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# Hands-on Learning and Everyday Technologies in Finnish Preschool Education

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Starting from a very young age, technology plays a significant role in children's lives. This has created a need to define what technology education for young children is, and how it can be implemented in a child-oriented manner. The purpose of technology education in pre-primary education is to help children understand everyday technology and how it can be used to solve daily life problems (Fox-Turnbull, 2019; Sundqvist & Nilsson, 2018). One main goal of young children's technology education is to encourage children to observe technology and technological implementations surrounding them, and to evoke their interest in practical, hands-on ways. Working together, and inclusive, experimental and student-oriented activities are at the core of STEAM pedagogy. STEAM uses technology, natural sciences and art as approaches to learning self-direction, interaction skills and critical thinking.

In this article, with the help of some case examples, we will focus on what technology teaching is in Finnish early childhood education.



## Technology Education in Finnish Preschools

Unlike in many European countries, Australia and New Zealand (Benson & Lunt, 2011; de Vries, 2018; Milne, 2018; Turja et al., 2009), technology education is not an independent subject in the Finnish school system. In primary education, *technology education is integrated as a part of crafts education* (FNBE, 2016), and in the preschool curriculum, technology education is a part of the "Exploring and interacting with my environment" learning module (FNBE, 2014, 40–42), together with mathematical content and environmental education.

In Finland, the main principles in young children's technology education are child-centered ways to act, use of imagination, and constructive play. Technology education in early childhood education means a wide-ranging content area that approaches technology practically from different angles, whereby children learn to observe the technology and technological phenomena around them. It has many common goals with other learning areas (FNBE, 2014), especially with crafts. Both of these learning areas include designing, creative problem solving, examining and experimenting with structures and materials, constructing or making, and reflecting on the process and products. Preschool technology education focuses on everyday machines, devices, electronics, information technology or robotics, or it can be related to housing or environmental technology (Yliverronen, 2019). Children are encouraged to figure out and build various constructions or solutions to their own, self-found technological problems using versatile materials, and to verbally describe their decisions (FNBE, 2014). At the same time, children acquire technological knowledge and exploratory learning skills (Yliverronen et al., 2021).

Starting from early childhood education, the teaching of crafts has a long tradition in Finnish schools. However, while certainly an element of it, neither specific work methods nor craft techniques have ever been at the essence of craft teaching. Rather, through working with craft materials, children practise their understanding of language of form, and math and science skills in a practical, everyday life context. When planning the visual and technical properties of the product to be manufactured and when considering their own operating process, they develop their design and process thinking skills, and their self-direction. It is essential to offer children the opportunity to invent, experiment and realise their own ideas, as their solutions and choices are part of the learning process. At the same time, children can practise shared responsibility and participation

(Yliverronen, 2019). Furthermore, children's visuomotor skills, which are pivotal for learning academic skills, are developed through concrete tasks (Grissmer et al., 2010).

Synergies between inquiry-based and hands-on activities in early years science education have been highlighted in several studies (Lindeman et al., 2014; Park et al., 2016). Both approaches can be employed as tools for knowledge creation and learning, and both offer motivational support for promoting a positive attitude to science and creative ways of working (Stylianidou et al., 2018). Indeed, according to Roden (2015), it is almost impossible to separate some aspects of science, technology and craft education.

Young children's crafts and technology education form an entity, which offers different ways to implement learning modules, including inquiry-based and hands-on elements. The term *investigative activity* depicts young children's functional way of acting in a context of inquiry-based approach, where several objectives of early years education are integrated in child-centred way (Rönkkö et al., 2021). When learning activities are connected to experiences, children have the opportunity to wonder, explore, and experiment, as well as to ponder and recognise interesting phenomena. This is at the core of the way young children learn because they have a natural ability to ask and explore (Bulunuz, 2013; Vartiainen & Aksela, 2013).

## Playful Elements and Investigative Activities

Young children's learning is generally holistic. They learn by playing, moving, exploring, by working on different assignments, expressing themselves, and through activities based on arts (FNBE, 2014; Leong & Bodrova, 2012). Because of this, children are typically very interested in hands-on activities and small-scale investigations, such as observing daily live technological solutions and their functionality, examining phenomenon related to nature and technology, and making artifacts as a result of their experiences. Educators should enable children to implement their thoughts and investigations by preparing the tasks convenient to the children's age and skills and offering scaffolding during critical moments if needed (Reiser & Tabak, 2014). Preschool children's craft-making processes include the phases of experimental learning (Kolb, 1984) in proportion to children's age, where personal experience is based on reflective observation, perceiving, and active experimentation (Rönkkö & Aerila, 2015; Yliverronen & Seitamaa-Hakkarainen, 2016).

Working together, and inclusive, experimental and student-oriented activities are at the core of STEAM pedagogy.



Investigative learning projects for young children can vary. For example, following the forming pattern on the surface of the fabric in solar dyeing or making a simple insect hotel can be a step for children to a broader consideration of natural phenomena. Alternatively, the observed natural phenomenon can be studied from different perspectives, where the phenomenon can be the starting point for the making of a craft product. Despite the technological abundance of today's world, for many young makers creating a pom-pom using cardboard discs and colourful threads has proven to be exciting - it has been like magic. Mixing reflective thread with the pom-pom thread and investigating in a dark room with the help of flashlights can add experientiality to the task. At the same time, children are able to consider issues related to light or traffic safety (Yliverronen, 2022).

Next, I will present two projects that approached technology education from different viewpoints.

## Project One – Power Creatures

The first project, 'Power Creatures', an electricity-themed integrative learning unit in a municipal preschool, is an example of a STEAM project that integrated technology education with art, design, and handicraft. Nineteen preschoolers, aged 5 to 6 years, participated in the project. The goals of the project were for children to learn the basics of everyday technologies in designing and making a felted craft product, and to develop co-operation skills, and to boost children's self-esteem through the joy of making. The project was implemented during a total of 20 sessions, approximately 30–60 minutes each, over a period of four months. The project began with an orientation phase, in which the teachers led the children toward the project's themes by reading storybooks related to the development of self-esteem aloud and by guiding discussion and play around electricity and electrical safety (Rönkkö et al., 2021; Yliverronen et al., 2021).

Playful experimentation was used as a method for understanding the components and function of a circuit. In circuit play, the children held each other's hands, and one of them acted as a switch (sending an impulse), the second as a buzzer, and the third as a battery, while the rest of the children were conducting bodies. This gave the children the initial idea of a circuit, which helped them to build a real circuit with actual components after the play. In pairs, they constructed a circuit with batteries, a battery holder, a switch, alligator clips, and a buzzer. The children then experimented with various materials (i.e., furniture, walls, floors) to see if the material was conductive or nonconductive. After a short

book introduction and various hands-on activities, the children were able to design and make fully-functioning circuits for their creatures. Further, the experiences supported them in understanding electricity and the function of everyday electrical objects (Rönkkö et al., 2021; Yliverronen et al., 2021).

The craft part of the project included the design of a "Power Creature", with children felting two pieces (front and back) for their creatures. With the help of eight grade students (aged 13–14), children then sewed a short circuit to their creature using conductive thread, adding a coin battery and LED lights onto the figure so that the product became an e-textile. Children then had the opportunity to reflect on their activities on Grandparents' Day, when they presented their characters. The children received positive feedback about their work, which is important for their self-esteem, and the grandparents helped the kindergarten staff to record the children's stories through the storycrafting method. Each child told a story about their creature, including what kind of powers it gives to the child, and how the powers can be used. The children acted as narrators, and the storycrafters, in this case grandparents, wrote the stories down verbatim (Karlsson, 2009; Rönkkö et al. 2021).



*Design and ready-made ladybug with a LED light*

## Project 2 – Forest Animals' Nests

Design is a crucial aspect of creative technological activities because designing gives visual form to one's thoughts. Design can refer to visual design (i.e., shapes, colors, patterns), but it also can refer to technical design (i.e., structure, function, construction). Both of these aspects are important educational goals in young children's craft and technology activities, even though technical design is often difficult for novices.



*Forest animals' comfortable nest in a cardboard box.*

The second project mentioned above involved preschoolers being given a task to collaboratively design and sketch forest animals' nests (Yliverronen et al., 2018). Craft making is traditionally seen as an individual execution, where makers are producing their own craft products, rather than a collaboration with shared outcomes. During this project, children were presented with the opportunity to experience shared design and making.

A total of 15 six-year-old pre-schoolers, randomly divided into four groups of either three or four children, took part in the project, which took place over five sessions of about 1.5 hours each. The groups were asked to decide which animals they would like to design nests for. The first task was to discuss ideas related to particular themes, such as how animals live in nature, and which items could make nests comfortable for them. From these discussions, children were asked to design convenient homes for forest animals and to draw their ideas on a sheet of paper from a bird's-eye view. To support their activities (Hope, 2008), children were encouraged to investigate and explore materials that were available for the designing task, including textile materials, package materials and materials from the forest (such as sticks, pinecones, spruce branches). The opportunity to investigate different kinds of construction materials helped the children to create more details for their plans. The concept of working collaboratively with peers to solve the given task was new for these children. The children not only had to imagine the result of the task without making the final product at the same time

(Hope, 2008), they also had to verbalise their thoughts to the other group members, as well as find a way to work together as a team.

The main objective of the project in terms of data collection was to investigate the nature of preschool-aged children's collaboration during a designing task from the perspective of verbal and embodied interaction. The children's verbal collaboration was clearly focused on designing – they proposed ideas, developed ideas further, agreed and disagreed with proposed solutions, asked questions and organised their processes. The embodied interaction was focused on drawing, investigating materials, non-verbal participation like hand gestures, as well as playing around or other off-task activities. The results showed that preschoolers (6–7-year-olds in Finland) succeeded in working collaboratively and they managed to solve the designing task with their peers (Yliverronen et al., 2018). Afterwards, they built the forest animals' nests in cardboard boxes based on the plans.

## Discussion

Young children's designing and making are often intertwined, and their designs develop while they are making. Design discourse has the unique potential to support shared thinking processes and it gives a natural context in which to learn collaboration (Murphy & Hennessy, 2001). Opportunities for collaboration in STEAM projects should begin in early childhood education, because the activities provide a natural real-life situation in which to cooperate, negotiate and



finally create a common product with peers. Successful collaborative working sessions with peers offer natural ways for scaffolding and supporting deep understanding (Sawyer, 2006a). Peer support is seen as a system of giving and receiving help with key elements of respect, shared responsibility, and mutual agreement of helpful activities (Mead et al., 2001). It is facilitated through a similar language between young people, and it gives the feeling of participation and school satisfaction (Mead & MacNeil, 2004). Furthermore, through hands-on activities, children can learn issues related to everyday

technologies and demonstrate this learning in tangible, self-made products.

The project examples described above show the diversity of STEAM education. The objectives of the activity may vary in different situations, and different learning areas and working methods can be integrated into the STEAM implementation. It is extremely important to trust in children's abilities to solve the given task in their own way. Children's own implementation of the given task is the most valuable and instructive experience for them.

## References

- ◆ Benson, C. & Lunt, J. (2011). *International Handbook of Primary Technology Education*. Sense Publishers.
- ◆ Bulunuz, M. (2013). Teaching science through play in kindergarten: Does integrated play and science instruction build understanding? *European Early Childhood Education Research Journal*, 21(2), 226–249.
- ◆ de Vries, M. J. (2018). Technology Education: An International History. In M. J. de Vries (Ed.), *Handbook of Technology Education* (s. 73–84). Springer International Handbooks of Education
- ◆ FNBE. (2014). *Finnish national board of education, national core curriculum for primary education 2014*. FNBE.
- ◆ FNBE. (2016). *Finnish national board of education, national core curriculum for pre-primary education 2014*. FNBE.
- ◆ Fox-Turnbull, W. (2019). Enhancing the learning of technology in early childhood settings. *Australasian Journal of Early Childhood*, 44(1), 76–90.
- ◆ Grissmer, D., Grimm, K. J., Aiyer, S. M., Murrah, W. M. & Steele, J. S. (2010). Fine Motor Skills and Early Comprehension of the World: Two New School Readiness Indicators. *Developmental Psychology*, 46(5), 1008–1017.
- ◆ Hope, G. (2008). *Thinking and learning through drawing in primary classrooms*. SAGE.
- ◆ Karlsson, L. (2009). To construct a bridge of sharing between child and adult culture with the storycrafting method. In H. Ruismäki, & I. Ruokonen (Eds.), *Arts: Contact points between cultures* (pp. 117–129). University of Helsinki.
- ◆ Kolb, D. A. (1984). Experiential learning. Experience as The source of Learning and Development. Retrieved from [https://www.researchgate.net/publication/235701029\\_Experiential\\_Learning\\_Experience\\_As\\_The\\_Source\\_Of\\_Learning\\_And\\_Development](https://www.researchgate.net/publication/235701029_Experiential_Learning_Experience_As_The_Source_Of_Learning_And_Development).
- ◆ Leong, D. J., & Bodrova, E. (2012). Assessing and scaffolding make-believe play. *Young Children*, 67(1), 28–34.
- ◆ Lindeman, K. W., Jabot, M., & Berkley, M. T. (2014). The role of STEM (or STEAM) in the early childhood setting. In L. E. Cohen & S. Waite-Stupiansky (Eds.) *Learning across the early childhood curriculum. Advances in early education and day care*, (pp. 95–114). Emerald Group Publishing Limited.
- ◆ Mead, S., Hilton, D., & Curtis, L. (2001). Peer support: A theoretical perspective. *Psychiatric Rehabilitation Journal*, 25(2), 134–141.
- ◆ Mead, S., & MacNeil, C. (2004). *Peer support: What makes it unique?* Accessed 23rd October 2022. Retrieved from <https://www.intentionalpeersupport.org/>
- ◆ Milne, L. (2018). Technology Education in the New Zealand Curriculum: History and Rationale. Teoksessa M. J. de Vries (toim.), *Handbook of Technology Education* (s. 125–139). Springer International Handbooks of Education.
- ◆ Murphy, P., & Hennessy, S. (2001). Realising the potential – and lost opportunities – for peer collaboration in a D&T setting. *International Journal of Technology and Design Education*, 11(3), 203–237.
- ◆ Park, H., Byun, S., Sim, J., Han, H., & Baek, Y. S. (2016). Teachers' Perceptions and Practices of STEAM Education in South Korea. *Eurasia Journal of Mathematics, Science and Technology Education*, 12(7), 1739–1753. <https://doi.org/10.12973/eurasia.2016.1531a>
- ◆ Reiser, B. J., & Tabak, I. (2014). Scaffolding. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 44–62). Cambridge University Press.
- ◆ Roden, J. (2015). An introduction to science. In P. Driscoll, A. Lambirth, & J. Roden (Eds.). *The Primary Curriculum. A Creative Approach* (pp. 47–74). SAGE.
- ◆ Rönkkö, M.-L., & Aerila, J.-A. (2015). Children designing a soft toy. An LCE model as an application of the experiential learning during the holistic craft process. *Techne Series A*, 22(1), 44–58.
- ◆ Rönkkö, M.-L., Yliveronen, V., & Kangas, K. (2021). Investigative activity in pre-primary technology education–The Power Creatures project. *Design and Technology Education: An International Journal* 26(1), 29–44.
- ◆ Sawyer, R. K. (2006a). Introduction: The new science of learning. In R. K. Sawyer (Ed.), *The Cambridge handbook of the learning sciences* (pp. 1–16). Cambridge University Press.
- ◆ Stylianidou, F., Glaert, E., Rossis, D., Compton, A., Cremin, T., Craft, A., & Havu-Nuutinen, S. (2018). Fostering inquiry and creativity in early years STEM education: Policy recommendations from the Creative Little Scientists Project. *European Journal of STEM Education*, 3(3), 15. <https://doi.org/10.20897/ejsteme/3875>
- ◆ Sundqvist, P., & Nilsson, T. (2018). Technology education in preschool: providing opportunities for children to use artifacts and to create. *International Journal of Technology and Design Education*, 28(1), 29–51.
- ◆ Turja, L., Endepohls-Ulpe, M., & Chatoney, M. (2009). A conceptual framework for developing the curriculum and delivery of technology education in early childhood. *International Journal of Technology and Design Education*, 19(4), 353–365.
- ◆ Vartiainen, J., & Aksela, M. (2013). Science clubs for 3 to 6-year-olds: Science with joy of learning and achievement. *LUMAT*, 1(3), 315–321.
- ◆ Yliveronen, V. (2019). *Esiopetuksen käsityö. Kolme tapaustutkimusta esikoululaisista käsityötehtävien parissa*. [Preschool handicraft education. Three case studies of preschoolers working on handicraft tasks]. Dissertation. University of Helsinki. Faculty of Educational Sciences. Kasvatustieteellisiä tutkimuksia 55.
- ◆ Yliveronen, V. (2022). *Käsityöilmaisuu varhaiskasvatuksessa ja esiopetuksessa*. [Craft expression in early childhood and preschool education]. In I. Ruokonen (Ed.) *Ilmaisuu ilo. Käsikirja 0–8-vuotiaiden taito- ja taidekasvatukseen*. [The joy of expression. Handbook for skills and art education for 0–8 year olds]. PS-kustannus, 165–177.
- ◆ Yliveronen, V., Marjanen, P., & Seitamaa-Hakkarainen, P. (2018). Peer collaboration of six-year-olds when undertaking a design task. *Design and Technology Education: An International Journal*, 23(2), 1–23.
- ◆ Yliveronen, V., Rönkkö, M.-L., & Kangas, K. (2021). Learning everyday technologies through playful experimenting and cooperative making in pre-primary education. *FORMakademisk* 14(2), 1–10.
- ◆ Yliveronen, V., & Seitamaa-Hakkarainen, P. (2016). Learning craft skills: Exploring preschoolers' craft-making process. *Techne Series A*, 23(2), 1–15.