“Not crafting things just for the sake of the joy of making”

Sustainable craft systems model as a pedagogical tool in craft education

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The purpose of this study is to explore how a sustainable craft systems model functions as pedagogical tool in education for sustainability through crafts. The theoretical framework for this study formulates on education for sustainability, sustainable crafts and education for sustainability through crafts. This educational design research applies a multilayered systems thinking approach to connect theory in practice and practice in theory. The intervention took place in a workshop in craft teacher education context in higher education. The data consisted of the participating students’ (N=33) learning assignments and audio recorded group discussions (N=4). The data was analysed with inductive and deductive content analysis. The results highlight that a systems model of sustainable craft offer a visual and conceptual tool which, together with explorative and reflective learning tasks, open and concretize students’ viewpoints on sustainability in crafts and help students conceptualize abstract and complex concepts. The intervention also enabled students’ future visioning related to future work life. The results encourage to utilize theoretical basis for reflection of craft practices in education to support discussion and implementation of sustainability issues in practice to enhance education for sustainability in higher education.

TECHNE SERIES

Techne Series 33(1), 2026

Pages: 1–16

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https://doi.org/10.7577/TechneA.6336

Keywords: Sustainable craft, sustainable craft systems model, education for sustainability, higher education, craft teacher education.

Introduction

Sustainability is a pressing topic that concerns everyone. There are various definitions of sustainability with a range of aspects attached to it, for instance, environment, culture, social, economy, technology, spirituality, health, and even more interpretations and perceptions on personal level (Alexander et al., 2022). In response, the United Nations (2015; 2019) established Sustainable Development Goals for 2030 are set to make changes for people, planet and prosperity and to keep global warming under control. In educational contexts, the concepts of Education for Sustainable Development (ESD) and Education for Sustainability (EfS) are used to help individuals understand complex systems and engaged in sustainability actions (Holm et al., 2015; Leal Filho & Pace, 2016; Wals, 2009).

To build a sustainable future, we need competencies that can be developed at all levels of education. Garcia et al. (2017) describe the themes of ESD as learning to know, to live together, to do, and to be. These themes call for agency and collaboration. Addressing complex sustainability challenges also requires problem-solving, systems thinking, anticipatory, normative, strategic, and interpersonal competencies (Wiek et al., 2011; Wiek et al., 2016). Furthermore, we need competencies to face the challenges, namely, dialogue, creativity, innovation, critical thinking, and tolerating uncertainty in ESD. Bianchi et al. (2022, p.14–15) open the European Union Sustainability Competence framework with four competence areas: 1. Embodying sustainability values, 2. Embracing complexity in sustainability,

3. Envisioning sustainable futures, 4. Acting for sustainability. Each area includes more specific competencies. For instance, the first competence area focusses on values that essentially are reflected on personal level, while also understanding that values and knowledge form a continuum across generations. The competence area of *Embracing complexity in sustainability* emphasizes problem-solving, critical and systems thinking. Educating students to understand these complex contexts and systems, and how to solve 'wicked problems' (see also Salonen, 2019), poses challenges for teachers in their practice. Therefore, it is critical to develop teacher competencies for ESD and to create context-specific knowledge and practical solutions.

Since craft teachers' understanding and pedagogical approaches are essential for implementing craft education in educational institutions, recent attention has been given to craft student teachers' attitudes towards materials and materiality, particularly their preferences, choices, and acquisition of material knowledge in craft teacher education (Kröger et al., 2024). In this study, we explore how theoretical sustainable craft systems model functions as a pedagogical tool for education for sustainability through crafts. This research bridges knowledge and practice in craft teacher education context in higher education.

Sustainable craft

Sustainable craft is another complex contemporary phenomenon (Zhan & Walker, 2018). We base this research on our earlier studies on sustainable craft, which has focussed on the policies and practises, materials, methods and lifecycle, markets and economy (Väänänen & Pöllänen, 2020); as well as, on a practice-based systems that connect practices, products and intangible crafts (Väänänen et al., 2017; Väänänen, et al., 2018; Väänänen & Vilhunen, 2024) and also craft teacher education (Kokko & Räisänen, 2019). Recent studies in sustainable craft have focussed on, for instance, describing policies and practices in the craft sector, especially in cultural and educational contexts (Choi & Song, 2022; Hall, 2023; Kumari & Shirivastava, 2021; Mommo et al., 2025). Research has also paid attention to the material side of making (Aktas, 2022; Groth & Fredriksen, 2022). It is important to understand the relationships between materials and making, from the origin of materials to their agentic behaviour in various crafting processes and, furthermore, their connections to the environment. Studies related to markets and the economy have examined how craft can serve as an alternative to industrial production, provide employment, alleviate poverty, and empower people in rural areas (Mbesu-Mhlauli, 2024; Prados-Peña et al., 2023). Rennstam and Paulsson (2025) argue that a craft-orientated approach is valuable for post-growth societies, offering the possibility to choose hand-crafted products over industrial ones and to reconsider the relationships people have with production and consumption. On the other hand, crafts may not always be perceived economically viable alternatives in developing economies, which may lead to the rejection of craft traditions and the loss of traditional craft skills and knowledge (Kanungo et al., 2021).

From a practice-based theoretical systems model perspective, as visualised in Figure 1, the sustainable craft system consists of three interconnected elements: practice, product, and intangible craft, each having properties and contributions to the overall system (Väänänen et al., 2017; Väänänen et al., 2018). The model (Figure 1.), developed by other author of this article, was grounded in professional crafters' views on sustainable craft. From practitioners' viewpoint, *sustainable craft as practice* includes skills, knowledge and ideology, including attitudes and values. *Sustainable craft as product* involves the use of materials, diverse craft techniques, design aimed at a long-lasting lifecycle, preferably cyclical than linear. It also refers to good quality, aesthetics, making for need, all of which contribute to the product relationship. The *intangible craft* element refers to abstract aspects of sustainable craft. For instance, the environment can be understood from both natural or built perspective, as a source of materials, or as an ecological system to which we all belong. The social and societal aspects of intangible craft include issues related to craft production, such as working conditions or work environments (e.g., craft entrepreneurship). The economic aspects consider crafts through the lens of incomes or expenses

associated with making. The cultural aspect may focus on craft heritage, do-it-yourself crafting, and craft activism within the context of sustainable craft. Philosophical questions in sustainable craft relate to applied and environmental ethics in practice, for instance, how to choose between varied materials and their origins. Most importantly, the psychological aspect of sustainable craft emphasizes the well-being it generates for the maker. When extended to a broader context, this wellbeing contributes to environmental wellbeing and supports the cultural change we need to sustain life on our planet (see also Ehrenfeld, 2014). These elements (Figure 1.) affect, motivate and shape the system of sustainable craft. Like any other holistic system, they are intertwined, flexible and adaptive. Although the systems model presents these elements as distinct categories to highlight their critical aspects, in reality, they are deeply interconnected. In craft terms, it resembles a three-ply yarn, each fibre supporting and connecting with the others. The visual systems model effectively captures the complexity and key concepts necessary for a systemic understanding of sustainable craft.

Figure 1.

System of sustainable craft. (modified from Väänänen 2017, with the permission of the copyright holder)

Education for sustainability through crafts

In the Nordic and Baltic craft education context, sustainability in craft education is actively explored. Studies have examined how to safeguard traditions (Soobik, 2014) and how to understand and teach cultural heritage through using craft techniques (Kokko & Räisänen, 2019; Kouhia & Rönkkö, 2020). In craft education (Hofverberg et al., 2017; Väänänen & Pöllänen, 2021), the holistic craft process, along with the agentic and experiential learning, is considered beneficial. Through these practices, learners

can tangibly experience the effort involved in making, which helps them to develop appreciation and value for the things they create and own. Craft education provides a particular context for discussing and questioning sustainable consumption, especially in relation to fashion and clothing (Hofverberg, 2019; Hofverberg et al., 2023). Previous studies have shown that crafting activities have clear links to the UN Agenda 2030 Goals (Väänänen & Pöllänen, 2021), and these goals can be concretely integrated into craft activities and discussions with children, even in early childhood education settings (Carlsen, 2024; Väänänen et al., 2024). Recent research also highlights practical examples of techniques, such as embroidery, which can be used to narrate stories of sustainability through stitching (Robberstand & Veiteberg Kvellestand, 2023). Thus, crafts serve a powerful tool to understand broad concepts like sustainability in practical and tangible ways (Pinski et al., 2018).

Although crafts are commonly perceived as hands-on practice supported by embodied cognition (Schilhab & Groth, 2024), they can also be examined from various perspectives in interdisciplinary fields of science (Kokko et al., 2020). To integrate theory into practice and practice into theory, we need to able to think through our hands and senses while conceptualizing what we have learned (Groth & Gulliksen, 2024). These conceptualisations can then be reflected as abstractions of practice and connected with theories of crafts (see Bratland, 2023; Pannone & O'Connor, 2025; Risatti, 2009). Crafts and design in education for sustainability offer concrete ways to connect with materials, methods and making (Hofverberg & Westerlund, 2021). Materials and concrete products serve as an intuitive approach for exploring sustainable craft due to their tangibility, however, a more holistic view is needed to understand how practices and intangible aspects are interconnected in a systemic way that brings value and meaning to craft (Väänänen et al., 2018).

Context and Methods

The theoretical framework used in this study was originally derived from the perspective of craft professionals and craft student teachers (Väänänen, 2020), and it has been tested among craft hobbyists (Väänänen & Vilhunen, 2024). However, how the systems model reflects back into craft practices within educational context has not yet been analysed. As craft teacher educators, we work to strengthen education for sustainability in the training of future craft teachers. In this design research study, we explore how the sustainable craft systems model functions as a pedagogical tool for education for sustainability through crafts. We addressed the topic with the following research questions:

1. How do craft student teachers utilise a theoretical systems model of sustainable craft in their reflective learning assignments?
2. How do craft student teachers evaluate the framework's suitability in basic education context?

Design research is applied in many scientific fields, including design and architecture, engineering and technology, business, and humanities, such as material culture studies (Engholm, 2017). In educational design research, McKenney and Reeves (2019, p. 34) identify two basic approaches: 'one to fundamental understanding (theory), and the other to applied use (an intervention that solves a problem in practice)'. This study aligns with the latter approach, exploring an intervention conducted in a workshop that applied a multilayered systems thinking learning task based on the sustainable crafts systems model.

This study was conducted on a mandatory 5-credit (5 ECTS) course for second-year craft student teachers at a Finnish University in 2022. The course was collaboratively organized by a group of educators who provided lectures, workshops, and study assignments on sustainability in crafts and product design. Both authors of this article contributed to teaching in this course. The course included 16 hours of lectures, 48 hours of workshops covering various design practices (e.g., CAD, clothing design, learning design techniques, sustainability in craft education), and approximately 70 hours of independent work. The aim of the course was to equip students with theoretical and practical knowledge

and skills of designing their own crafted products, and to teach sustainable design principles applicable in school settings.

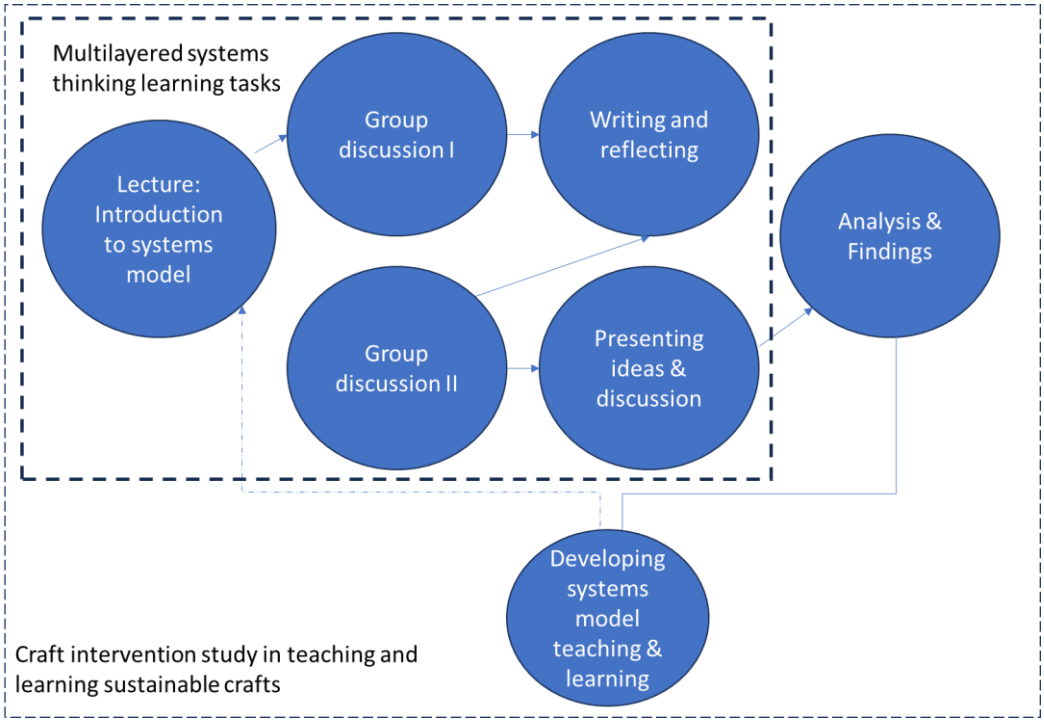
This study draws on the part of the course in which the systemic model of sustainable craft was used as pedagogical tool. Given that education in systems thinking aims to enhance systemic thinking, understanding interrelatedness, different perspectives, and reflection (Hofman-Bergholm, 2018; Williams & Hummelbrunner, 2010), we considered that the systems model of sustainable craft could visually, conceptually and concretely support students in their reflective processes and open up diverse perspectives on sustainable crafts. There are multiple ways to apply systemic thinking in learning, including describing and analysing, changing and managing, or learning about situations or systems (Williams & Hummelbrunner, 2010). Systems themselves may be well- or ill-defined, which affects the complexity of the phenomenon and how it is perceived (Rosi, 2015). In this multilayered learning task, through theoretical explanation and reflection on students' own crafting, we aimed to concretize abstract concepts related to sustainable crafts in a more holistically and systemic way.

For this intervention, we designed a learning task using a multilayered system thinking approach, consisting of a 2-hour lecture, a pre-assignment for 4-hour workshop, and a couple of learning assignments (see Figure 2). The other author of this article was the instructor of this part of the course. The multilayered learning task began with a lecture on sustainable craft, introducing relevant research and key findings as outlined in the introduction to provide a theoretical foundation. As a pre-assignment, students were asked to take a photo of a self-made handcrafted product and prepare to present it to their peers in small groups in the upcoming workshop. This student-centred activation was designed to lay the groundwork for a real-world case study analysis conducted and reflected on by students in the workshop (Bianchi et al., 2022).

The 4-hour workshop was divided into two parts. In the first part, the sustainable craft systems model was briefly revisited to help students to recall its key concepts. The students then worked in groups of 2-4 to discuss about their own crafted products in relation to the system model. Their discussions were guided by the following questions: *'In what ways are variable elements of sustainable craft manifested in your craft?'*, and *'In what ways does your craft project integrate the elements of sustainable craft?'.* The purpose of this activity was to support students in connecting theoretical reflections to a product they were personally familiar with (see also Schön, 1983). The learning task facilitated active peer-learning, helping students recognize interconnections and use conceptual/theoretical systems models to stimulate discussions (see Hofman-Bergholm, 2018). The systems model functioned as a concept map, guiding students' attention to specific aspects they found relevant in their crafting processes and reflections. It aimed at helping them to consider how the different parts of the system were present in their own products and practices. The group discussions were designed to enable students to construct and articulate their thoughts collaboratively.

Figure 2.

Multilayered systems thinking approach and systems model of sustainable craft as a pedagogical tool on educational design research in a craft intervention study



After the initial group discussions, students were given an individual assignment to analyse their own crafted products using the system model. The writing task was used to clarify students' thoughts and express more freely the connections they made to their own crafting bringing their embodied knowledge to more abstract level (see also Groth & Gulliksen, 2024; Pannone & O'Connor, 2025). These assignments were collected using the Microsoft Forms tool. The first page gathered background information about the students and about their craft practicing. The second page asked students to write an analysis of their own crafted product and to attach a photograph of the item. Third page invited students to evaluate the suitability of the model as design and analysis framework, and its applicability to craft teaching in basic education.

The second part of the workshop focused on the application of the sustainable craft systems model in basic education. Students first discussed in small groups how the model could be applied in basic education settings, and then they presented their ideas to the whole group. The group presentations were audio recorded, and their visual presentations were collected as supplementary visual data. Salonen et al. (2023, p.12) describe transformative learning as '*an individual change process that is linked to social transformation toward a sustainable future'* that *'occurs when people learn and develop their thoughts and actions by bringing together rational knowledge, a collaborative reflection of reality, and a holistic experience of reality'*. Transformative learning also requires learner agency, which can be supported through collaborative and reflective knowledge-building across cognitive (knowledge, e.g., rational thinking), metacognitive (values, e.g., critical, reflective, systems thinking), and epistemic (experience, e.g., embodied knowledge) learning levels, which the learning task was designed to support.

Research ethics were carefully followed throughout the study. The research complies with the EU General Data Protection Regulation (GDPR 2016/679) and Finnish legislation (1050/2018). Participation in the study was entirely voluntary, and students were asked to provide informed consent and permission to use their anonymized course assignments in advance. Students were given sufficient time to consider their participation without pressure. They first reflected on their thoughts by completing

the Microsoft Forms questionnaire, and upon submitting their assignments, they were asked to confirm their consent. The learning task was integrated into the course and did not require additional effort beyond regular coursework. Assignments were assessed on a pass-fail basis, with students passing by participating in the workshop activities. This assessment did not influence the final course grade. As a result, the students were not incentivized to align their responses with the teacher-researcher. Instead, they were encouraged to be critical, authentic and even to disagree. If something did not make sense to them, they were invited to ask questions and openly discuss about their thoughts. Nevertheless, the dual role of teacher-researcher may have unintentionally created a power imbalance, which is acknowledged as a limitation of the study. Out of 38 students, 33 agreed to take part in the study. If any member of the group declined to participate, the group's discussions and presentation were excluded from the analysis. When citing the student responses, we use S (student) followed by a number assigned during analysis, and G (group) to identify a specific group. When referring to an individual student, we use the gender-neutral term *they* [in Finnish: *hän* = she/he].

The main data analysed (Table 1.) consisted of individual student assignments, specifically, reflective essays (N=33) and audio recordings of the student group presentations (N=4). Secondary data included visual material created by students and the researcher's fieldnotes. We applied qualitative content analysis using both inductive and deductive approaches (Bengtsson, 2016). First, the essay data were analysed deductively through theory-based content analysis (Kyngäs & Kaakinen, 2020), using the categories defined in the sustainable craft systems model by Väänänen et al. (2018). The qualitative data analysis software Atlas.ti was used coding and categorizing the data.

Table 1.

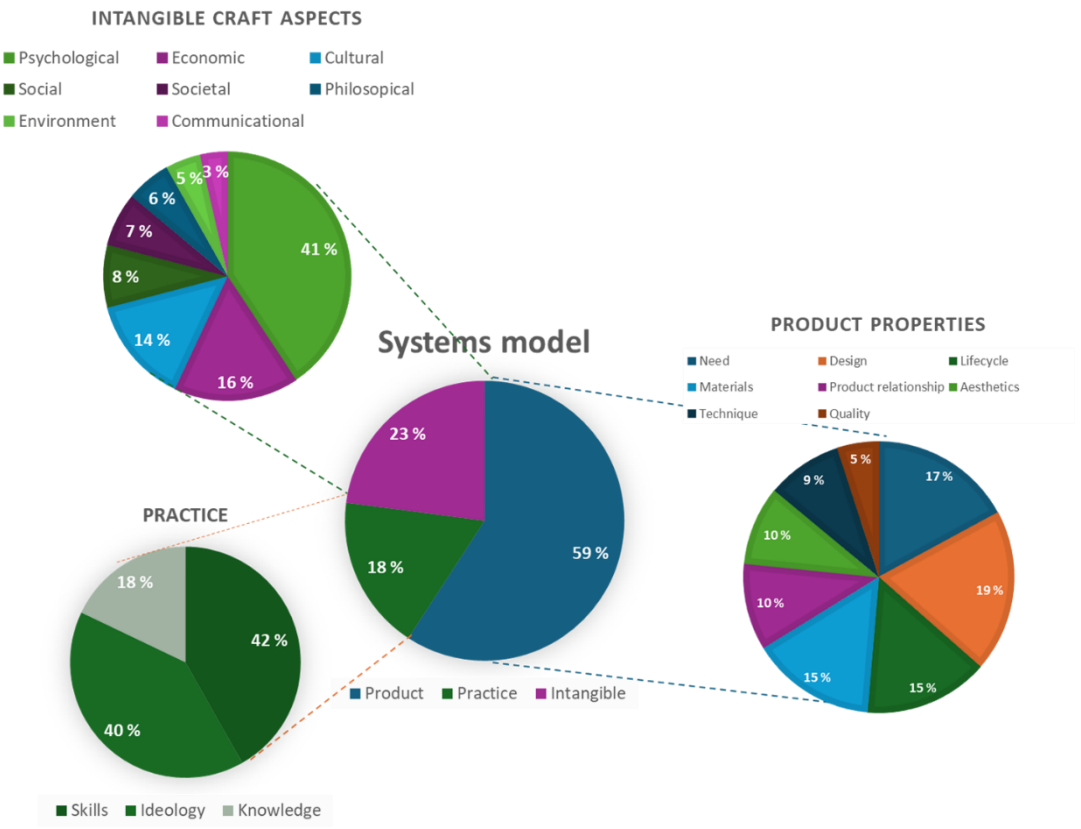
Research process, data and analysis methods

Research process	**Data**	**n**	**Research question**	**Analysis method**
Lecture	Lecture notes	Not included		-
Pre-assignment	Photographs	23		Supporting data
Workshop	Questionnaire	33	Which elements are relevant in the craft student teachers' own crafted products? What are the most important elements in the craft student teachers' own crafting?	Statistical description Supporting data
	Essay	33	How do craft student teacher utilise sustainable craft system model as a framework in analysing their own crafted products?	Deductive content analysis
	Group discussion	4	How do the craft student teachers evaluate the framework's suitability in basic education context?	Inductive content analysis
	Group presentations	6		-
Fieldnotes	Notes	8 A5 pages		Supporting data

The analysis revealed that the students were engaged authentically with the topic. For example, some used bullet points and short sentences in writing their reflections, while others adopted a more narrative style to describe and analyse their chosen crafted items. Following the deductive content analysis, we quantified the data by counting the frequency of each code in the essays. These distributions were compiled and visualized in Figure 3.

Figure 3.

Theory-based, deductive content analysis



Second, the audio recordings of the students' group discussions were analysed inductively, following the steps of qualitative data analysis (Bengtsson, 2016). The recordings were decontextualized, recontextualized and coded, with the resulting codes categorized into groups and compiled into overarching themes and subthemes (Table 2.). Both teacher-researchers were responsible for the conceptual development of the study, the design of the learning assignments, and the reporting the results. This collaborative involvement strengthened the triangulation of the study by ensuring consistency and depth across the research process.

Table 2.

Inductive content analysis of group discussions

Condensed meaning unit	**Code**	**Categories**	**Subtheme**	**Theme**
Not easy to understand, needs to be opened to understand	Complex, Needs discussion	Complexity of the model Dismantling the model	Among students	Understanding the model together
	Components	Clarity with children	With children	
		Purpose of craft education	With in craft education	
Minimizing the waste on materials Designing products for need Getting to know local craftspeople Understanding quality and the lifecycle	Waste control Need-based crafting Craftspeople Quality & life cycle	Concrete examples	Concrete examples	Utilizing model in practice

Learning basic skills in crafts How to repair and maintain the products	Learning basic skills Maintaining products			
Designing education	Designing one's education	Potential for syllabus	Syllabus work	
Pupils design task	Pupils design frameworks	Potential for designing products	Pupils crafting starting point	
Pupils' self-assessment	Evaluating pupils work	Potential for evaluating pupils work	Pupils work assessment	

Results

Reflecting the sustainable craft systems model on crafted products

When describing their own crafted products, most students elaborated on the **sustainable product properties** (n=222 codes). These descriptions addressed aspects such as *lifecycle* and *materials, design* and *need*. Less emphasis was placed on *product relationship*, *aesthetics*, *techniques* and the *quality* properties. However, students moved fluently between categories, shifting from concrete to abstract and vice versa. For instance, one student wrote: 'In my own project, I invested in materials and chose sustainable domestic pine, as I know that the domestic forest industry operates according to sustainable principles and that pine has good qualities.' (S22) Although the student referred to the material choice, they also demonstrated broader knowledge about sustainable forestry and wood processing principles. Students expressed preference for local, natural, recycled or leftover materials to avoid waste. One student described how they had dyed yarns with natural dyes and crocheted a blanket with 'Grandmother's squares' (S8), illustrating both sustainable material use and cultural continuity.

The *design* aspect of the students' reflections highlighted how they drew inspiration from the internet sources, pre-existing models, and ready-made instructions. Some students reported designing their own products based on a specific idea or a clear personal need, while others began their design process with the intention of using leftover materials. For some students, the design evolved organically during the crafting process. One student described how their design strategy was flexible and responsive to the outcome: 'If it does not turn out to be pleasing and useable, I unravel it and knit it again so that it won't be unused' (S11). This example illustrates a sustainable mindset in design, valuing adaptability, usability, and minimizing waste.

Most of the students elaborated also on the *need* aspect when reflecting on their crafted products in the essays. We identified a range of need types: utilitarian, physical, psychological, and social. For many, the need for the product to fulfil its purpose as a functional and usable utilitarian object, was a starting point for their design and making process. However, psychological need was also evident. One student, for instance, reflected that although they had no physical or utilitarian need for a crocheted toy, they were motivated by desire to learn the technique: 'However, my product does not meet the need in any of these areas. I had no need for a small toy when I started crocheting. I only did it because I wanted to get into crocheting.' (S10). Another student insightfully noted that 'need and motivation walk hand-in-hand' (S25).

Students who reflected on *product relationships*, stressed the personal meaning of crafting. Products were considered especially meaningful when they were designed and made for a specific need. One student noted 'the need ought to come from the user themself' to make it more meaningful and useful (S13). Another student highlighted the emotional and experiential value of crafting, stating that it can be 'fun and rewarding' (S23), which contributes to a deeper, more meaningful relationship with the product. These reflections show that the concept of need in sustainable craft is multifaceted,

encompassing not only practical utility but also personal growth, learning, and emotional fulfilment, and fortify a meaningful product relationship.

Aesthetics were described as form, shape and colour. While technical aspects of the products were mentioned in some essays, they were less frequently elaborated. Students referred to the use of various *techniques,* but these were generally brief. *Quality* was associated with materials, lifecycle or craftmanship. Students recognized that when materials are handled skilfully, it enhances the durability and lifespan of the product, and thereby, contributing to sustainability.

The practice element (n=67 codes) was mostly elaborated from the perspective of *skills* and *ideology*. Students described learning specific techniques required to craft their products, emphasizing learning by doing and the satisfaction of being able to create something tangible. Some students connected skill development to their future profession, noting how mastering a technique was nerving but also rewarding: 'I was nervous about welding, but I wanted to learn the technique, so I decided to challenge myself with this task by starting a project that included mostly welding.' (S28).

The *knowledge* aspect was evident in students' reflections on how their understanding and knowledge of materials and skill developed through making. Some students also expressed that, as future craft teachers, they still needed to develop the necessary skills and hoped to grow further in their studies.

The *ideology* aspect, including *attitudes and values* related to sustainable crafting, was discussed through materials choices, such as opting for recycled over virgin materials. The need aspect was reframed as an ideological stance as an attitude with students expressing a reluctance to make making anything without a clear purpose. One student admitted that 'It is harder to assess the values.' (S10). Nonetheless, values were conveyed indirectly, when students described crafting as a meaningful part of their lives. One student reflected that their crafted item 'holds a spiritual relationship with the user and the utility' (S2).

The **intangible craft element** (n=86 codes) was mostly described through *psychological, economic* and *cultural* aspect. Students crafting contributed to their personal development and wellbeing: 'I want to learn more new techniques and to become better all the time.' (S18). Another student emphasized the emotional value of crafting as: 'The most important thing in my own projects is whether I get pleasure and wellbeing from doing it.' (S1). Based on these student reflections, the psychological aspect included wellbeing, internal motivation, self-achievement, and professional growth as future craft teachers. One student reflected on the sense of empowerment achieved through managing a clothing design and making process, highlighting the personal achievement in learning new skills:

> Intangible crafts in my thinking means that I was able develop my skills in clothing design. I had not sewn clothes before, so this sewing project gave me a spark to create my own clothes and to learn about clothing basics. I feel now that I can design and make simple clothes. (S21)

Students also reflected on the *social*, *environmental, societal, philosophical* and *communicational* aspects of sustainable craft, particularly when discussing ethical and ecological considerations in material choices but reflected less frequently. These reflections did reveal how crafting can embody values and decision that extend beyond the product itself. For some students, analysing their own craft products through the systems model opened up new perspectives: 'Now that I have reflected my own craft product in relation to the sustainable craft systems model, I feel that the system has opened many meanings, features, and viewpoints on my crafting.' (S10). While a few students expressed that the model required further clarification to fully assess its usability in their future teaching practice, most recognized its value. As one student put it: 'Different viewpoints can direct attention to something new, essential, that you have not considered before.' (S26). These reflections suggest that the systems model not only supported deeper understanding of sustainable craft but also encouraged critical thinking and broadened perspectives on craft as a pedagogical and ethical practice.

Ideas about teaching sustainable craft in basic education

In the second part of the workshop, students first discussed in small groups how the sustainable craft systems model could be applied in basic education, and then presented their ideas to the whole group. During these group discussions, students reflected on the theoretical framework from various perspectives, which broadened their understanding of both crafts and sustainability. These reflections were thematized into two main categories:

- Understanding the model together 1) among students, 2) with children and 3) within craft education,
- Utilizing the model in practice.

The first theme, *understanding the model together*, revealed that students critically assessed the theoretical framework and acknowledged its complexity. They noted that the model was not easy to grasp and needed to be dismantled into smaller pieces. Peer discussions were seen as helpful in this process, as one student commented 'Even just in this task, the concept opened to me in a new way.' (G9). When viewed in smaller segments and supported by practical examples, the model became clearer. Students emphasized that they needed to understand the concept themselves before they could adapt it for teaching *children*. One group realistically noted: 'For God's sake, you can't include all of it in every work! Take one element from here and there.' (G1). Students also emphasized that the importance of making the model specific and accessible in their own teaching. For example, they pointed out that pupils might not understand abstract terms like 'technique' but would grasp concrete actions such as nailing or 'to be able saw'(G9), especially when grounded in their own crafting experiences.

Students also discussed the importance of *craft education* at the cultural and societal level. Examples included 'crafts as an occupation running in the family' (G3), and references to cultural heritage, such as weaving rag rugs, which are considered as a Finnish tradition. As one group (G1) noted, even if the tradition 'might not be 500 years old, it can be 50-100 years old' and still practiced and passed on, with skills and knowledge transferred through schools.

The second theme focussed on *utilising the model in practice*. Students discussed how the systems model could be used to diversify their teaching. One approach suggested was to focus on one element at a time and gradually introduce the different components of the model to the pupils. One group proposed that upper elementary pupils could use the model to design and evaluate their own products, thereby integrating systems thinking into the craft process.

The students demonstrated how they could turn theory into practice by creating concrete examples for teaching sustainability through craft. These included minimizing material waste, designing products based on actual need, connecting with local craftspeople, learning basic craft skills, and teaching pupils how to repair and maintain existing products. They also reflected on the importance of meaning in the making, emphasizing that crafting should go beyond enjoyment to carry deeper significance: 'Not crafting things just for the sake of the joy of making - they should make a deeper sense.' (G1). Overall, the students saw the value of the theoretical model in their future profession, particularly in designing educational content, planning course syllabi, and evaluating the pupil's work. However, some expressed doubts about its direct applicability for younger learners, as one group noted 'how much a fourth grader would reflect on their values.' (G1). In this reflection suggests that while the model is a useful pedagogical tool for the teachers, it may need to be adapted or simplified for use with pupils in basic education.

Discussion and conclusions

The purpose of this study was to explore how a sustainable craft systems model functions as a pedagogical tool for education for sustainability through crafts. We explored how the systemic model of sustainable craft, originally developed by the other author (Väänänen et al., 2017; Väänänen et al.,

2018) was perceived and utilized among craft student teachers during a higher education course. The results showed that using a theoretical framework to reflect on practice in craft education supports meaningful discussions around sustainability and its practical implementation. The systems approach and transformative learning (Salonen et al., 2023), when connected to a real-life, student-centred learning environment, encouraged deeper reflection and broadened the perspectives of craft student teachers. By analysing their self-made products through the model, students were able to identify which sustainability aspects were relevant in their own crafting. This facilitated engagement with complex systems thinking of crafts and develop more holistic understanding of sustainable craft. Importantly, sustainability can be assessed without being a craft maker. However, when personal making is integrated into the process, agency, knowledge, values, and beliefs are incorporated (see also Groth & Schilhab, 2024). The students' reflections on materials and making align with the earlier finding (Hofverber & Westerlund 2021: Väänänen et al., 2018), where the *materials* and *lifecycle* were most frequently discussed due to their tangible nature. For instance, the use of left-over materials, a long-standing tradition in craft, was seen as a source of creativity and a way to direct material flows within circular economies (see also Väänänen, 2020; Riis, 2025).

Through this intervention, student's conceptions were intentionally directed toward reflecting on diverse viewpoints of sustainable crafting. Notably, the students emphasized the psychological, economic, and cultural aspects related to the intangible aspects of sustainable craft. This emphasis contrasts with findings from a previous study with craft student teachers (Väänänen et al., 2018), where environmental sustainability received greater attention. These findings reinforce the importance of the psychological aspect, particularly the ways crafts are connected to individual wellbeing, as highlighted in earlier research (Pöllänen, 2015; Sjöberg & Porko-Hudd, 2019). The role of internal motivation to learning (see Deci & Ryan, 2000; Ryan & Deci, 2000); self-achievement (see Maslow, 1970); and professional development as future craft teachers (Kokko & Väänänen, 2023) were affirmed in the students' reflections.

The teaching and learning method, centred around the learning assignments consisting theoretical and practical reflection. They were intentionally designed to help students systematically map out sustainable craft aspects of their own crafting, thereby supporting transformative learning in line with Salonen et al. (2023). Group discussions were acknowledged by students as helpful in breaking down the complex systems theory into more comprehendible parts. Through the process, the students demonstrated development of sustainability competencies (Bianchi et al., 2022). Groth and Schilhab, (2024) acknowledge the role of craft teachers in supporting the students' understanding of the connections between theory and practice. By critically discussing and evaluating the model's suitability for craft education, envisioning sustainable futures in their own teaching practices, and building an understanding of sustainability's complexity, the students recognized the teacher's role as a mediator between theory and practice. This included translating abstract concepts and terminology into accessible language and meaningful activities.

As reflective practitioners, we conducted a careful analysis of the intervention and the students' activities to inform the future development of pedagogical practices. First, the students primarily focussed on the product-related aspects of the sustainable craft model, especially the aspects of need, design, materials and lifecycle, which are critical in making sustainable products. This emphasis is understandable, as tangible objects help make abstract concepts more accessible and concrete. The analysis of their products in reflection on the systems model opened new viewpoints and fostered systemic thinking, which was further explored through small group discussions and reflective writing. Second, the multilayered systems approach, used as a learning task, served as a brief intervention that initiated peer discussion and supported Education for Sustainability through crafts. However, we recognize that the students require more time to develop deeper understanding and engage in meaningful reflection, even though the systemic model did facilitate theoretical reflection in practice. Third, this

intervention showed that the theoretical framework can be applied in various ways by craft student teachers when planning practical learning assignments for the pupils. Overall, this study demonstrates that the craft intervention, together with the sustainable craft systems model, functions as an effective pedagogical tool for advancing sustainability education by cultivating students' competencies through critical reflection on practices and theories, fostering peer-to-peer collaboration, and promoting future-oriented perspectives via multilayered systems thinking learning tasks. Based on the findings, we aspire to advance teaching and learning approaches for sustainability through crafts, informing future research, pedagogy, and curriculum development within higher education craft education.

Disclosure statement

We used an AI tool, Microsoft Copilot (November 2025 version) to 'Check and correct for English grammar and fluency' in a secure mode. The authors have supervised these corrections. The paper is written by both authors, not by AI.

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