

CONSTRUCTION TECHNOLOGY IN PRESCHOOL

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The aim of the study is to describe what young children are offered to discern and actually discern through the construction technology in preschool, and in what way different constructions result in different learning affordances. Three different kinds of constructions were studied; house, vehicle and towers. The variety of objects generates functional differences which affect what focus the children have on the constructions. 11 preschool teachers and 49 children aged 4-5 years old from three preschools participated. Data consists of video-recordings of five activities of construction technology and fieldnotes. The results show that differences in constructions implies different expressed focus and learning during the activities. Building a house resulted in a focus on how to make the building solid, water resistant and inspired the children to learn about different kinds of material for different purposes in a house, such as the ground, floor, walls and the importance to tilt the roof to get rid of water and snow. Building a vehicle inspired the children to talk about speed, movements and different kinds of fuel. Finally building towers resulted in a competition where they tried to build the highest tower. The importance to build the tower as straight as possible was found to be important to avoid that the tower collapses, and by that they focused on equilibrium and balance. The results show that different kind of construction activities can be used to create different focus in science learning during play in preschool.

Keywords: preschool, construction technology, science learning, variation theory

INTRODUCTION

So far, research on younger children's educational technology is limited (Turja et al., 2009; Mawson in 2008; Bjurulf, 2008), even though it is an important part in the Swedish curricula for preschool. The research conducted is primarily about children from 11, and upwards (Mawson, 2008). Mawson (2008) argues that teachers' knowledge affects the content and the image of the subject technology. If teachers' skills are limited, we can by that assume that children get a narrow view of what technology is, and they may struggle to find concepts to explain what they do. Many children have the experience of technology from their leisure activity or their parents' occupations (Mawson, 2013). When teachers take advantage of these experiences based on the children's interest, children can develop their technology learning to a higher degree. Construction technology has a long tradition in preschool (Bjurulf, 2013), but the knowledge of science and technology and the concepts used, need to be strengthened and highlighted to be visible for the children. Building and construction games can be anything from building huts to construct simple tools and a variety of materials can be used, depending on what is to be built or constructed. Mylesand (2011) indicates several aspects of building and construction games in preschool. These provide examples that give opportunity to explore the balance and strength of the various constructions and materials. By offering the children to practice using different tools and building models, they also develop their language at the same time as they explore and discover the world around them. As many subjects are involved, such as mathematics, language, technology and arts, it is also a tool to understand various phenomena in the environment and in society. Also Turja, Endepohls-Ulpe and Chatoney (2009) highlights that play is central in technology teaching at preschool. They use different materials, such as recycled material and bricks, and by imagination, anything can be possible. While playing, children experiment and work on getting to know the different kinds of materials and tools. Mitcham (1994) uses four concepts for defining technology in play, technologies as: volition, knowledge, actions and objects. Technology as volition refers to the children's own willingness and intention to start an activity. Knowledge refers to the knowledge needed to carry out the activity. Technical activities are carried out to reach a goal by producing something or use of technology. Objects are the artifacts used or created in the activity. When the Swedish preschool curriculum Lpfö 98 (National Agency for Education, 2016) was revised in 2010, technology and science were defined as important areas to work with in preschool. Since then there have been several initiatives of in-service

training to develop teachers' abilities to teach technology and science in preschool. In Swedish preschools, play is an important activity for learning. Technology construction covers many different areas where children can explore technology in toys and try to construct their own mechanical solutions (Bjurulf, 2013). In games, they can try different materials when they e.g. build and design, and thereby gain experience of technology and technical solutions. The Swedish preschool aim to create opportunities for the children to use their creativity and the creative ability to discover and develop technical solutions in everyday life (Ministry of Education 2010, p. 16). The Ministry of Education (2010) says that it requires a physical environment in preschool where unstructured material invite the children to test, experiment and explore. It is also emphasized that the conversation about what is happening is important to challenge the children to come up with different solutions and improvements, but also to put into words what they do. Therefore, it is important the preschool teachers discover together with the children and make visible new solutions for the children. The theoretical point of this study is variation theory, which means an analysis where aspects the children have discerned are captured, and aspects not yet discerned are identified as critical aspects (Marton, 2015). Variation theory is a learning theory that describes the conditions necessary in order to learn (Marton & Booth, 1997; Marton, 2015). In this study, the relation between differences in constructions built and the children's different focus and learning opportunities are studied. The aim is to find out if different constructions give implications for different technological and/or scientific learning opportunities, and the approach is to study the learning objects and concepts that are visible in the children and preschool teachers' activities in science and technology. The aim of the study is to describe what young children are offered to discern and actually discern through the construction technology in preschool, and in what way different constructions result in different learning affordances.

METHOD

Mixed methods are used in this study (Creswell, 2007). The methods used are fieldnotes, video-recorded observations, meetings and interviews. Participants were 11 preschool teachers and 49 children aged 4-5 years old from three preschools. In the part of the study described here, the video-observations of children's construction activities are analyzed qualitatively. In the analyze, three different objects of learning have been used, in three different groups of children, to find out what relationship there might be between the content and focus of developed knowledge. All video-recordings have been verbatim transcribed and analyzed based on variation theory (Holmqvist, 2011; Marton, 2015; Runesson, 1999), which means aspects, which the children have discerned, are studied in relation to the object of learning. Mitcham's (1994) four concepts were used for defining the children's technology play as: volition, knowledge, actions and objects.

Table 1. Participants and data.

Preschool	Children (N)	Mean age children (Y)	Video-recordings/fieldnotes	Teachers (N)	Meetings	Group interviews/teachers
A	1	4,7	fieldnotes	2	3	2
	9	4,7	39:36 min	2		
B	7	4,5	23:10 min	5	3	5
	3	5	43:51 min	1		
C	4	5	22:45 min	1	3	2
	25	4,4	46:04min	4		

RESULTS

Differences in learning opportunities were found depending on what constructions they are supposed to build and the material used. The results show that differences in constructions implies different expressed focus and learning during the activities. Building a house resulted in a focus on how to make the building solid, water resistant and inspired the children to learn about different kinds of material for different proposes in a house, such as the ground, floor, walls and the importance to tilt the roof to get rid of water and snow. Building a vehicle inspired the children to talk about speed, movements and different kinds of fuel. Finally building towers resulted in a competition where they tried to build the highest tower. The

importance to build the tower as straight as possible was found to be important to avoid that the tower collapses and the concepts explored were equilibrium and balance. The results show that different kind of construction activities can be used to create different focus in learning during play in preschool. The results also describe in what way children's volition when playing with constructions leads to different knowledge focus, activities and objects.

DISCUSSION AND CONCLUSIONS

Construction technology in preschool can be used as a tool to develop knowledge in different areas of science and technology. Depending of what kind of technical solution children work with, they will have to focus on different concepts, important for the construction. The function of the construction makes difference for what become important knowledge. To construct a vehicle develops exploring energy and speed, building a house requires knowledge about sustainability in choice of material and building a tower as high as possible makes the children focus on gravity as the towers collapses if they are not straight. We need more knowledge about children's learning and understanding of construction and how teachers can use construction technology to inspire children to develop different areas of science and technology knowledge important to understand objects in their environment.

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