From Story to Product: Pre-schoolers' Designing and Making Processes in a Holistic Craft Context

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Abstract
Early childhood education and care, pre-primary education, and basic education form an integrated whole that seeks to progressively facilitate a child's development in Finland. In pre-primary education children are understood as active problem-solvers who learn in a holistic way through imagination and play. The term ´child´ is used to refer to a pupil or a student in early childhood- and pre-primary education. In the Finnish education system, the teaching of craft should strive towards a holistic craft process already from the first grade, though this process is rarely employed in pre-primary education. This article details an experiment in which 10 pre-schoolers designed and made an artifact in the context of a holistic craft. This experiment was intended to immerse the children in all phases of the designing, making, and assessment process. This process began with collecting anticipatory stories by storycrafting method. Following this, the pre-schoolers were asked to design and make a puppet-like character using textile materials. Qualitative content analysis was carried out on the children's brainstorming and designing processes to find out the ways in which pre-schoolers make connections between the various stages of a holistic design process. During the children's work processes, their awareness of the holistic process was recognized. The experiment showed the pre-schoolers' designing processes to proceed logically, and that they were able to design individual crafts in the context of a holistic craft process.

Key words
holistic craft process, craft education, designing, pre-primary education, pre-schoolers, children

Introduction

While designing refers to a complex, long-term creative problem-solving process, craft can be understood as a way to materialize design thinking (Seitamaa-Hakkarainen, 2011). In order to acquire design skills and the ability to materialize designing, training in these skills should begin in early childhood. Children should be given opportunities to develop their own knowledge and understanding through personal design or invention (Hope, 2008: 167). As children's design plans commonly involve many different ideas and motivations, more research is still needed to find out children's way to think and design. As previously mentioned, the designing processes of pre-schoolers in a holistic craft context are the central focus of this article. Firstly, the holistic craft process and its implementation with beginners will be outlined, and the designing capabilities of pre-schoolers will be examined in a literature review. Secondly, this study's design and craft-making experiment will be introduced. Then, practising content analysis (Krippendorff, 2004), the children's designing processes will be investigated by dividing these processes into individual activities so that one activity can be examined more closely. Finally, the designing potential of pre-schoolers in a holistic craft context will be discussed.

Craft has represented an essential part of European early childhood education since Friedrich Fröbel (1782–1852) founded his first kindergarten based on the pedagogical ideas of Johann Heinrich Pestalozzi (1746–1827) (Salminen & Salminen, 1986). During this period, craft was considered to be useful for children's development in a variety of ways. Uno Cygnaeus (1810–1888), the developer of public schools in Finland, introduced craft as an educational school subject based on Pestalozzi's pedagogical thinking (Nurmi, 1988). Cygnaeus's belief in the educational role of craft as a part of primary education is still valid today. Nowadays craft educations goals are to develop creative problem solving skills, technical and aesthetical skills, working skills and promotion of self-expression (FNBE, 2004). The current conception of learning, according to the Finnish 2010 National Core Curriculum for Pre-primary Education (NCCPE) involves active and goal-oriented processes based on previous knowledge structures.

In Finland, pre-primary education is a part of early childhood education for children six to seven years old. Child-centred teaching approaches, learning through play, and instilling a joy of learning are the general objectives of learning in pre-primary education (NCCPE, 2010). Pre-primary education is based on seven content areas, and craft education encompasses two of these areas: physical and motor development, and arts and culture. The general objectives of craft education are as follows: `Children's fine motor functions, manual skills and hand-eye co-ordination will develop in everyday activities,' and `Children's creativity, imagination and self-expression will be developed through making pictures, music and objects by hand, drama, dance and movement'. (NCCPE, 2010: 14). The pre-primary curriculum gives teacher's the freedom to implement craft education in many ways, essential is to

support children's holistic way to learn when teaching (Stakes, 2004). Despite these mandates, however, the actual implementation of craft education in pre-schools often stays at the level of making without encouraging children to develop creative ideas to tasks. Pöllänen (2009) has pointed out that a similar phenomenon exists in elementary schools in the country.

The holistic craft process

The concept of holistic craft refers to the designing and manufacturing process of craft and the craft-maker's role in this process. Holistic craft considers the generation of ideas, the design stages, the production, and the assessment of an artifact as interrelated parts of the craft process (Pöllänen, 2009). The maker works through each of these phases by him or herself or with a group. This pedagogical model, outlined by Pöllänen (2009), focuses on specific aspects of craft learning, including product-making, skill and knowledge building, design and problem-solving, and self-expression. If one or any of these aspects of the holistic process are left out, the process becomes merely an ordinary craft making exercise, which entails production without the maker's engagement in the design phase (Pöllänen, 2009). Model copying, following specific instructions, or reproducing previously learned models or techniques are typical examples of ordinary craft.

The holistic craft process begins in motivating pupils to brainstorm ideas using a wide range of sources, including sensory experiences, memories, visual or written material, or other materials and tools (Pöllänen, 2009). Brainstorming sessions are then followed by visual and technical designing (e.g., creating sketches, diagrams, and schemes). This stage is considered to be the main stage of holistic craft, as it includes information retrieval, performing experiments, problem-solving, and evaluating solutions and potential outcomes. This process can be slow and does not need to proceed in a linear fashion from one task to another (Pöllänen & Kröger, 2006). In the next stage, pupils implement their designs, yet their planned visual and technical ideas are subject to continuous evaluation and problem-solving throughout the craft process. The assessment stage then involves assessing a produced artifact and the entire process of creating it, including sketches and notes, as well as reflecting one's thinking processes during the whole process (Pöllänen, 2009). Holistic craft is often thought to be difficult to practice in early childhood education, yet children in fact are quite open to holistic creative activities by nature. Holistic craft in pre-school does not entail that children have to work independently at all stages of the process. Rather, teachers can use various pedagogical methods to guide beginners in the holistic craft process (Pöllänen, 2009).

Pre-schoolers' design capabilities

It is generally agreed upon in design research that sketching plays a crucial role in generating, developing, and communicating ideas (Anning, 1997; Welch et al., 2000). Research on children's design drawings, however, is far less conclusive in this regard. Rogers (1998) found only a weak link between children's designs and their finished products. Contrarily, however, Fleer (2000b) reported a strong correlation between young children's (3-5 years old) design intentions and their final productions when using both oral and visual design methods. It is important to note here that children are not always aware that they are following a plan, as they may understand what a plan is in different ways, such as being in one's head, in one's hands, in what they have done, or on paper (MacDonald et al., 2007).

Research has shown that novice designers rarely use two-dimensional models (i.e., sketches), but tend to move immediately to three-dimensional modelling (Welch, 1998; Rowell, 2002; Hope, 2005). Anning (1997) has stated that it may be unrealistic to expect a young child to draw a design before, as young children's experiences of the world are based on a direct exploration of the physical three-dimensional world. Thus, it is quite natural for children to move directly to three-dimensional modelling, in which case their designing is linked directly to the phase (MacDonald et al., 2007) (e.g., producing things from modelling clay (Welch, 1998)). Children learn through observation, experience, and action, and therefore they may not understand what it means to design something. They often want to get to work with materials as quickly as possible. According to Piaget's theory (1977) of cognitive development, a child at 6-8 years of age begins to move from the pre-operational stage to concrete operations stage. A child is able to follow logical operations if the objects of thoughts (e.g. textile materials for a character in this case) are present. Therefore, a child needs real materials to support their design (Hope, 2008). It can be difficult for children to design something if they do not have information about (often in the form of something's physical presence) the materials they will use and their properties, what methods they can employ, or the general nature of a future product.

With no guidance in designing, children simply draw the way they know how and typically produce what they assume they are expected to draw. Therefore, children have to be taught how to design, including the role and usefulness of drawing in developing design ideas (Anning,

1997; Welch, 1998; Hope, 2008), as well as offered examples of design drawings. When children of 3-5 years of age are offered the opportunity to see a plan materialize into a product, their drawing capabilities in representing plan-views have been shown to markedly change (Fleer 2000b). For children without design experience, for example, it may be easier to execute design drawings at different stages in a project (MacDonald et al., 2007), such as when a product is finished. Children will not use drawing for planning if they do not perceive its significance. In fact, they often tend to see drawing as an end in itself (Hope, 2005). Hope (2005) has proposed the dual metaphor of drawing as a container for ideas and a journey on which to develop them in order to clarify the function of design drawing for children 6–7 years of age.

Adequate language skills are a prerequisite for design, as designing is a cognitive process that requires one to be able to handle ideas mentally. Hope (2009), who has outlined a tentative taxonomy of generic human capacities that underlie design capability, suggests symbolism (language) to be an essential requirement for the ability to design. In relation to this, Hope notes that children begin to draw well enough for design purposes at roughly 6-7 years of age, which is the age at which many young children begin to tell linguistic jokes.

Anticipatory stories and storycrafting

An anticipatory story refers to the continuation of a fictional text fragment. The aim when working with an anticipatory story is to continue writing the text both stylistically and substantively in the same vein (Aerila & Rönkkö, 2013b). In teaching, anticipatory stories are commonly used to examine the degree to which a reader understands a text. Imagining the continuation of a story is similar to planning a course of action (Aebli, 1991: 353). In storycrafting (Karlsson, 2013), a child or a group of children are asked to tell their own story or to proceed (to tell their version of) from a text excerpt in their own words. After the telling, an adult reads the story that the child told back to the child, who is then asked to correct or make changes to it. During the storycrafting process, children are allowed to express themselves through drawing or other acts (Karlsson, 2013).

Children often find designing tasks to be an obligatory step before the making of an actual product, they rather move straight to the making stage without designing (MacDonald et al., 2007). It can be very difficult for children to design when they have the conception that their ideas are to be drawn out of thin air. Even the word `design´ may be foreign to many young children. This study included an experiment in which a group of pre-schoolers designed and made crafts in the context of a holistic craft process. The pre-schoolers' crafts were based on anticipatory stories that were collected using a storycrafting method. Following a holistic craft approach, the anticipatory stories were intended as motivators for brainstorming and designing.

As the craft makers were novices, the process was structured so as to allow the children the freedom to design products within a given task frame and to make their own decisions with regard to the various techniques they would use, the details of their crafts, and material alternatives offered by the teacher. This study's experiment included various methods of design for two main reasons. First, this allowed the children to approach the design task in a way that best suited their learning style. For example, the anticipatory story of the experiment would engage auditory learners, while visual learners could develop their ideas through the drawing component. Second, one aim of the design process was to show the children that designing consists of several steps through which an idea is developed. The study's research questions were as follows:

1. Can pre-schoolers follow a coherent design and making process in a holistic craft process?
2. Are pre-schoolers able to design and produce individual crafts in the context of a holistic craft process?

Method

Participants and data collection

The study took place in a public kindergarten pre-school situated in the countryside of western Finland. The participant group included ten children, three girls and seven boys, aged 6-7 years, who started primary school later in the same year. One kindergarten teacher and two assistants normally work with this group. For the study's data collection, the design and making phases were directed by the author's colleague, a craft teacher, so that the author could focus on the data gathering. The data were collected three times over two weeks for two hours at a time, adding up to six hours in total. The table below shows the details of the data collection. The dotted line shows the data, which was collected from each activity.

Children receive a mysterious letter a few days before the beginning of the project

Period	Holistic craft phases	Activities	Data collected
1st period	Brainstorming Designing	*Anticipatory story and storycrafting..... *Anticipatory drawing..... *Design task..... *Dyeing fabric for the characters	*Children's stories *Drawings, sketches *Design drawings *Video recording
2nd period	Making	*Making the characters...	*Characters *Photos *Video recording
3rd period	Assessment	*Children's interviews..... *Children's stories are read for all *The rest from the anticipatory story	*Interviews *Video recording

Table 1. Data collection

The starting point of the design process involved a letter that was sent to the pre-schoolers a few days before the first visit to the kindergarten. The children were asked to help a fictional detective figure out who sent a mysterious letter. This letter was intended to motivate the children to tell anticipatory stories and get excited about the craft task. During the first visit in the kindergarten, the children's activities focused on brainstorming and designing, both key elements of the holistic craft process. The process began with a fragment of the fairy tale `Kumma kirje´ (`The Strange Letter´, Laulajainen, 2010). The story tells about a teddy bear, Teddy, who receives his first letter in life. Teddy knows the alphabet and how to read his own name, but he cannot read the whole letter by himself. Therefore he asks for help from his animal friends. Unluckily, however, the letter includes the number `13´, which makes the animal friends afraid. The children were then asked to think about who sent the letter in this story and how the story ended. The writing of the children's stories was then carried out using the storycrafting method because the children could only write a few words. Following the storycrafting method as well, some students from an upper-school 8th grade class assisted in writing down the stories dictated by the children. These students were asked to write down a child's story without manipulating it in any way.

In the next phase of the process, the children drew their impression of what they heard in the story, including the mysterious letter sender. Later in this article, the term 'anticipatory drawing' will be used when discussing about these drawings. Drawing is a natural way for children to express their thoughts and feelings (Hope, 2008). Therefore, it is often used when working with children. In the third assignment, the children were asked to consider which of the basic forms (i.e., triangle, square, or circle) best represented their notion of the letter sender's nature. They chose one of these from printed ready-made basic form models for future work. The children were asked to think about the letter sender's appearance, including their texture and colours, as well as to describe their character's nature, and then to draw their vision of the character using the ready-made model. The last assignment under the first visit in the kindergarten was dyeing fabrics for the characters. The teacher gave the children some advice on how to dye the fabrics and craft their character's surface,

but the children still had to think for themselves, how to pattern character's front and back pieces.

The second visit was reserved for making the characters ready by sewing, embroidering, and decorating them. The pre-schoolers had to make several choices and decisions during this process. The teacher presented alternative materials and technical possibilities for the creation of the character while avoiding giving ready answers. Each child was responsible for his or her own work, but received help and advice from the teacher if necessary. The aim of this approach was to get children to discover the best solutions to problems themselves or after a discussion with the teacher. A character's technical implementation required the children to monitor different aspects of the preparation. For example, the children had to figure out how their character's ears, hands, and legs could be attached between front and back pieces, as well as the right time to put padding into the character.

The last visit mainly involved the assessment phase of the holistic craft process, which was implemented through interviews. During these interviews, in which the whole pre-school group was present, the children had their characters with them to keep the designing and making phases on their minds. This method is similar to what is known as stimulated recall, in which the aim is to recreate an interviewee's original situation (Fox-Turnbull 2009). The interviews lasted approximately five minutes depending on how willing the children were to talk about their work. Some semi-structured questions regarding the children's processes were prepared, but the effort was made to keep the interview open-ended and natural so that the children would feel comfortable in the situation. The interviews focused on each child's assessment of their creation in order to get the most information on the children's thoughts and choices in the designing and making phases. In the end, all of the anticipatory stories and the original ending of the fairy tale were read for the children.

Method of data analysis

The children wanted to take their self-made crafts home, so all the items were photographed and saved in an electronic format for analysis. A qualitative content analysis can be carried out different ways (Krippendorff, 2004). The analysis scheme was developed for this case and the analysis was conducted according to the structure of the designing and making process. Each child's designing and making process was divided into parts and analysed in relation to each of the phases of the overall process. The analysis considered the unique design process structure of each child. As noted earlier, designing is not limited only to a brainstorming and designing phase, but involves a much more encompassing process. The analysis began with the children's completed puppet-like characters, which were compared to each child's output at various stages in their designing and making process, respectively. The analysis proceeded in reverse order to the children's design process. It was anticipated that most connections between their original designs and crafts would be made at the later phases of the children's design processes, and that the farther the analysis progressed, the more disconnected the connections would become. The scheme for the analysis and the minimum criteria for a child's performance are described in Table 2.

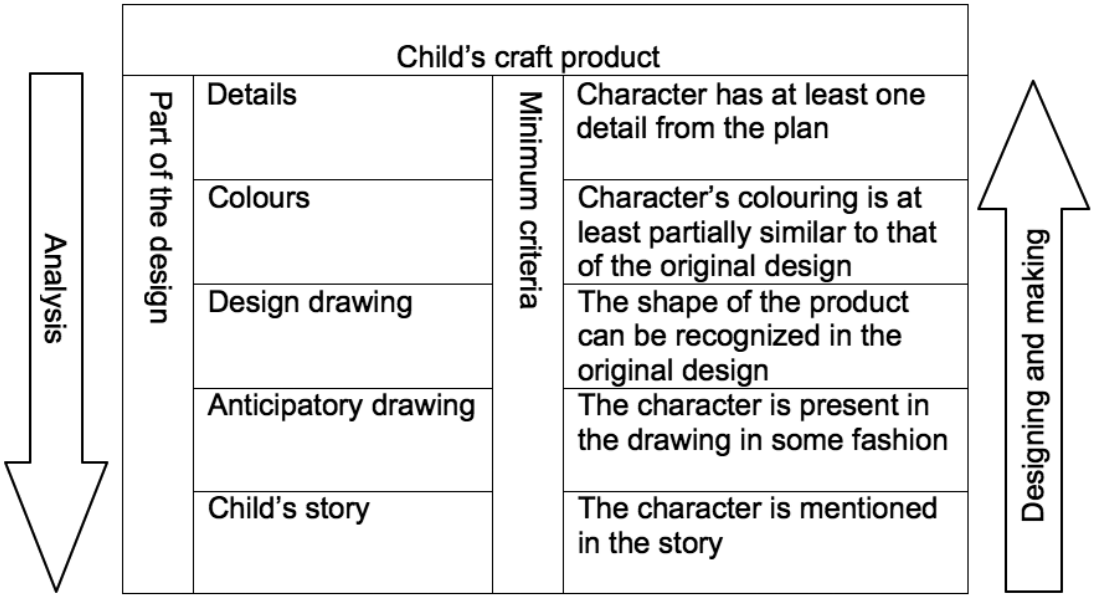

Table 2. The analysis scheme

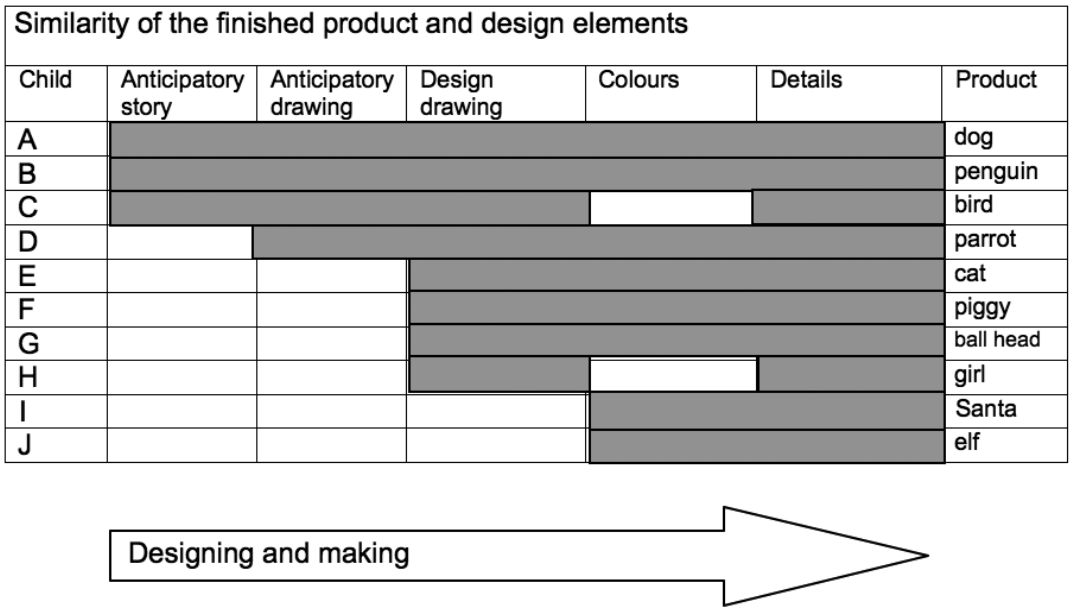

Table 3. The similarity between finished products and their original design aspects

The interviews were transcribed, but were not systemically analysed to the same extent as the video recordings. Both were used to acquire more detailed information on the children's processes and choices. The children often used non-verbal communication such as laughs, head nods, and hand or finger gestures along with spoken language to say more about their processes and crafts if they did not have the sufficient linguistic skills to explain their thoughts (Fredriksen, 2011; Milne & Edwards, 2011). In addition to the transcriptions, notes on the children's non-verbal activities were made from video recordings, which helped to better understand matters that the children mentioned during the interviews.

Results

The main purpose of this study was to explore how pre-schoolers' (ages 6-7) design processes progressed when working on a guided design task. Table 3 (above) demonstrates the similarity of finished artefacts to their original design elements produced during the design and process. The table also shows the different phases of the children's work processes leading to a finished product and how coherent the processes were after finding an idea.

All of the children were able to design and produce some kind of character. Three children out of ten derived their final idea for a character from the anticipatory stories, and one child's process began at the anticipatory drawing phase. Eight children out of ten produced a design that could be identified from a finished character. Four recognizable processes began from design drawing phase. Two children's finished products showed no clear connection to their original designs, but were similar to them in terms of colour and certain small details. The children dyed the fabrics for their characters themselves. Eight children used the colours that they had originally planned to use, though these colours were, sometimes unintentionally, mixed, causing unexpected hues. All of the children appeared to be working with a mind to carry out their planned details carefully.

A comparison of the children's original designs and final products revealed there to be a clear progression in these children's processes from start to finish. After settling on an idea, the children's work processes proceeded mainly in a coherent manner. The children were able to make connections between the various previous stages of the design process. Interviews with the children revealed that while many pondered different alternatives for their characters when in the phase, they did not change the foundation of their design. The phased procedure of the task offered a wide range of possibilities to children in terms of creating their character in their own unique way. It thus appears that the versatility of a holistic craft process encourages uniquely individual plans from children.
One of these processes, Tony's penguin, will be described in more detail below. The following discussion offers an analysis of a particular child's story, anticipatory and design drawings, final product, as well as related video recordings and an interview. A pseudonym has been used in place of the child's name.

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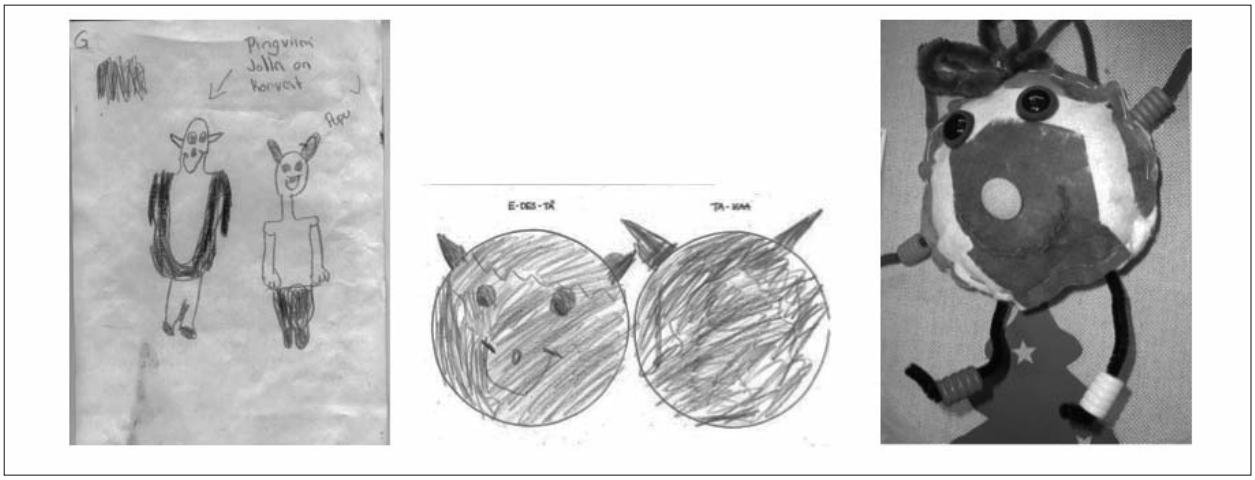

Tony's penguin

Tony's process progressed straightforwardly from when he began to the completion of his artefact. His story was fluent and for the most part progressed in a logical way. In Tony's story, his character, Teddy, and his animal friends find a friendly penguin on an island. They play and then throw the penguin a birthday party together. In his anticipatory drawing, Tony drew two characters: a penguin with ears and a bunny. The penguin's stomach was black and white like that of a real penguin, and the faces of the characters were happy. In the design phase, the children were asked to choose a basic shape to represent their character's nature. Tony chose a round shape. He retained the happy look of his character's face, as well as the character's colour pattern, but he changed the character's colours to blue and grey, and its ears he changed to horns. Tony showed the horns to his teacher and asked her to notice the change from his first drawing. He came to the eventual decision that his character would have horns by first considering several types of ears. Before dyeing the fabrics for the characters, the teacher explained to the children different ways to pattern a fabric's surface. In following, Tony became inspired in learning how to use painters' tape to prevent colour seepage, and so he formulated the shape of an iceberg for his character. He got the idea from the teacher's models about different ways to pattern the fabric. He then patterned the back piece of his character with white and grey stripes. He told us that he intended, according to his design, to colour the white stripes on his character with blue later because the front side of his character was also blue, but he did not end up having enough time to do so. Tony then decorated his character's face with buttons and added wooden beads to its hands and legs based on their colours. He chose a button for his character's nose based on the ornamental surface.

Tony was a very dedicated craft-maker in the creation of his artifact. He listened to instructions carefully and learned good techniques by watching instructions. Tony showed both an awareness of his own work process and the ability to work in a holistic craft process. Tony compared different materials for his work and then selected the most appropriate of these in following. He also evaluated his work continuously and corrected it when he was not satisfied. For example, at one point he removed his penguin's ears and said, "These ears went funny. They seem like hands!" After this, he made a new design for the penguin's ears without becoming nervous, even though this was difficult for him. Tony was also able to transfer technical solutions to problems from previous situations into his work process. At first, he suggested gluing certain pieces of his character together, but then decided to go with a solution arrived at in a previous experience after a discussion with his teacher. Here, Tony found out how to sew the penguin's mouth along a line as well as how to sew its front and back pieces together using running stitches based on previous experiences. Thus, it is quite true that young children are able to transfer information from one situation to another and possess the ability to use meta-skills when problem-solving if the tasks they are working on are familiar (Milne & Edwards, 2011; Milne, 2012). When working, Tony invented words beginning with the letter `a´ along with the children working near him, which is a typical kind of outcome in a holistic work process. The child's comfort in craft making led to his creative playing with words, which represented another creatively pursuable effort.

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Discussion

Despite the situation of the investigation, one of the aims in visiting the kindergarten was to offer a novel craft-making experience for the children. Children who participated in this study had made crafts before, but they were unfamiliar with the holistic craft process. Images derived from anticipatory stories and drawings based on storycrafting supported the children's ideas throughout the process, as the characters they created embodied their personal views on the mysterious letter sender of a story. Allowing the children space to come up with their own solutions to various problems encountered made this process meaningful for them. The children gained a sense of pride from their self-designed and -made craft products. The children indicated their appreciation of their own work by taking on the role of their creature and performing its voice and way to move. The design method used in this study allowed the children to use their imaginations while utilizing materials from a large selection. In this experiment, the children's brainstorming and design processes began with a fairy tale, but other things could easily be used to drive the phases of these processes. When children become adept at designing at the pre-primary level, increasing the required skill level, changing the method of design, or more complicated design tasks can be offered at schools. The great value of the holistic craft process is its wide applicability in terms of methodology and focus. In this study's case, the focus was children's design processes, but in other cases the focus might be, for example, children's co-operation skills.

In the holistic craft process, all the phases are intended to be undertaken by one person, yet this is not entirely possible with young children, as they need help from adults at particularly challenging points in the process. This in turn may make the process challenging for a kindergarten teacher to teach. The children's joy in engaging with their characters encouraged the staff in the kindergarten of this study to continue to utilize this kind of craft-making process, as the children's development and enjoyment of their education was of top priority for them. This study shows that young children undertaking a craft project may, with moderate assistance, develop their capacities in creative ways.

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