# Researching Interplay between 3D-Materials and Young Children in Socio-Cultural Contexts

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*This text presents empirical and interpretative methodological inquiry in a study of young children's interplay with three-dimensional (3D) materials in early childhood educational settings. Recent acknowledgement of young children as competent individuals challenges forms of research with them. Respecting their views and competence demands that they are treated as actors and not objects of research. At the same time, young children are vulnerable and need to be protected from harm, for example when they use tools. This combination of children's competence and vulnerability challenges research ethics and methods. This article discusses the following question: How to conduct ethical and valid research in sloyd education with young children?*

*The study was carried out in a Norwegian Early Childhood Education Centre, ECEC, using a multiple case study approach. To be able to understand young children's experiences, the researcher positioned herself inside the educational contexts taking the role of an A/R/T-ographer. Ten case contexts were conducted, in which pairs of different children played with 3D-materials. The cases were filmed and the video-material was analyzed both contextually and in a cross-case manner.*

Keywords: method, sloyd, early childhood education, video observation, three-dimensional materials

## Background and theoretical perspective

Within the Norwegian education system sloyd used to be a school discipline that dealt with woodwork, thus this discipline no longer existeds as separated, but as an integrated part of visual art education. However, in Sweden the concept sloyd maintains a sense of children's engagement with different 3D materials, referred to by Arne Trageton (1995) as; play with construction materials. Research in visual art with young children has mostly focused on their drawings (Kindler, 2004), and there is little documentation about how children's activities with 3D-materials are

practiced in early childhood education. There are reasons to fear that young children are not given many opportunities to handle construction materials. According to Nordin-Hultman (2004) children in Swedish ECECs have few possibilities to explore and play with 3D-materials, because such materials, especially those defined as "messy", are seldom available.

Dewey demonstrates the manipulation of physical materials as being extremely important for body-mind (Dewey, 1925, 1956). He suggests that the process of transforming materials stimulates "inner transformations" of the person handling them (Dewey, 1934/2005). Similarly, Eisner (2002) suggests that different qualities of materials – possibilities they afford us with and resistance they give to the body that treats them – trigger students' distinctive skills and challenge them to think (Eisner, 2002). But what happens during such processes of interplay between children and materials?

The presence of 3D-materials is necessary for "productive activities" where children engage emotionally and cognitively, and develop their technical and aesthetic competence (Lindfors, 2000), but we do not know much about how sloyd activities can contribute to learning in general. Golomb (2004) and Trageton (1995) are amongst the few, who have investigated children's activities with 3D-materials. Golomb describes stages in children's representation of a human figure made of clay, while Trageton (1995) describes stages of children's development with different 3D-materials; plastic materials, flexible and solid construction materials, and building blocks. According to Trageton, young children do not necessarily intend to make products, but they desire to manipulate materials (Trageton, 1995).

The methodological approach presented here aimed to better understand of the process of young children's (3–5) experiential play with 3D-materials. The focus is considered to be a valuable arena for the "exploration of meaning" (Thompson, 2007) or aesthetic learning processes, where aesthetic activities (like sculpturing or singing) are considered specific forms of learning (see for example Austring & Sørensen, 2006; Hohr & Pedersen, 1996; Häikiö, 2007; Lindstrand & Selander, 2009).

A study of a process requires different methods than a study of tangible products. Studying a learning process demands continuous and close attention to details and complex relations between people and materials. Studying young children's learning processes is additionally demanding, because they are less verbally competent, and more competent in learning through embodied activities, play and imagination (Egan, 1999). Researching relations between children's experiences and thinking is also a highly challenging task. However, if one applies qualitative

inquiry, where knowledge is considered as mediated through the researcher's body, words and actions (Schoultz, Säljö, & Wyndhamn, 2001), one can achieve better understanding of the phenomenon without claiming to find an "ultimate truth".

To be able to study children's aesthetic learning processes, one needs to be there when such processes take place. In the study presented here, providing opportunities for children's interplay with materials to take place, and gaining access to the processes, was a question of methodological choices. To be able to get as close as possible to the children's experiences, a practitioner-researcher inquiry was chosen. The specific practitioner inquiry was inspired by the method called A/R/T-ography. A/R/T-ography is an interactionist approach, where a researcher seeks to understand a certain phenomenon on the basis of his/her own experience while taking part in the context (Järvinen & Mik-Meyer, 2005). Artist-researcher-teachers "integrate these roles in their personal and professional lives" (Irwin, 2004) and try to grasp human meaning holistically through their lived experience from the contexts they are studying (Van Manen, 1997). A/R/T-ography is a method informed by arts-based education research, which is characterized by interpretative, embodied, narrative inquiry focusing on the researcher's understanding through empathic engagement with the studied phenomenon (Bresler, 2006a, 2006b).

The merging of roles makes it possible to stay close to the children's experiences. However, in turn, it is exactly such closeness that is ethically challenging. In close contact with young children, one's attitudes, expectations, personal, pedagogical and research-related choices, all influence children's learning opportunities and potential for constructing meaning. Construction of meaning is about getting to understand something on the basis of communication with others. From a socio-cultural point of view, meanings are always socially constructed and negotiated in social contexts (Bruner, 1990; Carpendale & Müller, 2004; Freeman & Mathison, 2009; Gjems, 2009; Narey, 2009; Rogoff, 2003; Säljö, 2003). However, in visual art education construction of meaning is also dependent on interplay or dialogue with materials (Barone, 2001), and in sloyd education, particular meanings are negotiated between children, teachers, materials and tools (Illum & Johansson, 2009).

## Data collection and empirical investigation

Gaining access to the children involved in the study required formal procedures, such as parental consent and the approval of the Norwegian Social Science Data Services, but access to the children's learning processes was also dependent on the

relationship between them and myself. I was an intruder on their territory: They did not invite me, I came to learn from them, It was my responsibility to respect them as competent individuals with their own rights and choices (Freeman & Mathison, 2009), as they are presented in the Norwegian Framework Plan for the Content and Tasks of Kindergartens (Ministry of Education and Research, 2006). Respecting children's competence and right to participate had consequences for my methodological and pedagogical choices. For example, instead of planning a sloyd class content in detail, I prepared materials with specific qualities and let the focus of the session develop around the children's interests and needs. In this sense, the materials' qualities functioned as the structure for pedagogical planning (Fredriksen, 2010).

During the 15 weeks of data collection, my A/R/T-ographer roles were organized in the following ways: In my role as researcher I observed the children in organized activities and free play. These observations informed me about the children's interests, playmates and gave me ideas about suitable 3D-materials for sloyd activities with pairs of children. In my role as ECEC teacher, I planned open-ended sloyd activities, though the choices of materials and tools pre-determined what could be learnt (Eisner, 2002). My competence as visual art teacher, influenced my choices of materials; selecting materials with qualities that might stimulate exploration. Both of my teacher-roles were engaged while the activities were carried out. In total, 11 observations and 10 sloyd sessions were conducted and filmed. The videos from the 10 activity sessions, together with the documentation that informed them, were considered as 10 individual case studies and were further analyzed using a multiple case study approach.

Robert Stake refers to a case study method as a mainly qualitative approach, where one intends to understand how things work in specific contexts (Stake, 2010). In contrast, a multiple case study can be either quantitative or qualitative (Stake, 2006) depending on why one chose to study more than one case. Here, a multiple case study approach was selected for the following reasons: 1) I was not sure which qualities of 3D-materials might have most influence on children and therefore I chose to conduct activities with different materials. 2) I did not know how motivated the children would feel comfortable to engage in activities with me (an outsider). For this reason, different children were invited to participate. 3) I knew that unexpected circumstances could arise (sickness, problems with location, problems with equipment etc.) and therefore wanted to ensure that at least some of the data was usable. Additionally, since spending time with me happened to become popular among the children, I conducted as many sloyd activities as practically possible, so that no child would feel excluded, or disappointed.

*Table 1:* Summary of the case studies giving the participant children's age, gender, the selected materials for each case study, and the resulting responses to the materials.

| | **Children's age: Years, months ,days** | **Materials** | **Activities** |
|---|---|---|---|
| **Case 1:** Woodwork | Boy 3,4,25<br>Boy 3,9,3 | Branches, planks, rope, tape | Sawing, whittling, taping, binding, tying |
| **Case 2:** Colour and textiles | Girl 3,4,17<br>Girl 3,4,19 | App.35 different types of textiles, in shades of pink | Tearing, cutting, dressing, making crowns |
| **Case 3:** Clay play | Boy 3,1,3;<br>Boy 3,0,18 | 12 kg of soft clay | Making prints, storytelling, stamping, rolling out |
| **Case 4:** Clay and yarn | Boy 4,5,8<br>Girl 5,5,23 | Two similar installations, one made of clay, the other made of cotton yarn in the same colour, shape and texture | Making symbols in clay, shaping the clay with different tools |
| **Case 5:** White yarn | Boy 4,11,2<br>Boy 5,6,22 | 11 yarn balls, same size, different textures, softness, small, yarn thickness etc. | Knitting with a circular knitting machine |
| **Case 6:** Cardboard boxes | Boy 5,5,8<br>Boy 5,4,9 | 78 cardboard boxes of different sizes and shapes | Building houses for animals from a song/book |
| **Case 7:** White sand | Girl 3,10,3<br>Boy 3,10,12 | White clay-like sand and usual sandbox-sand | Making prints and shapes with hands and toys |
| **Case 8:** Building with Wood | Boy 5,5,11<br>Boy 5,2,16 | Plank pieces in geometric shapes | Hammering, taping, making boats |
| **Case 9:** Blue wool | Girl 4,6,11<br>Girl 5,6,27 | Brushed wool in 7 shades of blue | Felting |
| **Case 10:** Glass balls | Girl 5,5,5<br>Girl 4,8,24 | Glass balls, ribbons, pearls etc. | Filling the balls with various materials |

Since the activities had educational content, they were prepared to match children's interests in order to provide possibilities for their aesthetic learning processes. It could therefore be said that the sample of cases was tailored for the study (Stake, 2006). However, since the study did not seek to uncover usual education practices in ECEC, it was not necessary to study the phenomenon in "natural settings". On the contrary, the accessibility to the specific phenomenon was decisive to facilitating the study. Additionally, taking a multiple case study approach rather than of single case approach, provided greater scope for a better understanding of the studied phenomena (Borman, Clarke, Cotner, & Lee, 2006; Yin, 2009) – in this study; children's processes of interplay with 3D-materials.

The sloyd activities were filmed using a fixed video camera, positioned to capture all participants' faces, hands, activities and voices. Documenting as much as possible was important, because any form of action and expression could carry valuable information. On several occasions, a child moved outside the scope of the camera. These were moments when my researcher-role and teacher-role came into conflict. From the researcher's point of view it was not desirable that children left the camera's focus space, however from the teacher's point of view, it would be unethical to give priority to the film quality rather than respecting the children's choices while engaging with the materials. The process of interacting with the children constantly demanded similar difficult decisions, as I will later discuss.

## Methods and analysis

Each decision during the empirical work was dependent on my advocacies which, in turn, influenced my subsequent choices. I was learning during the research process. My experiential knowledge – my lived experiences (Van Manen, 1997) – became an integral part of my understanding, which further influenced my analysis. The process of analyzing was continuous during the research process; including video editing, transcribing, coding, defining themes and issues (themes with tensions and advocacies), micro-analysis and writing. Each step was important, for example, cutting the video recordings (40 to 90 minutes long) into 5–6 minute clips in order to make them suitable for NVivo8-analysing software. Already at this stage there was a danger of disconnecting the children's actions from their contexts. I had to be careful, since it is only through contextual analysis that children's experiences and learning processes can be understood (Graue & Walsh, 1998).

The process of analysis was guided by my research goals and influenced by theories of John Dewey (1934/2005) and Elliot Eisner (2002). As Erickson (2006) states, watching video recordings is not a "disembodied," objective activity, but a result of the theories behind one's pre-understanding. Watching the video material I was looking for relations between children's physical interactions with 3D-materials, and expressions that could indicate their "inner" processes. More precisely, I was looking for two types of phenomenon: Firstly, what the children were doing with the materials (going inside a cardboard box, hiding under a textile, hammering, lifting, tearing etc.), their smaller movements (touching, squeezing, pushing etc.), and less noticeable activities, such as smelling or listening. Secondly, I was looking for all their forms of expressions. These were highly ambiguous; a word, a sound, a smile, a sigh, or just an open mouth, could, for example, be interpreted as signs of joy or surprise. However, such expressions could indicate

the moments of children's sudden insights – "micro-discoveries", as Eisner (2002) refers to them. Additionally, because the study was based on the assumption that knowledge is socially constructed, I was also coding different forms of communication between the children and myself, and between the children.

By paying attention to the number and types of codes, I could identify similarities, differences and repetition across the cases and get a sense of emerging themes and issues. The density of codes was also significant: the most-coded sequences indicated that something of special interest for the studied phenomenon was taking place. The most coded sequences were therefore analyzed contextually. Stake (2006) suggests that both cross-case analysis and in-depth analysis of certain events are necessary in order to understand a phenomenon. In the study presented here, the balance between these two types of analysis was achieved through two main stages: 1) cross-case issues were identified, described and analyzed, 2) certain events (micro-contexts or vignettes) that illustrate the issues across the cases were described in-depth and analyzed contextually.

## Presentation of results

The multiple case study method functioned as a structure for organizing and analyzing the data. Some multiple case studies have a quantitative nature, however this study did not aim to generalize or disconnect the findings from their contexts. The process of coding across the cases actually made it quite clear that it was impossible to understand an expression, or experience if it was disconnected from its context. The children's experiences, emotions, actions and expressions depended on the here-and-now contexts. Four significant and interrelated issues were identified in the cross-case analysis:

1. The children simultaneously explored the 3D-materials' characteristics and their own bodies' capacities through their embodied experiences and physical activities.

2. The tacit experiences and the children's and researcher-teacher's verbal language mutually supported one another. Through imagination and metaphoric thinking, the children connected their earlier and new experiences and constructed meaning.

3. The materials' resistance stimulated problem-solving activities and engaged creativity. Unique solutions and new meanings emerged in the form of micro-discoveries.

4. The potential for learning opportunities was highly dependent on the quality of inter-subjective relations. My choices of 3D-materials and tools structured the curricula and what was possible to learn, but my attitude (expressed though body language, tone of voice etc.) was equally important to stimulate the children's possibilities to learn.

After identifying the cross-cutting issues, five relevant vignettes were described in detail and interpreted. This part of presentation of results was narrative and intended to engage the reader in his or her own processes of understanding. Arts-based researchers generally aim to create some connection with readers in order to engage them in the researcher's own aesthetic experience and to facilitate their re-experiencing what the researcher has experienced (Barone & Eisner, 2006). This was my intention with the presentation of the vignettes.

Writing is an important part of a research process, since it engages the researcher's reflection capacities and provides new understanding (Wolcott, 1990). However, the process of writing also continues to challenge the researcher's ethical choices, especially with young children, who are not yet able to read and respond to the way they are presented. Young children's preservation is therefore dependent on the researcher's sense of moral responsibility and ability to present their experiences and voices.

When a researcher actively uses his/her subjectivities, senses and emotions in order to empathically connect with the studied phenomenon, s/he is better able to understand it (Bresler, 2006b). However, to prove the validity of the results, the researcher is responsible for making his/her own subjectivities and advocacies visible for others. In qualitative research, validity is about trustworthiness (Cochran-Smith & Donell, 2006) and trustworthiness is "achieved through careful work in constructing the research design and approach, conducting the research ethically and honestly, analyzing findings carefully, and providing a presentation of results informed by rich descriptions" (Borman, et al., 2006, p. 130). In order to be trusted, the qualitative researcher has to honestly present all of the stages in the process of research. Readers need to understand how the researcher reached the conclusions. However, it is also important to remind the reader that each text is the result of only one possible interpretation. Researchers have to take responsibility for their own writing and let readers understand that each text is a construction – a piece of virtual reality (Bresler, 1996).

## Reflection

Observing and filming from a distance could not capture all the nuances of the complex and intimate interplay between children and materials. To be able to hear, see, touch and feel what the children were experiencing, I needed to stay close to them. And when I stayed close, I was myself engaged in sharing experiences and constructing meaning. Closeness was necessary in order to gain access and empathically connect with the children and the studied phenomenon. On the other hand, it was exactly this closeness that challenged the validity of the study: the children's aesthetic learning processes were colored by my tone of voice and choice of materials. Since children learn about many things through communication with adults (Gjems, 2007, 2009), all of my actions, either guided by my feelings or pedagogical choices, influenced their learning. From a child's point of view, a researcher is principally an adult, someone they look up to and trust to be responsible. Taking responsibility demands continuous reflection about the various choices one is making, especially when the researcher is alone with the children. When physical activities involve materials and tools, the researcher's responsibilities are even greater, in order to prevent accidents.

To ensure young children are protected from harm, it is important to pay constant attention to them and listen carefully to all their expressions (Clark, 2005). However, owing to "the selective nature of our attention" (Thompson, 2009, p. 33), it is difficult to listen to more than one child at a time. The quality of interaction is dependent on the researcher-teacher's attention and interpretations of the here-and-now. What s/he says, fails to hear or misunderstands, becomes part of the interaction. The nature of intersubjective relations "requires of the researcher that he or she stands in the fullness of life, in the midst of the world of living relations and shared situations" (Van Manen, 1997, p. 32).

Research ethics in qualitative research involve questions of dignity, privacy, confidentiality and the avoidance of harm (Bresler, 1996). This becomes even more complex when young children are involved (Graue & Walsh, 1998). One of the reasons for this increased complexity is the large discrepancy of positions of power between children and adults. Another complex balance has to be made between respect for young children's competence and protecting them from physical and emotional harm. Children need care, protection and support in order to feel safe. At the same time, in order to learn from their experiences, they need to be challenged, given possibilities and be respected for their creative solutions and competences. It might be exactly this tension (and transition) between young children's vulnerability and competence that is the most challenging factor for those who

teach and research sloyd? Nevertheless, we must meet this challenge if we want to provide opportunities for young children to become competent. Children need to experience the joy and pride of holding a hammer, hitting a nail and feeling how it moves through the wood. They need to negotiate their own power with materials' affordances and constraints if they are to learn about the world and themselves, and develop courage to meet future challenges (Dewey, 1934/2005, 1956; Eisner, 2002).

Fusion between research content and methods is an affordance of arts-based educational research (Barone & Eisner, 2006). When we acknowledge that different types of professional knowledge and embodied experience all are interconnected inside the same person/researcher, subjectivity becomes the strength and necessity of qualitative research (Bresler, 1996, 2006a; Eisner, 1991; Stake, 2010). Researchers should integrate their subjectivities, desires and beliefs into their research. Only when interpretations are enriched by the researcher's personal experiences, can understanding of complex processes become possible (Stake, 2006).

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