Is There a Gap to Mind in Preschool Practice When it Comes to Technology?

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Abstract

Research has indicated that there may be a gap between preschool teachers’ general descriptions of technology and the technology content in their actual preschool practices. This study investigates this further and, if a gap is found, looks for possible reasons for it. The study was conducted in the form of research circles in two Swedish municipalities with 19 technology-minded preschool teachers. A mixed research design was used. The starting point for mapping the preschool teachers’ descriptions of technology was an established questionnaire that placed technology into five categories. Following this, the teachers independently documented events at their preschools that they assessed as technology activities. The findings were that the most commonly chosen category in the questionnaire was technology as a solution to a problem. However, in their everyday examples the dominant activities related to the children’s attempts to use the artefacts. The preschool teachers said that the children had to be introduced to the artefacts, their names and functions, before moving on to more advanced levels describing technology. There is thus a distinction between the preschool teachers’ descriptions of technology and their everyday practices, where they themselves provide relevant explanations for the gap.

Keywords: preschool, research circle, technology

INTRODUCTION

The Swedish curriculum for the preschool includes several goals. Two specific goals relate to technology (Skolverket, 2016), namely that the preschool should strive to help each child to develop their ability to: 1) identify technology in everyday life and explore how simple technology works, and 2) build, create and construct using different techniques, materials and tools. Hence, it is expected that preschool teachers will understand what technology is and be able to translate this into pedagogical activities with the children.

What defines technology and describes its content is included in the research area known as the nature of technology. Some complimentary descriptions can be found e.g. in DiGironimo (2011) and Mitcham (1994). The syllabus for technology in the Swedish primary and lower-secondary school (Skolverket, 2011) can also serve as a guide for preschool teachers with regard to content and activities. A common aspect in these three examples is that technology is a human activity that meets our needs and requires knowledge and creativity in order to perform it, which results in a technological artefact or system. DiGironimo’s example and the Swedish syllabus for technology also include a social aspect, namely that individuals, society and environments interact with technology over time, which affects the development of artefacts.

Research shows that a teacher’s knowledge about technology and the nature of technology plays an important role in children’s technological learning (Jones, Bunting & de Vries, 2013; Rohaan, Taconis & Jochems, 2010). In relation to this, preschool technology education
faces a challenge in that teachers’ concepts of technology have proved to be narrow, because they either describe it as computers and other electrical devices (Öqvist & Högström, 2018) or include everything, thereby rendering the concept fuzzy and difficult to grasp (Elvstrand, Hallström, & Hellberg, 2018). While technology is often described by preschool teachers as artefacts, or as everything, preschool technology education has been shown to consist of primarily construction activities (Elvstrand et al., 2018; Skolinspektionen, 2012, 2017). Sundqvist (2016) found that the same preschool teachers who described technology as electrical devices also talked about technology education as block-building activities. Thus, there seem to be a gap between preschool teachers’ general concept of technology and the content they include in their technological activities with the children. Sundqvist (2016) speculated that a possible explanation for this was preschool teachers’ limited knowledge of technology and how they connected it to the descriptions in the curriculum. In this study, we investigate this issue further by mapping preschool teachers’ descriptions of technology to determine whether or not they reflect the technology activities that are carried out in their preschool work. The differences can be described as a gap, in which case we look for possible explanations for it. The study seeks to answer the following research questions: Is there a gap between preschool teachers’ descriptions of the content of technology and the activities involving technology with the children? If a gap is identified, what are the reasons for it?

METHODOLOGY

The study was conducted in two research circles in two Swedish municipalities with 19 preschool teachers. The research circle method is part of participatory action research, in which professionals and academics meet as equal partners to improve skills and knowledge concerning an issue in practice (Stringer, 2007, p. 19). One of our research circles involved six participant preschool teachers and two academic leaders, while the other research circle involved 13 participant preschool teachers and two academic leaders. One of the academic leaders participated in both circles. The participating preschool teachers were selected by their preschool managers. The basis for the selection was the preschool teachers’ own interest in technology. In both research circles, the preschool teachers worked at different preschools. The research circles lasted for a full year.

Each research circle meeting lasted for approximately two hours and the data for the study was collected during the first three meetings of seven in each circle. This limitation is due to our design. In the first meeting of each research circle we discussed the content and definition of technology, and in the two following meetings the preschool teachers presented examples from their own practices in the preschools. The meetings were video recorded and transcribed verbatim.

A mixed research design has been used. The starting point for mapping the preschool teachers’ descriptions of technology was a questionnaire, Technology Profile Inventory (Collier-Reed, 2006). The Discreet Option Type version of the questionnaire was translated and adapted to a Swedish preschool setting. The questionnaire describes technology in terms of five categories: artefacts, the application of artefacts, the process of artefact progression, the use of knowledge and skills to develop artefacts and a solution to a problem. These categories align along a complexity dimension, from a concrete to an abstract description of technology. All the participating preschool teachers responded to the questionnaire (n = 19) before the research circles met. The first part of the data analysis generated aggregated
questionnaire responses. The responses were then discussed in each research circle in order to determine how the participants interpreted and understood the various questions in the questionnaire. This resulted in rich answers about technology as knowledge content.

Following this, the participants independently documented events in their preschools that they regarded as technology-related. Each preschool teacher then presented these events in their respective research circle. In the circles, they were asked to describe the situation or context in which the activity appeared and how technology was reflected in it. In the follow-up discussions we used Collier-Reed’s five categories and asked the preschool teachers to describe which categories they thought best described the technology in the event. This led to discussions in each circle. Based on our interpretations of the discussions, two of the researchers used Collier-Reed’s (2006) category system through a directed content analysis (Hsieh & Shannon, 2005) in order to place the mentioned activities into an appropriate category. This was done with 59 examples generated in the second meeting of each research circle. Consensus was reached for the categories in all the examples. One of the researchers then independently categorised 20 additional examples from the third meeting of each research circle. Thus, a total of 79 examples were identified and categorised in the second part of the data analysis.

The third step in the data analysis was a comparison. The preschool teachers’ questionnaire responses and their descriptions of technology in the follow-up discussions were compared with the coding of the technology events in the child-related situations. Here we looked for overlaps in and differences between the descriptions of the technology content in general and the preschool practices.

RESULTS

In total, we received 19 completed questionnaires, yielding 94 analysed responses. Figure 1 shows that the most common category was technology as a “solution to a problem”. As can be seen in the figure, there is a clear difference in frequency to the second most common category “the process of artefact progression”, with a further drop in frequency to the category “the use of knowledge and skills in developing artefacts”. The categories “artefacts” and “the application of artefacts” received low responses. In total, the three of Collier-Reed’s (2006) most advanced categories cover 96 % (90/94) of the preschool teachers’ responses.

The preschool teachers’ descriptions of technology as an advanced subject, e.g. problem solving rather than common artefacts and the use of them, was confirmed in the research circle discussions. The questionnaire statement “Having wires coming out of things makes them technology”, that describe technology as an artefact, was dismissed by one of the preschool teachers, who stated that “We have electricity everywhere, that technology already exists”. Another remark from a preschool teacher was: “If you go down to a child’s level, then that’s technology, just plugging that cord into the socket is technology to a child.”
Similarly, a statement in the questionnaire defining technology as using an artefact - “A door lock becomes technology when a key is turned in it and the levers move to lock it. Otherwise it is just a lock” - was problematised by one teacher in the discussion in her research circle: “It is also technology, though it is so narrow”. She followed this up by saying: “Technology I think is broader .... Technology, this lock, that you made the lock. But the lock itself is not a technology, but what you do with it is”.

Hence, the preschool teachers presented an image of technology as an advanced subject. However, as can be seen in Figure 2, when presenting examples of their everyday preschool practices with the children, a different representation of technology emerged. In total, 79 different examples of technology-based activities were identified in the six analysed meetings, three within each research circle.

Some of the activities with the children are linked to the category “artefacts” with examples of the introduction of technical concepts and terms. However, the category “the application of artefacts” dominates, with examples of activities such as turning on/off the light, flushing the toilet, taking pictures, using an iPad and using a hammer as a tool. At the same time, there are also examples of the categories “the use of knowledge and skills in developing artefacts” and “solution to a problem”, especially in the activities involving older preschool children aged 4 to 5 years.

An example of knowledge and skills is given of two girls, both aged 5, constructing with Lego®. The preschool teacher reports:

“Now we have to make a staircase so they come up [to the second floor of the house]”, the girls said. Then I asked: “How are you doing a staircase then?” Then they showed me and were so eager that they both spoke at the same time. They dealt with the Lego building blocks and clearly showed how they put them together and merged them so they fitted like a staircase from downstairs to upstairs. Then they assembled the stairs and continued to build their house.”
In addition to Collier-Reed’s (2006) categories, a new category had to be introduced to describe the data “not technology”. Here, six examples containing mathematics or science that the preschool teachers had identified as technology were included.

**DISCUSSION**

It is clear from the differences between Figure 1 and Figure 2 that there is a gap in the participating preschool teachers’ descriptions of technology and the practices involving technology with the children. In contrast to previous research (Öqvist & Högström, 2018), in their general description of technology the preschool teachers do not emphasise the application of artefacts as technology. However, these categories are prominent in the preschool activities. On the contrary, the preschool teachers regard artefacts and their use as too narrow a description and prefer more complex ones, such as a solution to a problem. We have identified three reasons for these differences: the survey’s design and selection of participants, that preschool teachers need to see technology by ‘putting on technology spectacles’, and children’s development during their preschool years. These reasons are elaborated on below.

The construction of the questionnaire may have affected the results, in that only one category out of five could be chosen for each main question. As the preschool teachers had a well-developed view of technology, they chose a more inclusive and abstract answer that pointed to a category such as “solution to a problem” rather than “artefact”, even though they may have regarded both as valid. Their own reasoning when discussing the alternatives point to this. If a different group of preschool teachers, including less technologically interested staff, had answered the questionnaire, the result may have been different. The reason for suggesting this is that earlier research has shown that, in general, preschool teachers’ knowledge of
technology is relatively limited and that they also are aware of that (Elvstrand et al., 2018; Öqvist, & Högström, 2018).

The preschool teachers also addressed the challenges of seeing technology in their everyday activities with the children and how to point out the technological content to them. They did not always think or see that artefacts, or the everyday use of them, was technology. One example is that to a child, plugging a cord into a socket is technology. Well established technology also tends to be invisible to the preschool teachers. They frequently expressed the need to put on “technology spectacles” to see the technology and use it in everyday situations.

When the preschool teachers were confronted with the gap, they themselves motivated it with a progression. According to them, the children needed to be introduced to the artefacts and their names and functions before moving on to more developed or complex levels of technology. It could also be noted that the activities of the older children (5 to 6 years of age) were sometimes at these more developed levels.

CONCLUSIONS
Despite the developed technology competence amongst the preschool teachers taking part in this study, the results show a gap in the content and description of technology between its general definition and the selection of preschool activities with the children. They also show the competence and experience of the group when they collectively present complementary ideas to explain this gap. These insights will probably enable them to close the gap if this is deemed necessary. We also note that the activities in the preschool include examples from all the technical categories included in the study’s framework. The children are thus given opportunities to meet technology in several categories in the preschool activities.

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