped on the back of the couch over the parent's shoulder – all focused on the screen in a similar cluster to that a family may adopt whilst sharing of a book. Again, this interaction conveyed a sense that this family was interacting in a well-established routine, adapting it for the purpose of the workshop. However, rather than reading the parent was verbalising the options for engaging with the game and negotiating choices that the children wanted to make. The discussion involved a fair amount of figuring out what options were possible and how the app worked, as well as considering the options it offered. Other families engaged with the tablet whilst interacting with the soft toys and building blocks that were in the room, using these as props to enhance the exploration of the narrative and the choices for its evolution within the game. This illustrated for us the blend of modalities of play that disrupt the sedentary individualised version of digital engagement that is widely criticised. Watching family groups move comfortably across media of engagement in imaginative play alerted us to the possibilities of AI animated learning software not only for individual learners but also but also for families' playful learning interactions together in ways that adapt and augment practices they are already familiar with.

Family learning strategies

In terms of how these embodied stances enabled learning interactions, we saw a range of different strategies to engage with different affordances of the game. Each have different implications for game designers, families and educators to consider, which we highlight as they arise. Some asked scaffolding questions to draw their child's attention to aspects of the game or to encourage their child's choices. Others emphasised the voices of the characters and the emotional journey in reading the story. Some let their child take the lead and waited to support them if needed, or indeed, used the time on their own electronic device with a listening ear open. Others engaged in quite a different kind of multi-tasking such as attending to their infant or acting as a jungle gym for their toddler to climb upon whilst at the same time still offering advice to their older children on how to navigate the game. In terms of game design, parents divided attention may be worth considering in terms of amount and kind of support the game requires or invites.

Intuitive design, the assumption that interaction with a device tutors the user in how to engage with it, needs further critical evaluation. Without the parent's guidance some children 'jumped out' to play on other apps on the tablet rather than focus on the story app. Other children clicked the button to move on too quickly to read the story and could not figure out a way to go back. Some children tend to be more attracted by the colourful part of this game (slideshow and sticker play options). Some children went directly to the sticker part missing out the story aspect which the primary machine learning engine would need the participant to

interact with in order to learn from the child. This highlighted for us that not all the ways children may be drawn to engage with the app may elicit the kinds of exchanges that enable the machine learning aspect to learn from and challenge the child, limiting its educational potential. Many commercial games are structured to give players down time or respite, such as when players can spend time nurturing, training or grooming their avatars. Games that have the intention to be educational would do well to build in this same respite capacity as the sticker gallery in this instance provided.

Some children were aware of the architecture of the game and the fact that different choices would lead them down different paths of exploration. They wanted to go back to see what happened if they made other choices for their character. This evidences, that even young children are aware of digital game meta-structures or frames and used this digital literacy when engaging with this particular app. However, this poses problems for the AI interface of the game, as it may send contradictory information about what the child's interests are.

Children's divergent use of the game space may develop into convergent play. One child, left to his own devices when his parent took his sibling to the toilet, did not continue to use the tablet without his parent and sibling. First he looks at game, then shows it to the stuffed gorilla toy that was sitting nearby, possibly modelling his mother's recent showing the game to him. However, this docile scene is quickly abandoned for a more adventurous relationship. The boy has the gorilla start to eat the tablet. He then has the gorilla say to the tablet, 'I'm meant to be on the roof' thereby re-appropriating the tablet as a character in his role play game as well as the stuffed gorilla. Here he incorporates a moment from the game context and extends it into real room play. This suggests at least this particular child found it quite easy to move between online and off line play, a facility parents indicated they would hope the game can foster.

Focus group findings

Parents' views on their family's experience of the trialled game

Within the two separate focus groups similar perspectives emerged about aspects of the game and its potential to enhance their child's learning and about parents' concerns for the longer term implications of AI enhanced games. Parents expressed two distinct kinds of concerns that are in tension with each other, awareness that the digital world that their children would need to cope and even compete in is rapidly changing, leading to a concern that their child does not miss out. Opposed to this was a concern that engagement may have forms of surveillance or even exploitation that cannot be easily controlled or mitigated. Taking these in turn, we first focus on the specific affordances of the game and parents' criteria for assessing these before turning to the larger picture.

The key benefit parents were interested in were the ways AI could make games of more educational benefit saying:

> I'd be much more interested in technology that doesn't try to reinforce what children like, but opens up something, gets them to try something different–because, I think, I've heard, it's designs that keeps them coming back. (Parent 5, Focus Group 1)

Another parent voiced this same critique that she hoped AI would address, saying she wanted, 'something that isn't designed to repeat what they're doing because that's what all of them do' (Parent 8, Focus Group 2). Parents referred to games 'locking' children in, and expressed the view that they would want something 'that makes it a challenge for them, a creative way of getting into things in a different way' (Parent 7, Focus Group 1).

Parents valued learning about their child and being pointed towards more information and suggestions for offline activities, but wanted this to retain a light touch or fun feel to it rather than 'constant feedback':

> I'm always trying to find out how to support my child. I'm not worried about him but I would love to know without pushing him, as long as he's having fun in what he's learning. (Parent 7, Focus Group 1)

Participants valued their child's autonomy and saw the potential for this within the game

> As a parent you might be limiting them by the choices that you sort of make while you're playing with them, . . . it will be interesting to see what they're doing if they're having like their own journey. (Parent 6, Focus Group 2)

Whilst voicing concern about screen time and wanting some benefit from it, parents were split on how they conceived that benefit. In both groups parents voiced that children needed to learn new skills and that it would be valuable if the game gave them opportunities to engage with digital design. Parents did not have a clear understanding of how AI would motivate or interact with their child more fully than current technology. Without AI, the challenges a game can set are predetermined and are pitched at the average user, rather than being able to adapt to the interests and skills that a particular user demonstrates through their interaction. This levelled architecture is something parents seemed familiar with and referenced in their responses.

> but what if it's a mile(stone) for example an island one or a story one and then they play with this and then at the end of this . . . if they pass they get to the next level . . . And then you don't actually need to read any feedback (Parent 6 Focus Group 2)

What did not seem to be clear to parents is that by using eye tracking and other facial recognition tools the AI function within the game, when fully developed, will learn a range of very fine-grained details about their child's reactions. It needs a large amount of these to begin to 'learn' what the child might be challenged by and interested in and select options and strategies to offer in response. What this means is that such AI builds up an extensive data base about a user. With interaction over months and years a quite in-depth profile of the child's learning preferences and competencies can be compiled. This can have advantages, informing how educators, including AI educators, engage with the child. However, as current debates over ChatGPT training itself on archives of personal data without explicit consent illustrate, there are issues around creative and intellectual property rights of the information gained about a child through their game play. The long-term unintended consequences of letting AI learn from a child are difficult to anticipate.

Parent's views on the changing digital landscape

Within the focus group we tried to open up conversations about this without swamping participants with too much information or too much digital conjecture. Whilst they expressed a number of concerns about data collection for commercial use, participants said they would value data that came to them. They wanted to be able to set parameters of data collected as one parent described, 'If there is a facility to switch on, switch off a particular feature, that was clearly labelled, I would prefer that rather than general surveillance' (Parent 4, Focus Group 1).

A related concern was the identifiability of their child through information exchanged. Some parents were particularly concerned about eye tracking or capturing video of child's face and this being used for purposes other than intended or being hacked. They also wanted to know who gets to see the data and who would benefit from it, not only now, but as ownership perhaps changed hands and became amalgamated with other information about their child extracted from other apps:

> I know that if you have got your Gamin Fitbit that all those things that track your activity … (for) all the performance coaches, all the amateur folk, you know, folk that are just walking about trying to keep their doctor happy with how many steps they're taking, that crunches all the data and it builds a picture of the whole community. So, if you signed up to it, I kinda expect that someone else will be using the data from what my kid's doing to try and develop things further as well. But I can see how some folk might not be so happy – kinda like Big Brother sample sizing bits of their life. (Parent 3, Focus Group 2)

However other parents voiced views that indicated that there are benefits and complexity:

> But predictive technology can be good: what I love is Spotify. And I love the fact that it does predict things that I like, but it is so massive that it just takes me down that routes I never would have found myself. It has opened up so much. I used to be against it, that's totally swapped around. So, if that could be introduced (into learning games) that would be good. (Parent 5, Focus Group 2)

These two excerpts reveal that parents draw on their own emerging digital practice with AI in order to anticipate the ways in which AI will impact upon their children, thus, drawing on their own critically self-aware learning to a lesser and greater degree to assess risks, preferences and consequences. However, parents also expressed concern about the reliability of transferring their knowledge of AI to their child's use of it. They had difficulty envisioning how AI might make games more challenging or the active role they would need to take for these advantages to be realised. Parents were split on how they conceived that benefit. Parents voiced that children needed to learn new skills and that it would be valuable if the game gave them opportunities to become not only early adopters (Wohlwend 2009) but digital designers as well. Parents were aware of the changing needs of digital literacy included both critical and creative skills within rapidly changing socio-economic contexts, and that their children will inhabit a future beyond what they can currently conceive of. Even though their children are quite young, the sense that their children would eventually need to compete within a digital workforce were palpable:

Table 1. Parents' experience of the AI-enhanced game workshop.

Positive Level	5	4	3	2	1	Total
My child enjoyed the session today	6 (54.55%)	5 (45.45%)				11
The game was easy to navigate	4 (36.36%)	5 (45.45%)	1 (9.09%)	1 (9.09%)		11
The game encourages my child's learning	3 (27.27%)	4 (36.36%)	4 (36.36%)			11
The learning buddy app is a feature that would help me support my child's learning	1 (9.09%)	3 (27.27%)	4 (36.36%)	2 (18.18%)	1 (9.09%)	11
Adapting the game to suit my child's interests would improve the game	4 (36.36%)	2 (18.18%)	4 (36.36%)		1 (9.09%)	11

> The thing is that, there is a gap between the traditional workplace and the workplace in the future and the skills needed in digital world I think, and maybe this is just me, that has value, the idea that children can learn digital literacy in a fun way. To learn to be creative in that digital space is valuable. (Parent 5, Focus Group 1)

> . . . and I think it's important to encourage that because they're going to be in that kind of world with other people who are very good at this. So, I think you need to start it because otherwise you will be missing something. (Parent 6, Focus Group 2)

Exit survey findings

As can be seen in the tabulated results from the survey in Table 1, parents reported the experience as enjoyable and of some learning benefit. Some parents seemed to understand the point of the AI was adaptability and were on board with this. Others gave a noncommittal response that may be for a range of reason from concern about their child's data to uncertainty about how AI works or how 'feedback' works either within the game, or in any externalised report it may produce for parents, carers or educators. 'Learning buddy' is the term for this external reporting facility. Parents had the widest range of responses to this, with it receiving the most negative responses of any questions asked.

The survey also gave participants an opportunity to add any further comments they might not have had an opportunity to communicate otherwise. Three important replies are of note. One parent with a child with special needs noted the story frame was beneficial for their child. Another parent noted that they found the workshop facilitation: 'Really attentive to research participant comfort'. However, another parent voiced that they felt the focus groups had a class bias within them, with middle class parents expressing educational views that might not be representative of others. It is important to acknowledge this as a limitation of the study.

Discussion

This is a small illustrative study designed to prompt an important vein of questions in terms of how we understand AI's role within the digital education interface. Whilst the observation aspect did allow children to portray their preferences, within the constraints of the invitation of the game developers, we could not seek out children's views more explicitly. Doing so is important for a range of reasons from those that are rights based

(Kinnula and Iivari 2021; Undheim 2021) to those more centred on user design interface as an important part of product development and fit for educational purpose (Mertala and Meriläinen 2019). Certainly, research more embedded in family's daily routines would increase insights into family dynamics and emerging strategies for keeping abreast of digital innovation.

Within the data we have analysed there are a number of interesting questions. We noticed at least some children moving across modalities, using pretence to allow materials to be adapted for the uses they preferred regardless of their designed purpose, such as using the tablet as an interlocutor to interact with the gorilla soft toy. This cross-modal play transgresses boundaries as both Marsh et al. (2016) and Wohlwend (2009) have similarly observed. Edwards et al. (2020) have termed this mixed modality converged play, as the distinctions between real world and digital play become blurred. Designing apps and educational spaces that not only allow but tap into the creativity such play engenders is a key dynamic AI apps would do well to take into consideration, allowing a greater diversity of uses to be 'learned' from and 'responded' to. Such considerations need to be taken into account in the programming build from the outset. However, understanding this aspect of play is also something for parents and educators to be more aware of, and even guided by, to revise how we think about the range of ways we make meaning and enact creativity.

Turning to consider the posthumanist possibilities we can ask, if temporality is defractive, and non-linear, that is, if how past interfaces with present is fluid and revisable, can this help us better understand the re-visioning of past experience that seems to be at play when parents draw upon their own childhoods to understand the present? How does this change how we understand family and other early learning contexts and how researchers, educators, app designers and children enter the design space together (Barad 2014)? From this study, we can say that being alert to this revisioning and the mutability of resources families may need to draw on frames how we engage in design research with them. This process of filtering experiences takes time and a phase of trial and error to play with possibilities. As digital resources make options more complex, more time to play with and adapt past and present experiences will support better educational practice and outcomes. One question we are left asking is, if we are to incorporate into parental and education decision making a sense of the more than human, that is, our embeddedness in natural and technical systems, how does this change what we prioritise within learning? (Murris, Kuby, and Spector 2019) As Luo et al. remind us the digital divide is fractured across many fault lines:

> it is about the quality, relevance, and meaningfulness of that access. Cultural traditions, societal norms, global-localization influences, and unexpected global events like the COVID-19 pandemic further complicate this divide. (Luo, Yang, and Berson 2024, 7)

This study has given us only a glimpse of this more complex decision landscape, and we recommend more longitudinal studies to pursue this question further.

In comparing findings to the literature there are a few challenges. Much more is written about how early years practitioners understand and implement digital technology than the views of a child's first educators – their parent (Arnott 2016; Gennari et al. 2023), with much that is written about parents addressing concerns about 'technoference' – that is, parents own growing immersion in screen time squeezing out interactional time with their child (Glassman et al. 2021). These

concerns did surface in the focus groups within parents' discussion of how to balance all family members' needs within any given context, citing, for instance, needs that may arise in the car as different from those at home.

The more pressing tension parents voiced was the pull between wanting to give children the most advanced access to digital resources and a desire to protect them from the intrusion this may entail. Letting the prospective teacher of a child know what the weaknesses and strengths are in terms of cognitive ability measured through digital interaction is one thing, that data building a digital self that is then accessed by prospective employers or insurers is quite another.

Conclusion

We think it is important to consider that game and other mobile device activity takes place in much more complex relational dynamics of family literacy practices than current design practice takes into account (Vartiainen, Tedre, and Valtonen 2020). Parents are tasked with blending their own past experience of childhood, their present experience of digital interactive capacity, and their anticipation of the future developments within which their children will live. There is a lag between what parents experience and therefore can make judgements about and the kinds of qualitative changes that AI capacity is bringing to interactive game capability, which in turn ripples out into the learning spaces and eventually the work/life spaces families negotiate. Nevertheless, parents in the discussion recounted their attempts to imaginatively project themselves into the possible futures their children will encounter. The complexity of parents' considerations is worth giving attention. Parents here are revisioning and repurposing their past childhood experiences, pulling out of them aspects that at the time may not have seemed significant, thinking through them differently and overlaying them with the questions their current digital practices throw up. They use both to imagine their child's present possible interactions, their risks, benefits, and family implications and also their child's future possible selves, again using their own life experiences. At the same time, over a shorter adaptation history, children are also comparing, adapting and making decisions that construct their selves (Cross 2009). Thinking across different points of time (Murris and Walter 2021) opens up diffractive understanding, that is, alternative ways to understand the purpose and process of self guided learning and to critically compare possibilities.

Human agency in this complexifying space rests on the capacity to interrogate AI mechanisms, something parents' views in this study illustrate requires further work.

In these deliberations, we can see why it may be important to think differently about temporality as past, present and future have a capacity to 'thread through each other' (Murris, Kuby, and Spector 2019, 161). These dynamics illustrate how posthumanist perspectives help us: '. . . re-work the past across space-time as re-turning changes the in-between of what is documented and how it is "read" and the infinite possibilities created in this way' (Murris, Kuby, and Spector 2019, 162).

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