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Preschoolers' Conceptions of Technological Artefacts and Gender in Picture Books

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Abstract

Picture books are a frequent element of daily preschool activities (Damber, Nilsson & Ohlsson, 2013; Simonsson, 2004; SOU 2006:75). They are important pedagogical tools that can help children acquire an understanding of the everyday technology they come in contact with, as well as the human application of technology (Axell, 2015; Axell & Boström, 2015). These are skills that are emphasised in the Swedish preschool curriculum. In the curriculum it is also stated that the preschool should counteract traditional gender patterns and gender roles (Skolverket, 2010). However, an investigation of a selection of picture books aimed at preschool children shows that the books content is somewhat problematic. Many of the picture books provide a focus on the function of separate artefacts without any sort of context or explanation of their implications in a societal context. There also tends to be an emphasis on traditional masculine-coded technology in the books. Building and making and working with machines is depicted as a male activity. The male stereotype is essentially connected with different kinds of vehicles like cars, airplanes, motorbikes, tractors etc. (Axell & Boström, 2015; See also Holbrok, 2008). Based on these previous findings, the aim of this pilot study was to obtain an initial concept about how children's literature may influence preschool children's view on technological artefacts. The study was conducted through semi-structured interviews with four five-year-olds, two girls and two boys. Through a thematic analysis (Braun & Clarke, 2006) three overarching themes were identified: *The relationship between design and function*, *anthropomorphic animals as users of artefacts*, and *gender and artefacts*. Some of the key findings were that the 5-year-olds did not know what "technology" is, but had good knowledge about tools. Additionally, they did not genderise any of the artefacts included in the study.

Keywords: Technology education, preschool, picture books, gender, Sweden

Introduction

This paper is part of a larger study regarding technology in children's literature from a gender perspective. The first part of the study was reported at the PATT 29 conference (see Axell & Boström, 2015). One of the main results from the initial study was that technology in children's literature is often presented from an artefact perspective. Another result was that there is a heavy focus on masculine coded technology in books aimed for children. Men are presented as

both designers and users of technology. Men and women are also, more often than not, presented in a stereotypical manner. Our conclusion was that while children's literature may serve as an introduction to everyday application of technology, it also runs the risk of conserving stereotypical gender patterns. The research presented in this paper is a pilot study and our first step in shedding some light on how children's literature may influence preschool children's view on gender regarding to technological artefacts.

It should come as no surprise that technology and its various accompanying fields is a gendered arena. Society's view of gender and technology is always shaped in mutual processes (Berner, 1999; 2003; Faulkner, 2003) or as Nissen (2003) puts it: "[technology] is an inseparable part of a social and cultural context" (our translation, p. 89). The cultural image of technology belonging to a masculine sphere can be traced at least 500 years back in the history of western culture. This symbolism between masculinity and technology was then enhanced even more during the turn of the last century and the rise of the engineer as a male role model (Berner, 1999). This hero-worship of the technology savvy man has ever since taken root in our collective consciousness. Just look at inventors and scientists in popular culture, these are almost exclusively male (Nyberg, 2003). Dr. Frankenstein, Reed Richards (from the Fantastic Four), Tony Stark, Gyro Gearloose, Professor Cuthbert Calculus just to name a few.

According to Faulkner (2003) the connection between gender and technology can be categorised from a couple of different perspectives, one of them being cultural images. This symbolic connection between masculinity and technology also mediates a dichotomous hierarchical notion of a "male", "hard" technology and a "female", "soft" technology (Berner, 2003). This notion becomes even more apparent when looking at particular kinds of masculinity, what Mellström (2003) categorises as "the handy man", "the engineer" and "the hacker". The picture mediated by these cultures is often that of the technology savvy, hands-on-no-question-asked male, while simultaneously presenting the image of the technologically incompetent woman. Another connection between gender and technology has to do with the genderisation of artefacts – symbolical and/or material. The symbolic genderisation means that certain artefacts may not be designed with a female or male user in mind but have fallen into one of these categories through common everyday use. It also has to do with the societal discourse of naming artefacts or parts of artefacts as "he" or "she". The material genderisation concerns the aspect of the design of the artefact being able to create and/or enhance gender differences (Faulkner, 2001; 2003; Sorensen & Berg, 1987).

Research has shown that children's literature has the capacity to influence preschool children's view of their understanding of the world and themselves. One perspective of this understanding has to do with the children's understanding of gender – of society's femininity and masculinity norms (Crisp & Hiller, 2011; Gooden & Gooden, 2001; Hellsing, 1999; Kåreland, 2013; Reynolds, 2011; Trepanier-Street & Romatovski, 1999). However, it has been documented that these books often have presented a stereotypical view on gender (Axell & Boström, 2015; Hamilton et al., 2006; Martin & Siry, 2009). The fear has been that these books will socialise children into traditional roles and limit their interest in other activities that may also suit them (Gooden & Gooden, 2001; Oskamp et al., 1996).

It has also been documented that many picture books use anthropomorphic animal characters to highlight human intentions, knowledge and different abilities. Anthropomorphic animals are for example able to build houses, drive cars and so on (Ganea et al., 2014). However, there is research, (e.g., Ganea, et al, 2014; Legare et al, 2013) that proposes that books using anthropomorphic animals as main characters may hinder the children in connecting the information conveyed to the real world.

Purpose of the Pilot Study

Taking previous research as our outset and putting it in relation to the findings of the first part of our study, the aim of this pilot study was to investigate how children view and relate to technological artefacts presented in picture books. More precisely; we wanted to examine how children view the characters and artefacts presented in these books. *In what way do anthropomorphic stories have an impact on preschoolers' view of technological artefacts and their function, in relation to gender?*

Methodology

Participants

The pilot study took place at a preschool in a city of Sweden. Four children, two girls and two boys, were interviewed by one of us while the other one took field notes. The interviews were semi-structured. The children were interviewed in pairs (a boy and a girl) and each interview took approximately 20 to 30 minutes. The interviews were also video recorded and have subsequently been transcribed into verbal text.

Presentation of the Books

In the first part of the larger study 180 picture books were used as the subject for analysis. Two of these books were singled out for the part presented in this paper – *Castor Does Carpentry* and *Mamma Moo Builds a Tree House*. The selection was based on the notion that we wanted two books, both of which focused on main characters dealing with different kind of tools. A second criterion was that one of the books would have a female main character and the other a male. We chose not to read the books to the children, partly because we did not want to influence their interpretation of the illustrations and partly because most preschoolers “read” through the illustrations when on their own (e.g., Elster, 1995; Simonsson, 2004).

Castor Does Carpentry is about Castor, a male beaver. He lives alone in a house and spends most of his days hanging with his friend Frippe, who also is a male beaver. Together they are making stuff. In *Castor Does Carpentry* their aim is to build a tool kit for all of Castor's tools. During the course of the book the different tools and how to use them are thoroughly described. In the book the only characters present are Castor and Frippe.

Mamma Moo Builds a Tree House revolves around the main character of Mamma Moo, who is a female cow, and her best friend Crow, who is a male crow. Mamma Moo lives on a farm but she sometimes strays from the farm to visit her friend Crow in the nearby forest. In *Mamma Moo Builds a Tree House* she does precisely that and happens to see some children building a tree-house. She instantly wants to build her own and goes to Crow to tell him about her idea. During the course of the book we see how both Mamma Moo and Crow use different tools to build their respective tree-houses.

Design and Procedure

Earlier research has shown that children talk more about artefacts when they are presented in a three-dimensional way (Evangelou et al., 2010). The problem regarding this way of presenting the artefacts is the lack of context, something a picture book can provide. When technology is not placed in a broader context, the connections between artefacts and humans are disregarded (Klasander, 2010; Mawson, 2007; Siu & Lam, 2005; Svensson, 2011). Taking this into account the

following real world artefacts appearing in the books were brought along to the interviews by the researchers – *a hammer, a pen, a handsaw, a brace drill* and a *folding ruler*. Because all of these artefacts can be seen as masculine coded technology belonging to the sphere of the “handy man” (Mellström, 1999), some other artefacts were also brought along – *a cell phone, a heat gun, a woollen cap, a whisk* and a *hair straightener*.

We first asked the children what they knew about technology and what technology meant for them. The children were then introduced to Mamma Moo and Castor in the form of laminated pictures of the characters. These pictures were then positioned at opposite ends of a string, with a clip marking the middle of the string.

The children were then asked who they thought used the different artefacts. If the children answered that an artefact was used solely by Mamma Moo it was placed at that end of the string, if the children said that it was used equally by the two characters it was placed in the middle (i.e. the clip) and so on.

Analysis and Discussion

The material was analysed using a thematic analysis (Braun & Clarke, 2006), which ultimately resulted in three different themes: *The relationship between design and function*, *anthropomorphic animals as users of artefacts*, and *gender and artefacts*.

The Relationship between Design and Function

All four children had good knowledge about most of the artefacts. Initially, the children seemed to identify the artefacts function from the design. For example they named the folding ruler a “measurer” and the brace drill, hardly a tool that most children come in contact with today, was named “drillere”. The only artefact they could not identify was the heat gun, which they thought was a glue gun. A glue gun is a common artefact in Swedish preschools and the two guns have a lot in common regarding their surface design.

This is in line with Gelman & Brooms (2000) suggestion that an important aspect for children when naming artefacts has to do with their view of the intent of the creator. Matan & Carey (2001) showed that, while perhaps not fully understanding the design stance (i.e. that an artefact is created to fulfil an intended function, and that this function is the artefacts essence) 6-year olds understand artefacts in terms of function and relate this to human action in the form of what the artefacts originally were made for. However, they found that 4-year olds were prone to not take the intent of the designer into consideration and instead relying on current, contextual use of the artefact. Kelemen (1999) on the other hand showed that when 4-year olds were asked what an object was for, they tended to ignore the object’s ultimate use in favour of what it was originally intended for.

Later in the interview, all four children used correct labels for the tools. This can be interpreted in relation to the dual nature of physical artefacts. They are both physical objects of a certain size, shape, colour, weight, etc., but also have a certain functional dimension (de Vries, 2006).

That the children could positively label an artefact they had never come in contact with before (the brace drill) may be explained in that the design of the artefact met two of Normans (2002) characteristics of good design *discoverability* and *understanding*. The discoverability is about the possibility to figure out what actions are possible and how to perform them. Understanding is related to how the product is supposed to be used. This could of course also be indicative of earlier research that demonstrates that children who get in contact with technological artefacts in

their leisure time, also have good knowledge about them (Mawson, 2010; 2011; Milne & Edwards, 2011; Outterside, 1993; Roden; 1995). Mawson (2010), for example, found that it was more common with technology activities together with a male relative than a female. Mawson's study also showed that men who worked in crafts seemed to have a greater influence on whether children came into contact with technology activities or not. This is something that we could investigate further in the forthcoming study.

Anthropomorphic Animals as Users of Artefacts

We have not found any prior studies that examine how anthropomorphic animals affect children's understanding of the use of technology, but there are studies that explore how anthropomorphic animals in children's books affect children's conceptions of real animals (e.g., Ganea, et al., 2014). The fact that there were anthropomorphic animals handling tools in our pilot study did not seem to affect the children's understanding of what the tools were or their function.

All of the children seemed to have prior knowledge about *Mamma Moo* as a character, for example they talked about films starring her, and they also referred to a poster of Mamma Moo on a wall at the preschool. None of the children did however recognise Castor.

This prior knowledge or non-knowledge about the characters seemed to influence the first pair heavily when deciding where on the string to put the different artefacts. They ended up giving most of the artefacts to Mamma Moo except the woollen cap, which they gave to both characters, and the pen and the heat gun, which they gave to Castor. However, when they were introduced to *Castor is Doing Carpentry* they quickly rearranged the artefacts in his favour. Subsequently, when introduced to *Mamma Moo Builds a Tree House*, the children rearranged them in both of the characters favour.

Child 2: Does she use a drill to...yeah, I see on that (*points at the cover*), so... the hammer (*picks up the hammer and positions it at Mamma Moo's end*).

Researcher: The hammer. Does Mamma Moo have the hammer?

Child 1: No, both of them use it (*positions it in the middle*).

The other pair were, however, more influenced by Castor having human looking hands and that Mamma Moo does not when distributing the artefacts.

Child 3: Mamma Mu cannot draw.

Researcher: She cannot draw?

Child 3: No, she has no hands.

The same reasoning where used for most of the artefacts and in the end this pair put none of the artefacts at Mamma Moo's end, instead they distributed them evenly between the middle category and Castor's end. This pair did not change the position of the artefacts when they were introduced to the two books. But when the laminated Castor was replaced by the laminated Crow the children put all of the artefacts in the middle category, arguing that both of the characters used these.

Another factor that seemed important for all of the children when distributing the artefacts had to do with the characters as representations of a species.

Researcher: Do you believe that both use the pen? Or is it Castor who uses the pen? Or...

Child 2: Castor! Castor.

Child 1: Castor, because he builds.

Researcher: Castor builds?

Child 2: Yeah, he needs sticks and he thought that was a stick

So to recap, the level of anthropomorphism as well as the discernibility of the characters species seem to be important factors influencing the children.

Gender and Artefacts

There are studies showing that girls generally have less interest and self-confidence when it comes to technology (e.g., Mawson, 2010; Turja et al., 2009). In Mawson's survey (2010), the girls (aged 5-10) were slightly more likely to select domestic items as examples of technology. They also had more difficulty deciding on how to answer the questions.

In our pilot study, we could not recognise any differences between the boys' and the girls' answers or self-confidence. It was also clear that none of the children took into account a stereotyped gender perspective when they chose who used the different tools. Instead, crucial for their choices were book illustrations and movies. During the interviews all four children stated that both the male and the female main character (both anthropomorphic animals) were able to use the tools. On the other hand, sometimes Mamma Moo (a cow) was referred to as "he". One possible explanation is that the children unconsciously associated the tools (e.g., saw, hammer, drill) to the male domain. The question is whether the children had responded in the same way if we instead of anthropomorphic animals had used books with humans as main characters?

Moreover, when discussing ownership of the artefacts, we only used the images in the books, we did not read the stories. The result may have been different if we also had read the books and discussed the technological content on basis of context. For example, Mamma Moo is a character that somewhat violates prevailing norms. Although she is a cow she wants to do all the things the children do. Crow, however, is a conservative character, who wishes to be confirmed on the basis of his technological knowledge. Mamma Moo, on the other hand, solves technological problems because it makes her happy. Crow, in contrast, likes to flaunt himself and believes that the way Mamma Moo solves problems is not the correct way. He thinks of himself as superior when it comes to the field of technology. In the pictures Crow wears a cap with the text: "Crow Construction Limited" and his tree house is almost perfect compared to Mamma Moo's house. During one of the interviews, one of the children also noted that "Crow is a better builder".

Conclusions

Our pilot study indicates that that when there are anthropomorphic animals using different kind of tools, the children do not indicate in any explicit way that these artefacts are genderised. We also found that the 5-year-olds participating in the study did not have any direct concept of what technology is, but they had good knowledge of the various tools and their function. Building on previous research and the results from this pilot study, we intend to do the following:

- 1) Examine if children's books with human characters may have an impact on children's genderising of artefacts.
- 2) Examine in what way preschool children's interaction with everyday technological artefacts at home influences their genderisation and knowledge of said artefacts.
- 3) Examine whether preschool children can identify the function of an artefact from its design, even when using artefacts that they do not come in contact with in their daily life.

This will be done by using a larger sample of preschools and children. These will be represented by different regions, both urban and rural, as well as different cultural backgrounds.

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