Designing Playful Products

Nine principles for including children in collaborative, rapid R&D

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Introduction

About this paper

REACT was established in 2011 and funds academic researchers in the arts and humanities to collaborate with creative businesses, and produce prototype products or services. In September 2014, REACT launched 'Play Sandbox', a four month research and development (R&D) scheme that supported six teams to create new products or services aimed at children between 7 and 12 years of age. Central to Play Sandbox was a group of 14 children and young people called 'Young Coaches', who participated at different points from inception to completion to help teams develop their ideas.

The purpose of this paper is to support and guide others looking to do similar collaborative design with children in effective, meaningful ways. Its findings are aimed at individuals or organisations interested in involving children or young people in design processes, particularly in relation to digital play products or services for children or in rapid, collaborative environments.

About the research

REACT commissioned the authors of this paper to explore the Young Coaches' impact on and experiences in Play Sandbox. This paper shares what Play Sandbox taught us about how to involve children in designing and making things quickly. It is built on the voices and experiences of the adults and children involved, as captured through action research that worked alongside the Play Sandbox.

The specific research questions that frame the findings in this paper are:

- What happens when children participate in collaborative R&D?
- What factors influence how that participation unfolds or is limited?
- What facilitates the effective, meaningful involvement of children's participation in collaborative design of products or services for children?

As well as exploring how Play Sandbox involved children in collaborative design, the research also aimed to offer a useful reflective tool to the REACT team during the Play Sandbox period. We chose an action research methodology to encourage reflection, feedback and adjustment. This approach aligned with REACT's ethos, where participation, reflection and sharing with Sandbox community are as important as scholarly observation. Interim findings were shared between researchers and the Play Sandbox production team, in order to feed into the design of the remaining work with Young Coaches.

We used the following methods to collect data:

- Observations at six Play Sandbox workshop days (out of eight)
- Interviews with six design teams (during the Sandbox and after it finished)
- Interviews with five REACT staff members and advisors
- Interviews with eight Young Coaches (out of 14)
- Focus group with parents/carers
- Documentary analysis including the collection and analysis of photos, letters and emails and other items

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Play Sandbox

What is Play Sandbox?
Play Sandbox was funded by the Bristol-based REACT Knowledge Exchange Hub for the Creative Economy. REACT[1] is a collaboration between UWE Bristol, Watershed (a Bristol-based media centre and cinema) and the Universities of Bath, Bristol, Cardiff and Exeter. REACT is funded by the Arts and Humanities Research Council.

Play Sandbox is the final of five 'Sandboxes' run by REACT. The 'Sandbox' concept, first developed by Watershed in 2008, is 'a space in which people can take an experimental idea to working prototype over four months of rapid R&D.'[2] REACT Sandboxes comprise a cohort of six to eight teams of academics and creative businesses. Each team pursues their own idea for a product or service. The cohort is bought together for regular workshops and meetings which focus on the R&D process, including user testing, audience development, PR and business support. The method adapts working practices common to technology innovation methods, such, such as agile production methods, frequent testing, sharing ideas, and peer support. Each Sandbox is managed by a Creative Producer who helps to establish collaborative relationships, oversees projects as they develop, and offers bespoke support during the R&D process. The Creative Producer is supported by other REACT team members, including the management-level REACT Director and Watershed Creative Director, as well as operational support from another REACT producer, a Research Fellow and the Hub Manager.

Play Sandbox funded the collaborative development of six new products or services for children from late October 2014–February 2015. The programme intended to 'bring together companies, young people and research to develop prototypes that mobilise play in new and transformative ways.'[3]

Play Sandbox workshops were held from the Pervasive Media Studio, where REACT are based. The Pervasive Media Studio hosts a curated community of artists, creative companies, technologists and academics exploring experience design and creative technology. It is a collaboration with UWE Bristol and the University of Bristol, managed by Watershed. The Studio offers a variety of spaces including an open plan office area with hot-desking facilities as well as larger event spaces and a bookable conference room. It is housed in Watershed's building in Bristol's harbourside.

The Young Coaches
Central to Play Sandbox was a group of fourteen children and young people — called 'Young Coaches' — who were involved across the Sandbox process. The Young Coaches were recruited and supported centrally by the Play Sandbox core team. The Coaches were seven boys and seven girls, with an age range between 7 and 12 years old (eight of the Coaches were 9 years old or younger). Most of the children were from Bristol (though two were from a town in Devon), and there were three sets of siblings.

REACT recruited the Young Coaches through various methods, including social media distribution, via their own and local partner networks, and through a few local schools and community groups. From 37 applications, they selected participants mostly on gender parity, age, and location. The REACT team also hired a Young Coaches Mentor to work specifically with the children. The main priority for this role was the children's wellbeing, and supporting the REACT and Sandbox team to involve children in the design process.

1 REACT stands for Research & Enterprise in Arts & Creative Technology
2 http://www.react-hub.org.uk/playsandbox/sandbox/
3 From http://www.react-hub.org.uk/playsandbox/play-theme/

The programme intended to 'bring together companies, young people and research to develop prototypes that mobilise play in new and transformative ways.'

The Young Coaches participated at various points throughout the Sandbox (days marked with an (*) denote where Young Coaches were present to work with the teams):

Wildcamp
A full day to introduce potential applicants to Play Sandbox and the Young Coaches, July 2014

Young Coaches day out
Day out with REACT staff to visit Bristol's M Shed and Aardman Animations and prepare for the Play and Pitch day, August 2014

Play and Pitch day
Teams pitch their project ideas to REACT staff and Young Coaches, September 2014

Sandbox Welcome Workshop*
Six teams awarded Sandbox funding meet, plan and consult with Young Coaches, October 2014

Workshop*
After-school workshop for design teams to work with Young Coaches, December 2014

Workshop*
Day-long workshop for design teams to work with Young Coaches, February 2015

Celebration Day
Celebrate and demonstrate new play products to partners and stakeholders, including families of Young Coaches, February 2015

The teams worked with the Young Coaches at different points across the Sandbox process. Although the ways in which teams and Young Coaches met differed, with some teams working with the same group of children throughout the project, and others working with different groups in shorter bursts, all teams worked with the Young Coaches.

Some teams also engaged with other groups of children and young people outside of the Sandbox workshops.

A Snapshot of the 2014 Play Sandbox projects

Fabulous Beasts (lower left) is a two player game of stackable objects that create a corresponding digital game world on an iPad. What happens in the real world affects the digital world.

Light Bug (lower right) is a swing that responds to interaction, through light and sound. It is part of an exploration into the playground of the future.

Mighty Minis (p.14) is a cross-platform game, where digital characters are developed and strengthened in communication with a real-life toy that responds to the physical activity of the user.

Millie Moreorless is a prototype game aimed to help children with Down's Syndrome understand numbers, maths and magnitude.

The Teleportation Tent (upper left) is a den that uses 360-degree projection to enable those inside to interact with items to produce stories in other worlds.

trove (upper right) is a digitally enhanced keepsake chest, that enables children to tag their treasured possession with audio memories, aimed at adopted and cared for children to enable them to document their own life story.

Involving children in Play Sandbox: REACT's aims for working with children

Play Sandbox was the first REACT Sandbox to recruit users as part of the design process, and the first time REACT as a project had ever worked with children.

REACT wished to see if the inclusion of users in the production of products designed for them, would make for better, more robust products or services. Early exploration by the team suggested that fewer than 5% of children's products were designed with children[4]. REACT committed to involving children early in the planning of Play Sandbox and sought to find ways to support businesses who wished to work with children. The REACT team wanted to see 'how we can fit [children] into an R&D model that we have done a number of times and we know works for small companies,' as one REACT member put it.

The aims as stated by the team were:

1. Improve the product
There was a common assumption that involving children in the design of play products would make these products better.

2. Involve children as makers and creators rather than consumers
An attempt to disrupt common ways of involving children grew from REACT's recognition that the idea of a child is often *'constructed as a consumer at the end of the process rather than as a co-creator at the beginning of the process.'*

3. Develop an innovative approach to R&D in the field
How could design with children on rapid R&D projects be useful, effective and respectful of children?

4. Provide meaningful experience for the children
Ensuring that the experience 'would actually enrich [the children] in some way' and not be purely tokenistic was a common motivator for REACT team members.

5. Enable small companies to involve children in a long-term process
By organising children's involvement centrally, REACT enabled design teams to focus on the

collaborative process rather than use time and resources in organising and maintaining that involvement.

6. Challenge the Sandbox process
Involving children in the Sandbox in a sustained way was seen as risky and difficult but that also made it attractive to a team that sought to invigorate existing processes. *'It was so challenging and so exciting that it became slightly irresistible.'*

Children and participation in design

Play Sandbox's attempt to understand and practice collaboration in design with children and young people finds itself in good company. Internationally, institutions and research centres at places like the University of Helsinki's Playful Learning Centre, MIT's Media Lab, and the Centre for User Experience at KU Leuven are developing exciting new design techniques with children and aiming to reach a better understanding of collaborative design that aligns with emerging play products and new technologies that are mobile, social and distributed.

But why might we want to include children in design processes?

Believing that children should participate in making decisions about their lives and the world around them requires a certain way of seeing children and childhood. It assumes that children have valuable knowledge that is worthwhile to consider and is of unique importance. This reflects a conceptual shift that occurred in the late 20th Century when children and young people began to be regarded as fully formed people – as 'beings' rather than simply 'becomings.'[5] Here, children are not solely outcomes of society but participants in its formation, and their present ideas, experiences and choices are seen as important, powerful and worth knowing.

In the field of HCI (Human Computer Interaction) the involvement of children and young people in designing things for them and their peers is seen by some as critical because they have their own 'likes, dislikes and needs that are not the same as adults'[6]. User-centred approaches generally acknowledge there may be a gap between adult-designed concept models and the children they're designed for – hence the importance of involving them in the process[7].

Allison Druin, who along with colleagues at the University of Maryland, has identified four roles that children may occupy, shown in Table 1 (opposite). Children's involvement may move across the different roles as they participate in the design process and will not always fit neatly into one box.

Despite the wide-ranging interest in involving children in design processes, their actual participation in the design of new technologies is not common practice.[9]

Many developers of new technologies consult with teachers and parents, or rely on their own

Role	**Description of child's involvement**	**Types of activities or methods**
User	Children use the technology and are observed, perhaps in different environments.	Observation of children
Tester	Children try out prototypes and are observed and asked for their ideas on the experience of using them.	Observation of children; asking for specific feedback on already existing ideas
Informant	Children participate in the design process at different stages, as determined to be useful by the developers.	Commenting on initial ideas or prototypes or observing children use existing technologies.
Design partner	Children act as 'equal stakeholders' in the design process, contributing throughout. This role requires frequent and egular direct interaction.	Participatory design activities that offer equal decision-making (eg, creating low-tech prototypes together)

Table 1: Typology of children's involvement in the design process

experiences rather than ask children. Practical barriers often get in the way, as user involvement can be expensive, time consuming and complicated to organise, especially within the tight timeframes that often accompany such design processes.

Other challenges exist when practicing collaborative design of products or technology with children. The practices of decision-making and collaboration are based in human relationships and shaped by communication, respect and power. The traditional conceptions of children often lead to assumed relationships between an 'all knowing' adult and 'all learning' child[10].

These relationships, rooted in authority and expertise of adults, are challenging to deconstruct in short periods of time. To attempt more equal, shared participative work, Muller and Druin[11] suggest that participatory design can create a 'third space,' one between the worlds of developers and children, where they can combine their different insights to create new ones. Constructing such a power-sharing space requires all participants to rethink their own assumptions and habits on how decisions get made and who knows 'best.' It is in this third space that the Play Sandbox experimented.

4 Carey, G. Tryee, W and Alexander, K (2012) *Just Kid Inc: An Environmental Scan of Children's Interactive Media from 2000 to 2002*, John and Mary R. Markle Foundation
5 Corsaro, W. (2015) *The Sociology of Childhood*. Fourth Edition. Sage: Los Angeles.
6 Druin, A., Bederson, B., Boltman, A., Miura, A., Knotts-Callahan, D., & Platt, M. (1999). Children as our technology design partners. A. Druin (Ed.), *The design of children's technology*. San Francisco, CA: Morgan Kaufmann.
7 Mazzone, E., Read, J. and Beale, R. 'Towards a framework of co-design sessions with children' *Human-Computer Interaction–INTERACT 2011*. Springer Berlin Heidelberg, 2011. 632-635.
8 Druin, A. (2002) 'The role of children in the design of new technology,' *Behaviour and Information Technology*. 21 (1), pp.1-25.
9 Druin, 2002
10 Druin, 2002:2
11 Muller, Michael J. and Druin, A. (2003) "Participatory design: the third space in HCI." *Human-computer interaction: Development process* 4235

What did we discover?

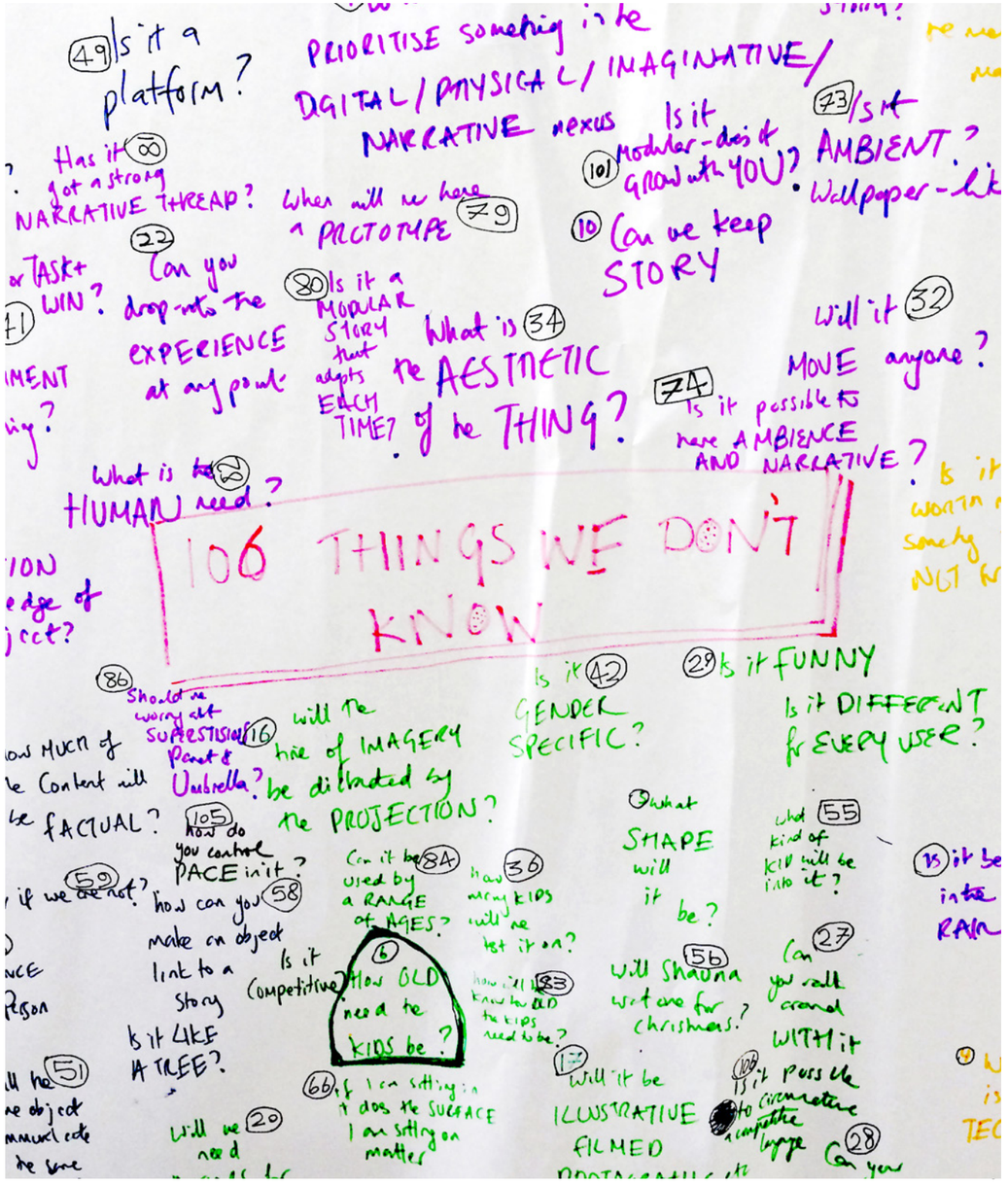
Overall, the involvement of the Young Coaches in Play Sandbox was seen to be positive, valuable, and influential on an individual level, as well as on processes and end products. The planning and management of Play Sandbox was significantly affected by Young Coaches' participation, from the way the schedule aligned with children's availability to the types of activities planned. Less tangibly but no less important, the regular presence of Young Coaches provided the *'sense of a living, breathing child'* (REACT team member) to know and keep in mind through the product design stages. This sustained, consistent presence of children can create a culture that is more playful and geared towards creating things for children.

> *'It's been very positive having the children involved. It's an excellent motivator and a grounder ... Every time I've seen them it's brought me back to thinking more honestly about who we're making it for and how we can make it better.'* — Design team member

However this process can also be challenging to manage, as a REACT team member suggested,

> *'I can see why games companies don't do it because it's so chaotic and crazy and because the results might not always be what they expect'*

The findings from the research that are presented here are intended to provide useful, practical guidance for others looking to do something similar. They are arranged as a series of principles that we hope companies, designers and others considering the involvement of children in collaborative design will find of value. These suggest a framework of aims, expectations, and ethical practices that are shared with all participants. Setting up and agreeing such a framework from the outset will help understand and balance the diverse needs and motivations of both designers and young participants.



Case Study:
Choosing children to work with

Working with any small group of children limits the ability to ensure 'diversity' and 'representation.' However, in Play Sandbox, some design teams welcomed the confidence, background and enthusiasm of many of the Young Coaches because they were more familiar and at ease with the incremental nature of design work. This was particularly the case with trove, a treasure chest container that held digitally stories recorded to a precious objects. While useable by any child, it was designed with a specific audience in mind – children who had been adopted or looked after. However, involving these children in such a rapid design process was a difficult challenge, and the readiness of the Young Coaches seemed better suited for the project timescale.

'

I think [the Young Coaches] also understand the timescale of design better than perhaps other children who weren't from those sorts of backgrounds. I think they were quite happy to sit back and not see amazing changes between sessions. I think that was important because I was concerned about managing expectation. I think they were quite happy to see it was really quite incremental and things took a long time to work through.'

For the Young Coaches it's quite easy to say, "This could be a couple of years down the line and it's not necessarily going to help you," but they see that as part of ... just being in a creative design process. Whereas the looked after groups whose circumstances are so adverse and so difficult, swanning in and saying, "Isn't this exciting? It's something that we're designing for people like you," and then them saying, "Well how do I get one?"

Nine Principles for the involvement of children in collaborative design

1 Start with a shared clear purpose and aim When you consider involving children in a design process, think about your aim and purpose. Make the aim realistic given the resources available, particularly timescales and support for children, and ensure that everyone involved – including the children – is aware of the purpose of everyone's participation.

Collaborative design with children can take many forms, and the important thing to consider is what form fits the aims, available resources and participants. The Young Coaches were consistently emphasised as integral to the Play Sandbox programme. They were, according to the Play Sandbox website, 'partners in the design process, challenging us to make better things with their imagination, opinions and values.'

The expectations of some design teams reflected this, as they anticipated Young Coaches to be 'co-designers' and an 'integral part of the design process.' Some said they had expected to meet more often with the Young Coaches and that their initial expectations of collaborative, sustained relationships were not realised.

> *'I thought we'd have longer sessions with them and I could actually design with them. What happened is we kept interviewing them about what they thought about each thing that we had done ... we were aiming for co-design, but actually we missed that.'*
> — Design team member

One REACT team member suggested it was unrealistic to expect children to be full co-designers,

> *'I don't think I ever understood them as fully co-creative partners. I didn't think it would either be fair, reasonable or we would be resourced for them to be fully co-creative partners … [Young Coaches] would be a voice that would add to that process.'*

This variance in expectations may be partly due to an initial lack of shared understanding around the aims of children's involvement. Echoing this, the Young Coaches also differed on their perception of their own roles. Some children felt that they were involved as 'testers' of products largely designed by adults:

> *'Play Sandbox was people who wanted to make games, lots of groups of adults, and they wanted kids to help test out the games they were making so they could make them better and add stuff that the kids liked.'*

> *'People designing and making games rather than just thinking about it all themselves they tested it on lots of different types of kids.'*

Whilst others felt they were more involved in the process of designing something new:

> *'We are Young Coaches who help adults to create things.'*

> *'It was sort of using the expertise of adults but then also the ideas of children to create like the best games possible.'*

Clear expectations and a shared agreement on what 'co-design' looked like and meant in this context – if indeed it was the right approach for this context – would have been useful preparation for design teams.

2 Consider recruitment and selection of children carefully When recruiting a new group of children, consider what cohort suits the aims of the project. Which children are involved should be thought through at the outset. This may require providing additional support or resources to ensure a diverse cohort is recruited and retained.

When setting up a group of children for participation in decision-making processes, the recruitment and selection process undoubtedly shapes the dynamics and demographics of the group. In Play Sandbox, age was a particularly influential factor in how Young Coaches participated and were involved. The age range of 7–12 was intentionally chosen to include children with different qualities that might be useful for design purposes, which was recognised by some:

> *'I do think having groups of different ages and different, like personalities, liking different things — I think that really worked.'*
> — Young Coach

However, the age range also made for some difficult group dynamics:

> *'Yes, I think [the age range is] good for product design. I'm not so sure it's good for the children if you see what I mean? To be part of that cohort where it's very diverse and you've all come from very different places and they've had to start from not knowing anybody.'* — Design team member

Others recognised the limits of any group with a small size, as well as the lack of representation from a wider range of children.

> *'It's really important to involve children but who are they representing? They are a very small number and they come from a particular place … It's also trying not to get drawn into thinking, "Five kids like it therefore it's good," and I think it's being able to stand back from that.'* — Design team member

The Play Sandbox recruitment approach also meant that many of the participants were seen to be part of the 'extended network' and 'junior versions of the culture that is running the whole process,' as described by a REACT team member.

The recruitment and selection process undoubtedly shapes the dynamics and demographics of the group.

The REACT staff team acknowledged that their selection and recruitment process did not 'privilege inclusion or diversity in a very big way' and could have been more considered by requesting further information that might have led to a more representative group.

In thinking about widening the demographic of children, REACT staff questioned their capacity to include children who required more preparation or support. For example, many involved found it tough knowing how to work with one child who did not engage easily in a group situation, raising the issue of how Play Sandbox would have managed many children who had additional support needs.

Another way to work with a more diverse group of children, as suggested by a design team member, was to get a whole school class involved, which might negate some of these issues,

> *'It might be better to get buy-in of a whole class in a school who'd actually give them time off class. Then you haven't got the issues of fitting in school and families, getting you there and those sorts of things, but what you lose is the creative backgrounds and the tech backgrounds.'*

However, for REACT, it was felt that the classroom dynamics, and power balances associated with known classmates and teachers were not appropriate for Play Sandbox.

Case Study: Mighty Minis

The involvement of Young Coaches in different projects depended on many factors, including the regularity with which they saw certain children. The Mighty Minis project created a collectible real-world toy that interacts with a dynamic online character. The two team members – an academic working on games and a robotics engineer – decided early on that they'd prefer a continuous, long-term relationship with one set of Young Coaches. As such, they requested that they work with the same group of Young Coaches from the pitching session through to the celebration, a request the REACT team accommodated.

They wanted to work with the same group for two reasons: the group's attributes matched the project's needs (there was an even gender split and an early conceptual understanding of the project) and they felt that continuous involvement meant deeper understanding and more effective feedback loops. While the Young Coaches group they worked with had different personalities and thus a sometimes challenging dynamic, the team members were able to understand how best to accommodate this dynamic because of the regularity with which they saw them. Their familiarity allowed them to plan tailored, appropriate sessions for the group.

'Two of them are very physical and two of them are quite sort of sit down and quiet. So when we think of the group activities we need to be really careful that we are making sure that everybody has got something to do and also that we are not segregating them. So it is not, "Okay you two quiet ones here, and you two noisy ones here."'

The team had some previous experience of involving children in 'user testing' but found the Young Coaches' involvement unique and extremely useful, as it influenced the design and functionality of the toy throughout the process.

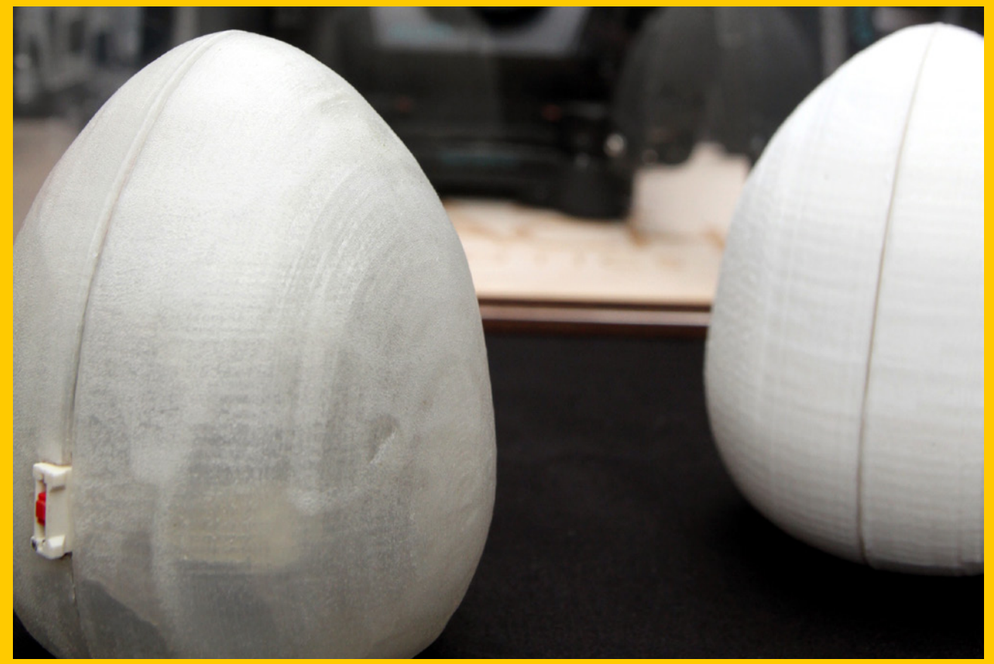
'Normally [for] your product design loop you have an idea, you test the feasibility nd then you implement it, you get feedback and there is the cycle. [In Play Sandbox], the loop is at every stage instead of one massive loop.'

The consistent relationship also enabled the provision of regular feedback about the Young Coaches' contributions, which further facilitated a deeper understanding of the design and opportunities for meaningful contribution within the team.

'Every time they turn up they are kind of a step ahead of us, I feel. They have thought of things that we haven't quite got our heads around.'

This was demonstrated at the end of the project when the Young Coaches explained and pitched the Mighty Minis project at the celebration event, as the design team members were both travelling internationally.

'We considered them part of the team because we tried to keep them in the loop of everything that has been happening. I think we did a really good job of that because they could stand at the end and pitch because they knew everything about it along the way.'



3 Carefully consider your own aims but also match these with the needs, desires and availability of the children For longer-term design collaboration, consistent, regular contact with the same group of children is useful. When planning children's involvement, consider their availability, motivations for participating and practical requirements like food, transportation and access. Carefully consider what types of design activities are feasible and appropriate, given the time restrictions and the space.

Practical considerations, like food, personal care, attention spans, time and space and children's schedules are also critical factors in enabling successful interaction. This was demonstrated in a discussion between parents in the focus group on how the ice cream had run out at the Wild Camp event before the children got any.

Parent 1: 'That was the first thing [she] came back and said, 'The adults got the ice cream.'

Parent 2: 'And that's really small, but actually it's quite a big deal, isn't it?'

Parent 1: 'And the next time I actually packed [her] a packed lunch, in case.'

Parent 2: 'Yes, me too. I put it in so that she wasn't worried about what you were going to eat.'

Practical issues sometimes meant that the aspirations of design teams were not met by what actually happened, such as when children had a bad day or arrived after school feeling tired.

'Being flexible as well, which one isn't looking happy today? Or it was really obvious they had come from school this time, and once you have come from school, their energy was much lower, which was useful, but they were tired.' — Design team member

Time was a second practical issue that made a difference to the children's involvement during Play Sandbox. Sandboxes are deliberately based around short timescales and rapid work, as these match the needs of companies and the innovation process. However, time constraints raise the question of what type of meaningful, effective involvement of children can exist in a rapid prototyping design process and what types of children does this process privilege.

Play Sandbox's quick, often unforgiving schedule was described as a tough context for involving children. Previous Sandboxes have highlighted challenges in syncing timescales between creative partners and slower moving higher education institutions[12]. In this case, incorporating appropriate 'time' for children or young people, including setting expectations and building and ending relationships, was particularly challenging given the fast pace of design and controlled rhythms of school-aged children.

The Sandbox timescales were seen by some to be motivating, while others felt limited and pressured by a lack of time with Young Coaches. For some, this lack of time impacted on the teams' abilities to form more natural relationships with the children, plan and reflect on the activities and create fruitful feedback loops. One team member commented on the pressure of 'feeling like this is supposed to be co-design' but not having the time or capacity to make that happen,' suggesting the importance of setting agreed, clear expectations at the beginning of the process.

'I think the ideal would have been to ... have a start off session which is very much about us getting to know them ... and just finding out things that may be trigger points or concerns rather than the design issue straight away. Again that's the timescales of the Sandbox.' — Design team member

The challenge of the timescale felt more acute for those without significant experience working with children:

'In the timescale they can't teach you to work with children, I don't think that's ever going to happen or give you the skills or the confidence or all the strategies for dealing with kids.' — Design team member

12 Moreton, S. and Dovey, J. (2013) *Working Paper 2: Curating Collaboration: The Experience of Collaborative Innovation in REACT*. REACT Hub, Bristol

Having longer periods of time and consistent meetings with one group of children may have alleviated some of the time pressure.

> *'I think it was cool to focus on a couple [of projects] ... because then you could really get your point across more, rather than constantly moving around.'* — Young Coach

> *'We don't feel like we had a consistent relationship with one group of Young Coaches. It would also have been good if there had been somebody or some smaller group that through them there was some continuity.'* — Design team member

A third concern was the space available for the design work. Having the right kind of space for work with children is also important, as it sets the tone for the interactions. REACT set up Play Sandbox workshops within the spaces available to them, which were not always appropriate for what teams aimed to do. The workshops were often in an office environment and thus could feel 'artificial,' adult orientated and uninviting for child-friendly activities or exuberant play. There were also few times when all adults and children met together to discuss, shape and reflect on the Sandbox.

> *'None of the spaces in the studio were necessarily child friendly or useful. You go from a sofa area which is open plan or you've got the very formal boardroom with the glass walls or you've got that great big hall, which was fairly chaotic.'* — Design team member

These intersection of these challenges shaped how children could engage in the process of testing. The products created in Play Sandbox demonstrate the rich variety of play. Some were rule-based games with educational outcomes while others embraced imagination and a child's creative influence. For example, products focusing on freer play and imagination employed less directed or structured methods of feedback. More broadly, the methods in the Play Sandbox workshops often echoed the methods or types of play that the teams wanted their product to elicit.

Where possible, develop a project timescale that accommodates the time needed for children's involvement.

'[There was] less child management and more trying to get in a vibe where you could see the depth of their experience. Then, you could start to imagine what the experience might be with this thing actually in a child's home or bedroom' — Design team member

The REACT team overcame some of these difficulties by being flexible and responsive to these issues and by encouraging teams to set up additional contact with Young Coaches. Some teams sent prototypes home for children to test out in their own natural settings whilst others took the Young Coaches to a park for one of the sessions. Teams were grateful for the flexibility shown by the REACT team in regards to setting up child-friendly spaces.

Our suggestion is that where possible, develop a project timescale that accommodates (and possibly overestimates) the time needed for children's involvement, considering their schedules and including time to build relationships. This should be balanced with the needs of other members of the cohort.

4 **Build relationships with individual participants and families** Discover early in the relationship what individual children require in order to participate and feel included, including dietary, communication and access requirements, what environments they prefer and their interests. Be aware that certain methods may be more or less appropriate for children depending on their ages, experiences with design processes, time available and interests.

Spend time building relationships with the children and provide time for them to do the same as a group. The different ways that children might be motivated or feel able to participate should be considered during planning. However, as relationships develop and children become more comfortable and confident, their involvement will change. Some Young Coaches discussed how the first Wild Camp event was difficult because they did not have enough prior information about the event. As one Young Coach suggested,

'I felt nervous on the Wild Camp day because there were loads of adults there ... they were all lined up.' — Young Coach

However, once the children's individual requirements and interests were better known, the experiences began to be designed more inclusively for the children.

"I think that luckily the group is just small enough that the people who are closest to them ... are able to have a personal, individual recognition of the needs of each one of the children." — REACT team member

'Two of them are very physical and two of them are quite sort of sit down and quiet. So when we think of the group activities that we need to do with them, then we need to be really careful that we are making sure that everybody has got something to do and also that we are not segregating them. So it is not, "Okay you two quiet ones here, and you two noisy ones here."' — Design team member

However, how sessions were tailored to fit certain children depended on the experience of the design team members and the regularity with which they saw certain children. Those who saw the same groups of children each time were able to better plan and organise sessions for that group's requirements.

It is important to recognise that the motivations of adults and children behind collaboration in design may not be in sync. While design teams were motivated to engage children with the prospect of a better design and product, children's engagement with the Play Sandbox process varied greatly and did not always prioritise design improvement. Some enjoyed the design workshops but, for others, participation was more socially based and relational. Here Young Coaches describe their favourite parts of Play Sandbox:

'I think my favourite was probably the workshops ... because it was just really interesting hearing all of the other Young Coaches' ideas and all the adults' ideas and just sort of merging them.'

'I made three friends.'

'I think my favourite part was connecting with other people you wouldn't really want to connect with.'

The role of others adults or gatekeepers in children's participation is also crucial though not always apparent. In Play Sandbox, many design teams had little or no contact with parents, carers or teachers, though the roles of these people were significant in providing and maintaining the Young Coaches' opportunities to participate. Parents in a focus group reported generally knowing very little about what their children were doing in Play Sandbox. Some teams had more contact with parents, carers and teachers — either with the Young Coaches when they were given 'work' do at home on a project or with external groups of children. Those that worked more with parents discussed the implications of doing so.

'One of the tricky things when we were working with the children and with the parents together is that parents obviously wanted to support their child to get it right, but also we were actually interested in kind of how they interacted with it, without any help.' — Design team member

'I have noticed the 'looking after-ness' of the programme, people being looked after has become part of the discursive framework.'

5 Establish procedures and systems to set expectations, roles, responsibilities and ethical guidelines Consider how expectations, roles, responsibilities and ethical guidelines are organised and communicated. How will adults be briefed on the shared responsibilities around child protection, risk assessments, feedback loops, consent and confidentiality?

The central REACT team described how children's involvement led to them taking on unexpected new roles, adding an increased element of 'care' into the Sandbox.

> *'It has introduced a care dynamic into the whole system that perhaps wasn't there before ... I have noticed the 'looking after-ness' of the programme, people being looked after has become part of the discursive framework.'* — REACT team member

Managing the expectations of the Young Coaches was seen to be important, and many identified it as part of their responsibility to the Young Coaches. The REACT team intended to ensure that children understood their involvement, what happened to their ideas and how the project would end.

> *[A REACT team member] said very early on, "Don't blow up their expectations, don't give them the world because you have got to be able to bring it.'* — Design team member

Some design teams suggested the management of overall programme expectations resided with the Play Sandbox team while others took that on themselves, working carefully with children to explain what might happen both with children's ideas in iterative design and also the overall future of the project.

> *'It's something we did talk about in that first session ... being clear with kids what the expectations are and that they might not get a copy of whatever it is straight away.'* — Design team member

Working with children in collaborative design processes brings unique ethical considerations, including risk, consent, confidentiality, and ownership of ideas that must be considered and communicated through clear procedures and systems at the outset.

The REACT team acknowledged this and understood that the addition of the Young Coaches to the process included 'risk,' 'additional responsibility' and a 'duty of care.' Researchers in design teams got ethical approval for involving children from their University and also agreed to Watershed's procedures for working with children, but beyond that it was sometimes assumed that 'ethics' were being managed by the REACT team. Others found it 'a little bit vague' who was responsible for what when working with the Young Coaches, in particular regard to risk management, safety, and confidentiality.

> *'As a group, we could have done things like talked about what does it mean that the university has ethics guidelines that they work within. I feel like we've been left as individual teams to find a way through those things without quite enough of a bigger view on that.'* — Design team member

A number of specific ethical issues around collaborative working with children emerged throughout the Play Sandbox process:

Ownership of ideas

In the creative industry, ownership of ideas is important. Some design team members questioned how the work and contribution of Young Coaches might be acknowledged or fit in with ownership of ideas, but there appeared to be little formal discussion or recognition of this question.

> *'It's interesting to go along the lines of intellectual property. I genuinely don't know whose ideas these were. Were some elements exploitative? I think probably not.'* — Design team member

Consent

REACT gathered consent for Young Coaches' participation from parents, which many design teams considered sufficient. One team used an additional consent form which they gave to the children to explain their project and questioned the level of informed consent that children had

'I genuinely don't know whose ideas these were. Were some elements exploitative? I think probably not.'

about their participation, especially given that their ideas, photos and stories were being recorded and shared. Another team discussed having an 'ethical radar' with the children they involved, which refers to working with an ethical awareness and looking for verbal or non-verbal signs related to consent and participation. Conversely, another design team member commented that the easing of stricter consent procedures common in university research with children was welcomed in a project like Play Sandbox.

Safety and risk
Certain activities raised anxieties of safety among some team members, especially those organised outside the Watershed building. They would have preferred clarity around who was responsible for assessing risk and ensuring safety of individual activities.

Confidentiality and information sharing
There was significant discussion around how much information about the participants should be shared across Play Sandbox. Very little was known about the children before they started, and both REACT staff and design team members commented that knowing more may have been helpful to facilitate a better experience. However it was noted that this was

> *'A balance between not expecting those children to disclose all of who they are ... [but] it's also about how do you respond to their particular needs.'* — Design team member

Design teams and REACT staff talked about this in relation to planning appropriate activities – both for individuals and for groups:

> *'I think a group coming together who knew each other, that might have been an easier start-off point. Or at least giving us, I don't know, a little bit more of a heads up, so particularly with the one child that we had in the first session that we were a little bit*

scuppered by because we just didn't know to expect anything. I think if we knew what we were expecting, then we could have planned for it.' — Design team member

'There was definitely an issue about, who are they? What is the best way to be with them? What helps them the most to be in a group, because actually being in a group is a big deal for a kid.' — Design team member

6 ***Develop shared but flexible expectations on collaborative decision making***

Create a shared set of expectations on how collaborative design will happen in the project so that all those involved understand how decisions may be made, how information is being recorded and how feedback is shared. This will change throughout the process as relationships develop and needs change, so making time for dialogue and reflection about the process as a whole will help.

Discussing and agreeing expectations is important because it allows the process to recognise and incorporate people's various motivations and the different things that people gain from involvement. For example, the Young Coaches identified a range of benefits they received from being part of Play Sandbox, from new friendships through to an impact on their sense of agency:

'It makes me feel happy because I get noticed a bit more, because I get someone to talk to and they take my ideas and they actually use them instead of just saying they'll use them and then they don't.'

'I think I might find it easier just to put my ideas across because ... now I know that people might listen to me more.'

Choices about how to involve children should be made collectively with design teams and with children. In Play Sandbox, design teams involved children in decision making in very different ways. Some involved Young Coaches at many levels of product design, while another suggested that they didn't want to 'burden' children with the responsibility of design.

'What we did with them was pretty concrete. It was for me more ethical in some ways because we weren't asking them to design the project for us, we were just asking them to react to a creative dialogue ... the burden of design responsibility should lie with the designer.' — Design team member

Thus, those involved in such a design process need to consider and discuss how power imbalances work and make clear the decision-making relationship between the designers and the young people. Some teams recognised the challenge of power dynamics in a collaborative relationship with the Young Coaches and made

an effort to give choices and control to the children so they felt they had some agency over the process, even while recognising that the bulk of all decision making rested with the design teams.

(As if speaking to a Young Coach) 'I want you to be empowered and enlivened and that is going to involve me giving you some control.' — Design team member

'Actually it's quite tricky ensuring that young people do really feel empowered and that the

A more equal role with children is tough to accommodate within a rapid prototyping process

agenda of other people doesn't dominate.'
— Design team member.

Our findings suggest that a more equal role with children is tough to accommodate within a rapid prototyping process where, ultimately, a product needs to be designed in a quick timescale. What is more important is to identify the appropriate role for children in decision making according to the resources available and aims of the design project — and to be clear and transparent about this role with everyone involved.

7 Listen, observe and respond Be open to accept feedback and change approaches when things do not go as planned or the plan has unintended outcomes.

Some design teams described things they had found personally challenging, such as allowing children to change designs or ways of working, while others described how they would take lessons from Play Sandbox into future work:

Even just the things that people said to us like, "How do you listen to people who you might not necessarily understand as well as you think you do?" That was a really key lesson. Listening is a real skill and it is a big one.
— Design team member

Through careful listening and observation of, for instance, the different social dynamics of working with a group of children, REACT staff and design teams were able to discover more about how children interact with each other, useful for the design of their products.

'Yes they are all leaning all over each other, they are leaning across each other and they are reaching and they are grabbing. Again, their social interaction is completely different. There is none of that personal space issue that you have with adults. They are not leaning across each other because they are being rude, they just want that pen and that is their friend, so it is okay. Again that sort of trust issue, I was a quite moved by that.'
— Design team member

Many teams commented on the difficulty of communicating information with the Young Coaches in ways that accessibly explained what the teams were doing – especially in the early, more abstract design phases.

'Communicating the complexity of what we are doing to them in a way that feels like they can understand it and be empowered to act in it, but aren't burdened by that complexity.'
— REACT team member

'It was explaining that collaborative process, and the fact that things were going to go in ways that neither party would expect, but trying to get that message across ... We felt that was quite a complex message to get across but we'd give it a go.'
— REACT team member

Interpreting the feedback of children and understanding their experiences was also a challenge for some design teams, who deemed it to be subjectively understood and often chose observation as a method rather than direct questioning.

'For me, the valuable thing is not to ask a child what they think, it's to be there and play, and learn through play and learn through how a child is with what's going on. Then you make your own interpretation from that.' — Design team member

'Sometimes they would make suggestions that we didn't really understand so we would have to say, "What do you mean by that? Can you explain it?" — Design team member

A related question was how to ensure that children weren't just saying what they thought the right answer was.

'If you frame it differently you might get those model answers, which are completely redundant... "I want to get this right because I'm trying to suck up to these adults who will give me cake at the end of the day".'
— Design team member

The design teams recorded and responded to children's ideas in very different ways. Some design teams were not sure they were doing this adequately and might have liked more help in thinking this through. In relation to the collection and interpretation of children's voices one design team member suggested, 'to be a maker, to be a designer, a maker or whatever, we haven't done degrees in research methodology with individuals.'

Some design teams also recognised the difficult position that Young Coaches were in, having to manage and work within different research team dynamics and across different working cultures. Two REACT staff members commented on how well children had 'coped with' different elements of the Sandbox such as the 'emergent ways of working.'

> *'I think there were advantages to having six parallel teams but I think that also posed different challenges because I think all the projects were asking different things from the children, so they were having to switch from different modes of being involved.'*
> — Design team member

> *'I also think it's good that people were … not working with all of the things because … [if] you only have a few groups you don't get mixed up with all of them.'* — Young Coach

Having said that, most, though not all of the Young Coaches we spoke to, felt they had made an impact on the different projects. The levels to which they could describe the impact of heir ideas varied widely. Some felt real ownership over certain projects, while others couldn't identify what specific influence they might have had.

> *'Because sometimes we'd say things to them and then we'd come back the next week and they'd changed it to what we said or around what we'd said. So I felt that we had quite an important role.'* Young Coach

Children's involvement also affected design team dynamics and decision making. Design

However children are involved, providing consistent feedback on how their ideas are being used is important.

teams discussed how working with the Young Coaches helped them reflect on their own design process:

> *'It was a really useful reminder because there's a stage where you're thinking about something and the stage where you're trying to build what's in your mind. Then there's a reality check of what the thing is when it's in the hands of an 8-year-old … and what it looks like to them and what they'd rather do with it.'*

8 Help children understand and celebrate their involvement However children are involved, providing consistent feedback on how their ideas are being used is important. Recognise and celebrate their involvement at the end.

Because they met design teams with some regularity, Young Coaches could see progress, so teams had to think carefully about which decisions to share and how to record and respond to the children's feedback. Teams did this in different ways, and some spoke about the importance of keeping the Young Coaches updated with project progress.

> *We considered them part of the team because we tried to keep them in the loop of everything that has been happening. I think we did a really good job of that because they could stand at the end and pitch because they knew everything about it along the way. I think we had a really good working relationship from the start."* — Design team member

A notable finding was that having feedback on where their ideas did not go was as important to the Young Coaches as knowing where they did go.

> *'[They talked about] the [ideas] they didn't take on, and maybe they tweaked them a little bit, and why. They kept us really up-to-date the whole time.'* — Young Coach

Recognition of children's overall involvement was also valuable to them, as demonstrated by comments from two Young Coaches on the final Work in Progress event.

> *'We liked it when they announced our names and we just felt proud of ourselves.'*

> *'Yes I felt really happy when the guy called out our names because that usually doesn't happen and I was like "That's me, that's me."'*

9 Take into account adults' previous work with and conceptions of children and young people Consider the previous experience of adults working with the children. Use this to set realistic expectations and plan any additional support or training needs.

The design team members had varied previous experience of working with children and young people. For some without significant experience with children, this added an additional layer of anxiety in an already very emotional journey. As one design team member told us,

> *'I wasn't so worried about them getting bored but I definitely remember when [the REACT team] were around and the kids were obviously not doing what I was asking them, I felt a little bit like, "They're going to think that I have no authority," because I don't and I felt a little bit embarrassed.'*

Previous work with children impacted how teams involved the Young Coaches. Firstly, the previous experiences in a team often shaped and constructed how children would be involved – that is, previous practice did not seem to shift significantly. For example, those whose previous experience centred on user testing often used this method while those experienced in play observation relied on this approach in Play Sandbox sessions.

> *'I've got a lot of experience of working with children but only in a very particular way, and that has definitely informed my process with it … For me, the valuable thing is not to ask a child what they think, it's to be there and play, and learn through play and learn through how a child is with what's going on.*

Then you make your own interpretation from that. ' — Design team member

For some who had previous experience, it wasn't always a smooth transition applying their usual approaches within a rapid design process like Play Sandbox.

'I guess my natural way of working with children would have been to have a much slower build-up and just build rapport and just spend time with them and let things emerge in a much more naturalistic way.'
— Design team member

Some teams also had to negotiate how to engage Young Coaches. For some teams including one person with significant experience with children, the other team members would allow that person to lead the sessions. Other teams compromised individual preferences when members had different approaches. In one team, a member's desire for detailed planning challenged another's tendency to work more 'on the hoof' with people. However this design team member felt that the negotiation had, 'helped me to think through the processes because sometimes "on the hoof" isn't always successful.'

In addition to experience with children, previous experience with design processes influenced how teams involved children. One member with previous experience in design said:

'If you're an academic and your research is in storytelling or something like this but you've never designed an object, then this process would have been completely different for them ... But I think the children certainly enjoyed working with us because we were ... not burdening them and actually giving them fun stuff to do.' — Design team member

Case Study: Choosing the right methods

The Light Bug project illustrates how factors like previous experience with children and the type of project affect children's participation. It also demonstrates the importance of aligning a project's aims, timeline and preferred methods, so that the experience can be valuable for both designers and children.

Light Bug's team – a media academic and an artist and researcher – had both used play observation in previous research with children. Their design product was a playground swing enhanced with LED sensors and lights, and the most valuable involvement of the Young Coaches for this team was to observe them using the swing.

> *'The fundamental gameplay mechanic we want to design is actually swinging ... which you can't ask about, you can't interview them; you just have to give them the chance and then observe.'*

However, because of the swing's size and technical requirements, a prototype was not available until late in the process. Early sessions with the Young Coaches that involved talking and drawing about the swing were therefore less useful than a later session at a playground.

> *'When we went to the playground, that's really when we started learning stuff, much more than when we were sitting and drawing ... that was less useful.'*

As a result, while the Light Bug team highly valued the Young Coaches' involvement, their points of engagement were often felt to be out of sync with the way Light Bug unfolded and therefore separate to the 'actual' design process.

> *'I wonder whether they sometimes were a little more detached from ours because we didn't have that prototype to hold and play.'*

> *'It was always interesting and ... there was always something to learn from them, but at times it was just less relevant to the actual process taking place.'*

Conclusions

One motivation for REACT's commissioning of this research has been to understand what impact the Young Coaches have had on Play Sandbox – was the result worth the effort? As the final outcome of Play Sandbox is six innovative play products for children, one way to demonstrate the impact of Young Coaches' involvement is whether or not the participation has led to better play products and services.

> *'The evidence for better products and services ... would come from the design teams saying, 'I think this product has been improved by working with the young coaches in these ways.'* — REACT team member

However a 'better product' is not the only measure to consider in an evaluation of collaborative design, as that is an output based on a series of conversations, collaborations, relwationships and events that co-construct the end result. As a REACT team member remarked,

> *'You can't abstract [a better product] from a good process. You won't get one thing without the other.'*

Many working within the Sandbox commented that 'success' in this instance may not relate at all to the product that came out of the process, but reside within the experience and relationships of the individuals involved, particularly the Young Coaches.

The involvement of children and young people in the design of technologies is widely practiced but rarely in an environment as unique as Play Sandbox. Often involvement is purely through user testing in silo-ed user experience activities near the end of design. Via the Young Coaches, Play Sandbox and REACT offered design teams a curated, managed opportunity, attempting to alleviate the logistical and financial burden often associated with deep involvement of children. This framework allowed for a deeper level of engagement rarely found in such rapid design processes and appeared to add value and challenge in equal measure.

The Sandbox process is rich with relationship, complex in its parallel collaborative partnerships across cultures and open in its intention. The resulting Sandbox dynamics are exciting and disruptive, as team members often inhabit new roles. Adding in a cohort of children with which to share decisions on playful designs makes it even more complex, but the involvement of children in Play Sandbox was seen by those interviewed as a wholly worthwhile step in the production of valuable, relevant products for children.

Play Sandbox 'brought children into' the Sandbox process, attempting to see how children 'fit' into a tried and tested R&D model. The Sandbox method itself certainly changed significantly in the process – in the relationships and roles of staff and design teams, how it ran and scheduled workshops, and in the additional considerations of time, food, safety, ethics and communication. This happened quickly and fluidly thanks in part to a reflective staff team and a working culture that embraces flexibility, responsiveness and openness. However, given the fast pace of a Sandbox and subsequent limited time for reflection and relationships, even a commitment towards participation and quick adjustments could not provide a structure and environment for design collaboration with children at a deeply shared level. One that aimed to do that more likely needs to begin with an environment set for long-lasting, sustained interaction and feedback loops, in which collaborators feed into ideas together rather than trying to fit another layer into an existing process. The risk in this process is that children involved become resources to use rather than individuals to collaborate with. They become representatives of a market and potential consumers rather than co-producers, an outcome Play Sandbox specifically aimed to invert.

Involving children in design is different than participation in decisions about their lives or services they use as it has a material end product that drives the process. In the case of Play Sandbox, the core ideas for those products existed before the Young Coaches arrived. Therefore, it was unlikely they were going to participate in 'co-design' or to become 'design partners.' It is important to stress that is not to be seen as a fault but rather as recognition of

the inappropriateness of applying certain approaches or methods in a process that may require a different type of relationship and set of discourses around it. Models of collaborative design roles, as those suggested by Druin, are useful guides in thinking how children might participate, but as demonstrated in Play Sandbox, these roles are fluid, dynamic, and highly dependent on the aims, resources, and contexts of a design process.

The culture of openness and reflexivity in Play Sandbox enables lessons to be drawn on how designing with children could happen with other commercial companies and digital designers or makers. The Play Sandbox project developed one structured framework from which emerged various forms of user testing, informant design and co-design practices. What can be learned from this model of flexibility within a structured framework?

A final suggestion may be to broaden and expand common assumptions and ideas about where and how children can be involved in design processes (beyond, for example, play observation or feeding back on prototypes). Children could also be involved at higher-level decision making or in processes related to product design, like marketing and business development. Longer term roles through internships or work experience may facilitate these expanded roles. They could help design the processes of collaboration and children's participation, as well as act as researchers themselves.

In conclusion, the Sandbox experience demonstrates that providing children and young people the opportunity to impact and decide how to design and create products, services and technologies for them and their peers is ultimately worthwhile. While it is risky and can be difficult, respectful relationships, context-driven methods, a shared understanding of expectations and responsibilities, and reflexivity enable it to be an effective and meaningful experience for the majority of those involved.

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