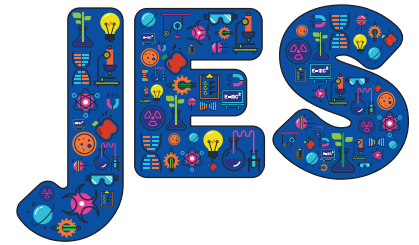


'I have been doing some science at home': children's relationship with science



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Abstract

In a study spanning two years, I generated data with eight children in their first years at school, from ages 5 to 7. The purpose of my research is to gain, from a sociocultural perspective, a greater understanding of science interests as part of children's fluid and constantly forming identities. The study explores the social situatedness of children's relationship with science, and examines the symbolic meaning of their interests, the cultural signs and tools they use to story themselves, and how they are storied by others. The findings indicate that children's science interests are deeply embedded in family practices.

Keywords: Interest, identity, sociocultural, Mosaic approach

Introduction

Interest in science begins at an early age, but can wane as children get older, particularly at the transition from primary to secondary education. Many studies have written about a general decline in pupils' attitudes towards science from age 11 onwards and the concern that fewer young people choose to study science subjects post-16 (Potvin & Hasni, 2014).

This generalisation masks a detail that some students, who had been recorded as having a low interest in science and technology overall, were nevertheless very interested in a specific aspect of science (Yang, 2010).

Some of the current initiatives seeking to address the perceived decline in children's interest in school science do so from a premise that the problem can be *fixed*. For example, an Ofsted survey of science

provision in 180 schools chastises teachers for focusing improvement plans on achievement in science and advocates strategies to 'make science interesting', engage pupils and 'maintain curiosity' (Ofsted, 2013, p.26).

Rather than starting with the design of new and exciting science activities, my study takes a different approach, looking at how children story themselves, and are storied by others, as being interested in science (by 'story', I refer to the way we construct our identities (Holland *et al*, 1998)). This is why I employed a participatory research method, the Mosaic approach (Clark & Moss, 2011) to gather data from a wide range of sources.

The nature of science is multidisciplinary and philosophically complex (Chalmers, 2014), yet school science presents a rather simplified view of science as the study of scientific concepts and processes (DfE, 2013). Much of the research about children's interest in science focuses on children's engagement with science as a school subject (Mantzicopoulos *et al*, 2009), and children's aspirations to study science-based higher education courses, or pursue a STEM (Science, Technology, Engineering and Mathematics) career (Macdonald, 2014). However, often the activities in which children engage, such as tinkering or constructing, are not found in traditional school science lessons (Luce & Hsi, 2015).

Science is socially and culturally embedded, so that learning science in school is restricted by curriculum prescription. When asked what science is, many young children cannot explain what the term means and would not recognise the kinds of activities they carry out as science activities (Crompton, 2013). Of course, not knowing what science is does not prevent children from engaging in numerous activities that could be categorised as science, as they observe, experience and learn about phenomena.



Research design

During the course of two years, I generated data with eight children, through monthly visits to two schools (four children in each school), using participatory methods. The methodology that I used is based on Clark and Moss's (2011) Mosaic approach, which is a framework for listening to children's perspectives of their lives, and uses creative polyvocal data generation techniques that do not rely on written words or verbal accounts. I generated data with child participants through observation, interview, photographs and drawings, and with their parents and teachers using questionnaires and semi-structured interviews.

Children were social actors in the research and made active choices about how to express their interests, as well as reflecting on data collected during previous visits. The Mosaic approach has been used in many studies (Schiller & Einarsdóttir, 2009) and is regarded as an authentic and flexible methodology (Greenfield, 2011). I focused on children's social practice in order to understand the ways in which children story themselves as

someone interested in science and how they are storied by others. Therefore, my research questions explore children's interest in science as part of their developing identities:

- ❑ *How do children express their interest in science between the ages of 5 and 7?*
- ❑ *What is the relationship between young children's identities and their expression of interest in science?*

This article addresses these research questions by discussing the data generated by and about two children in the study, Robert and Hakim (all names are pseudonyms).

Robert: 'You can make whatever you want'

In March of Year 1, when I asked Robert what he would like to photograph using an iPad, he photographed three different types of construction materials in the classroom (Figure 1). I started our conversation by asking him about his choice of subjects to photograph; his responses illustrate how he sees himself as a child who likes to make things.

Figure 1. Robert's photographs in March of Year 1.



Zoe: So what was your favourite thing to photograph?

Robert: The castle.

Zoe: And why the castle?

Robert: Because you can build any castle you want out of it.

Zoe: And what about Lego, what can you build out of Lego?

Robert: You can build spaceships, you can build... [distracted by activity in the classroom] and in the K'Nex you can make whatever you want in the K'Nex.

Zoe: In the K'Nex, yes that's right. So what else have you made apart from a spaceship? What are you making at home?

Robert: I've made a Lego Movie garbage cruncher and a Lego Movie ice cream squirter and gun. The guns are lollies and the squirting thing can transform into the ice cream thing as well as the squirting.

(Interview with Robert in March of Year 1)

Robert describes the properties of the Lego Movie models he has made at home and explains that he likes the castle and K'Nex because 'you can make whatever you want'. He describes himself enthusiastically as a child who knows the endless possibilities for building by repeating the phrase 'you can'.

The following extract is from an interview occurring 9 months later:

In this exchange, Robert provides a detailed description of what he thinks science is, positioning himself as something of a scientist in his response, 'I have been doing some science at home' when I asked about what a scientist would be doing. His account of making 'Bob's Best' – using his own name – associating his extraterrestrial inedible sauce with science, demonstrates a sense of ownership and that he sees himself as an experimenter.

Interviewer: So what about science, do you like science?

Robert: Yes, a bit.

Interviewer: So what do you think science is?

Robert: Well, I'll say it was moving stuff like pushing and pulling, they are the big two groups, then there are smaller groups like winding and spinning.

Interviewer: Yes, so that's what you've been learning about at the moment, about forces, but more generally what's science? What would a scientist be doing?

Robert: Well...I have been doing some science at home. I've been trying to make a Bob's Best that no one's been able to eat.

Interviewer: Bob's Best?

Robert: Bob is my nickname.

Interviewer: I see. So, no one else...?

Robert: Can eat it, cos it's made out of salt, pepper, cinnamon and nutmeg.

Interviewer: You're making food that nobody else can eat?

Robert: Yes, it's a kind of sauce that you put on that's supposed to be from Mars.

Interviewer: Wow, very good. So, do you want to find out any more about science?

Robert: Well, the next stage of science is to mix some liquids together.

Interviewer: What liquids are you going to mix?

Robert: Soap and my own shampoo and my Dad's bubble bath and my little sister's bubble bath and my potion will make it all bubbly, so you can't see underwater, except for with goggles.

(Interview with Robert in December of Year 2)



Hakim: 'I don't play with nothing. I've got a big grown-up bike'

During a visit in the month of April in Reception class (4-5 years), I watched Hakim intently painting several pictures of houses. His finished pictures were laid out, one above the other, on the drying rack and there were several on display around the classroom. Most of his paintings were of houses and the photographs that he chose to take during my visit were of his pictures (Figure 2).



Figure 2. Hakim's photographs in the month of April in Reception class (4-5 years).

Hakim expressed his interest in painting through his choice of photographs and in his two references to liking painting in this interview. Hakim told me that he liked learning about 'fishes', and both fish and dogs appeared multiple times in our future conversations. In addition, in several of his comments he positioned himself as grown up. He said that he did not play with his toys; had a 'big grown-up bike'; and that he was planning to 'sell his fish tank and get a dog'.

In a school record book about Hakim, his mother provided her views on his strengths and interests when he started school (opposite).

It is notable that his mother begins her description of Hakim with a strong statement that attributes an essential characteristic to her son – 'Hakim is

Zoe: So, tell me what kind of things do you enjoy doing at school?

Hakim: Painting and running in the playground.

Zoe: Anything else?

Hakim: Going on the bikes and climbing.

Zoe: What is it you like about being outside?

Hakim: Because it's my favourite.

Zoe: What do you like doing at home?

Hakim: More painting.

Zoe: You paint at home, yes, and what toys do you like playing with?

Hakim: I don't play with nothing. I've got a big grown-up bike.

Zoe: And what do you like learning about?

Hakim: Fishes.

Zoe: Go on, tell me about fishes.

Hakim: To dive. I went to an aquarium last time and then I got some fishes.

Zoe: And how many fishes have you got at home?

Hakim: I've got more than a hundred fishes. I've got a big fish tank and I've got some food for them and I'm going to buy a dog.

Zoe: You're going to have a dog as well as fish?

Hakim: I'm going to sell my fish tank and get a dog.

(Interview with Hakim, Visit 2, in the month of April in Reception class (4-5 years))

Child's strengths: Hakim is artistic, always ready to get the craft materials out at home (drawing, painting, sticking). He is very helpful, always ready to join in and help me with anything I am doing.

Child's interests: Hakim is very interested in construction and building things. His dad is a joiner. Hakim takes great interest in watching and helping his dad and grandad. Rather than playing with his toys, he takes great interest in gardening, mowing the lawn, washing the car, cooking and baking. Hakim recently has been interested in experimenting – with ice, different materials, seeing which is stronger.

(Entry in school record book by Hakim's mother, in January of Reception)

artistic'. Elsewhere, she repeats the words 'great interest' to emphasise her points about Hakim's general nature, underlining her comments about what her son likes to do at home by using words like 'very', 'always' and 'anything'. Hakim's mother stresses that he does not play with his toys, storying him as a child who prefers 'helping his dad or grandad' around the house and garden. According to Sford and Prusak (2005, p.16), identity can be defined as 'narratives about individuals that are *reifying*, *endorsable* and *significant*'. Here, his mother's language reifies Hakim as a particular type of child. This identifying narrative is endorsed by Hakim; in other words, it is a story that he tells about himself that reflects his mother's storying of him, particularly his self-positioning in terms of his membership of his family. Entries in my research diary included observations of Hakim building a house out of Lego and helping the adults to tidy up, which echo his mother's description of the activities he did at home.

An entry by his teacher in Hakim's school record book provides further clues about Hakim's motivation for building houses (opposite).

The teacher's photograph (Figure 3) captured the moment when Hakim had finished building his house and was perched inside it. The school record book entry reflected Hakim's storying of himself as 'grown up', recording his use of words that are related to his father's profession as a joiner: 'workshop', 'tools', 'drill' and 'plaster'. The house is the subject of his paintings and construction. We can see that Hakim stories himself as someone interested in construction, especially building houses, and that this identity is situated in the context of his family's shared activities, particularly his father's work.

Discussion

The case studies of Robert and Hakim's practice illustrate contrasting funds of knowledge (González *et al*, 2006). The concept of funds of knowledge is a useful way to foreground the importance of context, in order to view interests as situated in children's participation in everyday experiences, family activities and cultural practices (Hedges & Cooper, 2016). Children draw on funds of knowledge located in their family and community, and their actions can be perceived as symbolic of deeper interests (Chesworth, 2016).

Hakim was using the wooden blocks in the outside area and was sat down. I asked him what he was making and he told me, 'It's a house. This is my workshop. My tools are here. It's not finished, I need to drill some holes and plaster the walls'. A little while later, he called me over and said 'It is finished. I have drilled the wall and done the plaster'.

(Entry in school record book by Hakim's teacher, in January of Reception)

Figure 3. Photograph in school record book of Hakim, in January of Reception.



My first observation is about the presence of implicit cultural and family values in the way in which parents storied their children's interests. When I asked what their children would do given an hour of spare time, Hakim's mother described him helping to mend things with his father, whereas Robert's mother wrote that he would play with his toys. It would seem that the mothers are drawing on particular funds of knowledge when describing their children's practice. Robert's mother refers to children's toys, whereas Hakim's mother refers to participation in domestic activity and helping the adults. The case studies also reveal different discourses about the cultural construction of childhood (Wood, 2013), whether it is a time to play with age-appropriate toys (in the case of Robert) or contribute to adult endeavours (in the case of Hakim).

Another interesting contrast is in how Robert and Hakim's practice of building things and expressions of interest in construction materials, such as Lego,

might at first appearance seem to be similar practice. However, for Robert, the process of building structures is as important as the product, and the appeal of construction materials is that 'you can make whatever you want'. In contrast, Hakim's purpose when using construction materials was often to build houses and emulate his father's profession, which he role plays by saying, 'It's a house. This is my workshop. My tools are here'.

Implications for primary teachers and science educators

Some science initiatives that aim to promote children's engagement in science take a *cause and effect* approach, which assumes that exposing children to science activities will trigger and sustain their interest in science (Jack & Lin, 2014). However, something in the environment cannot *demand* children's attention. Rather, being interested is an expression of children's identity, situated in a context. Science is more than a curriculum subject and we need to provide space for children's meaningful enquiries. Hence, I argue that we cannot *make* children interested in science; instead, we need to understand development of interest in science as embedded in children's practice and symbolic of deeper interests.

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