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Exploring Memory of Textile Crafts

A learning game for dialogue in textile design education

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Abstract

This article presents the development of and initial teaching experiences with Memory of Textile Crafts, a memory-style learning game designed to support students' development of knowledge, skills and competences in practice-based textile design education with a focus on techniques. The objective of this article is not only to share information about the tool itself but also to present insights from early encounters with the game in textile design education. The learning game is described and discussed in different contexts through two teaching cases. In these cases, it shows flexibility in being combined with exercises and integrated into teaching situations to address different cognitive levels of learning. Furthermore, a concrete output of developing the game has been the formalisation of a Compass of Textile Logics, a visual compass that frames textile techniques as hierarchical transformations between levels and logics.

Introduction

Memory of Textile Crafts is a card game developed as a dialogue tool for teaching textile techniques in design education (see Figure 1). Through interactive, dialogue-based activities, the game emphasises active learning in the classroom. This article explores the development of the game, which is designed to facilitate students' learning in textiles by addressing the intertwined complexity of textile anatomy, features and contexts.

Figure 1

Memory of Textile Crafts – A learning game.



The game's development was driven by the need to further support material learning in practice-based design education. The demand for integrating knowledge of the sustainable transition and understanding how to work with rapid technological development challenges the resilience of traditional learning formats, such as textbooks. In recent years, product-

based design education has broadly shown increased interest in material-driven design processes, building on an urge to better connect hands-on practice with materials and resources (e.g. Bak-Andersen, 2018; Karana et al., 2015). This approach, we argue, is already deeply embedded in textile design practice, where materials and techniques are at the centre without necessarily having an end application in mind. This was recently explored by Tolnov Larsen (2025), with a focus on colour potentials in mechanical textile recycling.

However, disseminating this kind of knowledge among students and helping them navigate an ever-changing field of design, technology and environmental concerns require alternative learning formats. We aim to provide a gamified tool that enables students to connect hands-on making and experience with technical concepts that is otherwise often introduced through textbooks and classroom teaching, thereby creating an active learning environment in which each student is encouraged to bring their own practice-based experience. Our intention is to assist students in building bridges between different ways of working with materials, such as between the analogue and the digital (Dumitrescu & Motta, 2023) and between hand-crafted and industrial production (e.g. Adamson, 2013). This is intended to better support the strength and importance of physical prototyping in textile material innovation while also helping students activate a material-based approach within an embedded design for sustainability practice in a transformative learning scheme (Sterling, 2010). It can enable students to engage with sustainability issues, where an in-depth understanding of textile materials as resources and materialised products, as well as strong means of interaction and dialogue, can support learning at a higher cognitive level.

With the learning game, we aim to stimulate and motivate students to interact socially as part of their learning by supporting richer enjoyment and absorption in the experience, thereby enhancing a state of *flow*. Experiencing flow in teaching situations has been shown to positively influence students' learning within a subject as well as their development of skills (Klein et al., 2010). Therefore, designing classroom activities that facilitate a state of flow is important in students' learning (Bakker, 2005).

Our main intention is therefore to introduce a learning tool inspired by the rules and structure of traditional board games. To engage students in playing along, this tool includes elements of gamification, such as challenges, control and goals, while sparking imagination and curiosity (Garone & Nesteriuk, 2019). Whereas in a traditional board game or card game, such as a memory game, participants play against each other, in this learning game, they play together. The motivation to play along is therefore less focused on competition and, to a greater extent, based on interplay and interaction between players, building curiosity about how long the game can go on and how much knowledge participants can gain from playing when everyone contributes experiences, input and ideas. To facilitate this,

we have drawn on a gamified construction through structured and carefully selected content. For example, what elements make one curious to know more, and what kind of content may lightly provoke participants to search for more information?

Context of development

The context for developing *Memory of Textile Crafts* was CraftHub (2021–2024), a project co-funded by Creative Europe to promote craft culture and heritage in Europe, with partners representing academia, practice and organisations. Among the outputs, such as artist residencies and a craft festival, the development of an open-source repository and a digital materials library (The Craft Library, n.d.) served in particular as inspiration and input for the learning game.

The development of the learning game has been an iterative process of creating and discussing ideas in dialogue among the authors and with colleagues in the field of textiles, such as at the CraftHub Closing Conference, during a development meeting with colleagues engaged in teaching textile design, and at a workshop as part of the Aesthetic Practice Network, a collegial network for sharing and developing aesthetic practice, both held at Kolding School of Design.

We, the authors, represent different perspectives on textile practice. With backgrounds in textile design and textile engineering, we have found common ground in how human beings interact with textile materials and, through this, how we as textile makers and educators can support such interaction. Here, we aim to emphasise the necessity of understanding textile development as an integral process, in which a final textile material is informed by all previous sub-processes and decisions. This means not only working in detail with fibres, spinning and fabric making but also understanding how processes that come before and after will influence and be influenced by one another.

Experience with tool development

We have extensive experience in developing materials (hereafter tools) to support teaching and curriculum development. Specific examples include two related card decks, *Sustainable Design Cards* (Hasling & Ræbild, 2017; Ræbild & Hasling, 2018) and *Material Pathways* (Hasling & Ræbild, 2021), which unfold approaches and perspectives in design for sustainability to support analysis, discussion and concept development; the *Learning Activity Tool* (Hasling & Ravnløkke, 2021), developed as part of the FashionSEEDS project (2018–2021) (Fashion Seeds, n.d.) a collection of learning activities that offers tangible means for tutors to find inspiration, engage with and apply in teaching fashion design for sustainability; and the *DESTEX Training Book*, developed as part of the DESTEX project (2019–2022)

(Destex, n.d.) to support teaching within textile design, technology and innovation across academia and industry.

While we have a deep understanding of how to develop teaching materials and learning activities based on hands-on experience, we wanted to challenge ourselves by adding a game dimension to the teaching material. Although this dimension has received less attention in our previous work, it was something we wanted to focus on and explore further. We have both experimented with active learning in classroom teaching, so further exploring formats and modes of engagement was an initial motivation for us. As part of developing *Memory of Textile Crafts*, we found that devising the game structure, rules and challenges fostered a playful approach and a state of flow for ourselves, just as we hoped students would experience when playing the learning game.

Developing the learning game

The learning game was developed to support an understanding of textiles, with a focus on techniques specific to textile practice. Therefore, we investigated relevant means of describing techniques by examining textbooks (e.g. Brekke Koppen, 1982; Fashionary, 2021; Lund, 1971; Paterson, 1900; Petersen, 1995; Porsild, 1974; Salolainen et al., 2022), course presentations, videos, students' project presentations and other materials. Based on this, the following were seen as relevant components to potentially include in the learning game:

- Physical material samples made using specific techniques
- Written text describing the techniques
- Images of material samples made using the techniques
- Technical drawings representing the techniques
- Images or drawings of the tools used for the techniques
- Videos of the techniques in action

While there is agreement that physical samples that allow for direct hands-on engagement and embodied understanding of material properties and characteristics are valuable (Wilkes and Miodownik, 2018), it was decided to exclude these from the first version of the game, as they would prevent the game from being prepared for and shared in a digital format.

Furthermore, while it was also acknowledged that videos of specific techniques could be valuable in some settings, they would require access to and use of a digital device, which

would go against the wish to keep the learning game analogue. Consequently, it was decided to exclude these from the game itself, while emphasising that users of the game could, of course, search for and watch videos of specific techniques on YouTube or Vimeo to inform the discussion.

Based on this, it was decided that each specific technique should be represented by four separate cards:

- A Specific Technique card, with a text-based description of the technique
- A Technical Drawing card, with a technical drawing representing the technique
- A Tool card, with an illustration of the tool used for the technique
- A Material Sample card, with a photo of a material sample made using the technique

Understanding the large variety of textile techniques

To understand which textile techniques to include in the learning game, we referred to the CraftHub Material Library. When the library was developed, consideration was given to how best to organise and cluster contributions, as – with 2200 material samples – there would be an overwhelming list of applied techniques to search through. Consequently, it was decided to describe material samples using three categories related to the physical representation, each with predefined options to choose from and filter by:

- Material (the material resource)
- Craft (the craft practice)
- General Technique (the principal technique)

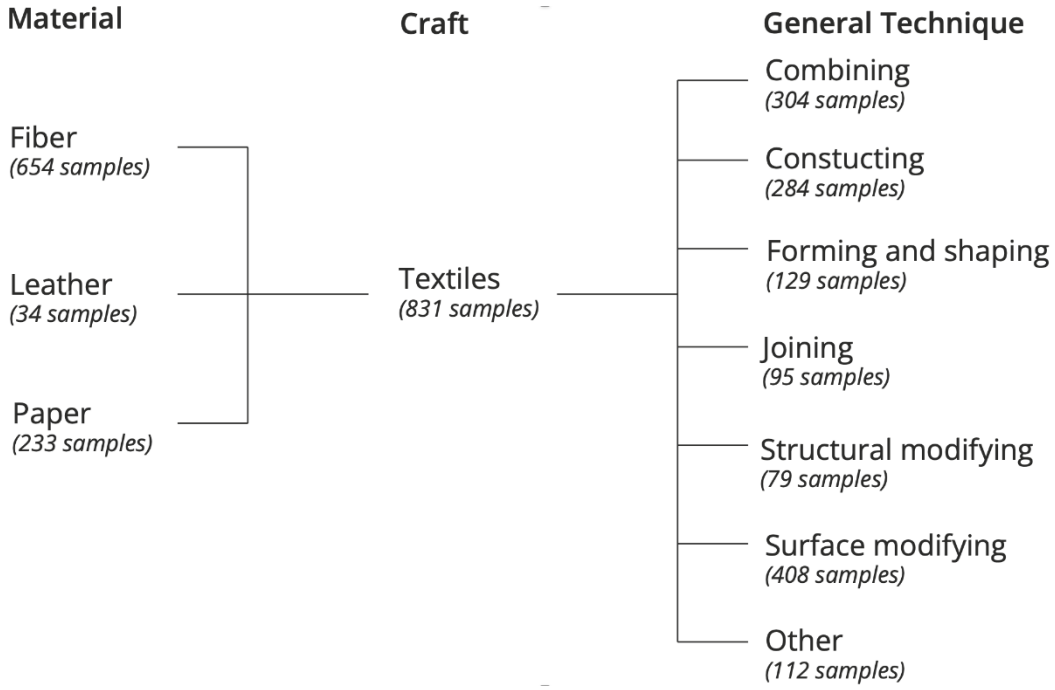
In addition, the Specific Technique category was introduced to allow information to be included about the techniques used for individual material samples. Here, there was overlap between the Material category ‘fibre’ (654 samples) and the Craft category ‘textiles’ (831 samples), while ‘textiles’ was also covered in, for example, the Material categories ‘leather’ (34 samples) and ‘paper’ (233 samples).

However, the Craft category ‘textiles’ represented samples broadly across the General Technique category: ‘combining’ (304 samples), ‘constructing’ (284 samples), ‘forming and shaping’ (129 samples), ‘joining’ (95 samples), ‘structural modifying’ (79 samples), ‘surface modifying’ (408 samples) and ‘other’ (112 samples). Because more than one General Technique could be assigned per sample, the sum of the representations exceeded the

number of material samples within the Craft category ‘textiles’. An overview of the material samples represented by Material, Craft and General Technique relevant to the game can be seen in Figure 2.

Figure 2

Overview of material samples represented by the Material, Craft and General Technique categories from the CraftHub Material Library relevant to the development of the game.

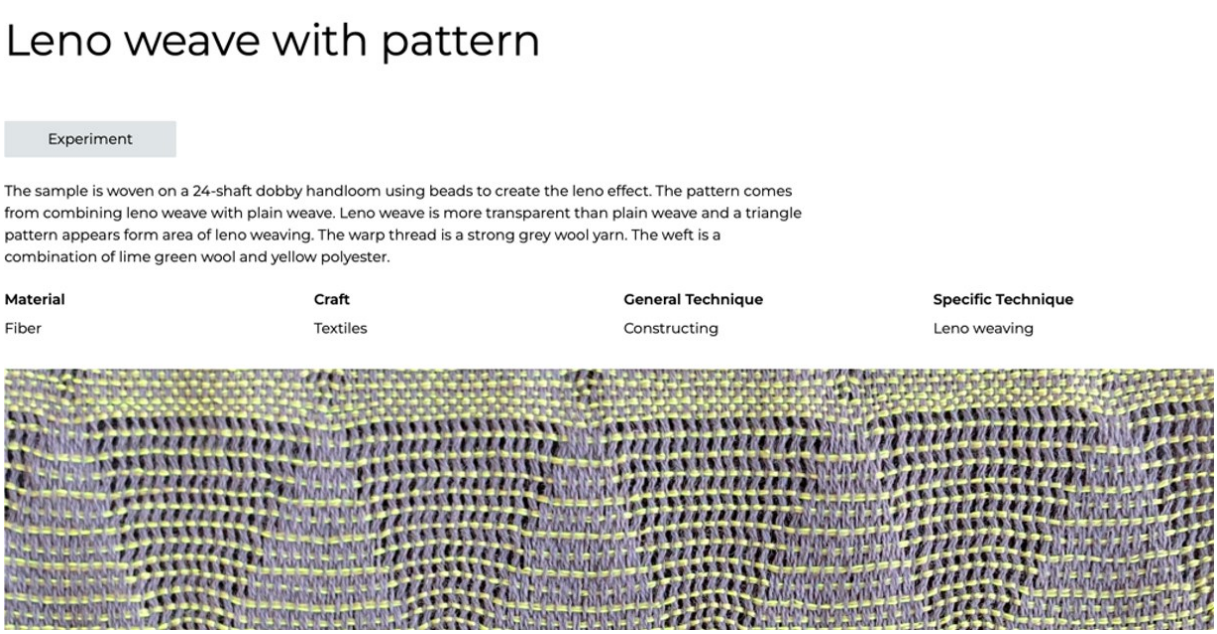


The Specific Technique category required free text rather than preassigned choices, so the variety of descriptions was wide. However, specific techniques were predominantly situated within conventional textile constructions, such as weaving, (weft) knitting, embroidery and tufting, and treatments, such as (screen) printing and dyeing, some of which emphasised techniques as either hand/analogue or digital processes. Furthermore, many main techniques were described through specific sub-techniques, such as weaving, dobby weaving, leno weaving and paper weaving (see the example in Figure 3).

We did not go through and cluster all 831 material samples from the Craft category ‘textiles’ to identify relevant textile techniques for the learning game, but we observed general trends and used these to inform further processes.

Figure 3

Example of the 'Leno weave with pattern' material-sample entry in the CraftHub Material Library (source: https://www.crafthub.eu/material/leno-weave-with-pattern/).



Textile techniques in the learning game

Building on the textile techniques identified in the CraftHub Material Library, we brainstormed relevant techniques to include in the learning game (see Figure 2). This initiated a discussion of the relevance of, and need for, understanding textile techniques from a structural perspective. This was first sparked by a discussion about what constitutes a technique and how techniques are related but was further informed by reflections and insights on curriculum content and structure across institutions as well as ongoing involvement in multiple cross-domain research projects and networks.

A preliminary description of a textile technique can be that of a process that transforms a textile material at any level into either the same level or a higher level, using friction and cohesion to construct, for example, threads, yarns and fabrics. These constitute 'logics' that can be used to understand general properties and qualities and how complex textiles are constructed. Furthermore, textile techniques are applied in different parts of the textile development process and at different levels and domains. For example, when fibres are converted into threads and yarns, properties and characteristics are influenced by the textile fibres, which can be referred to as ½D, and by how the fibres have been spun and twisted into yarn, from ½D to 1D. Likewise, when these are further processed into, for example, ribbons or fabrics, from 1D to 2D, surface modified with print, from 2D to 2½D, or made into a spatial shape, into 3D, all these processes define the final properties and appearance of the textile representation. The levels and transitions between them are further explored

when proposing the *Compass of Textile Logics* in the Discussion. Furthermore, in parallel with this work, the levels inspired the unfolding of design for circularity potentials in textile materials and products in Hall et al. (2025).

We emphasised the relevance of including techniques that represent different levels, as well as potentially introducing techniques that are not always part of the conventional textile design curriculum but have cultural and historical relevance.

It was valuable to find inspiration in books and magazines from before the internet era, when they were the main sources of information. As we are based in Denmark, these publications were often in Danish or other Scandinavian languages and written for a broader audience than is typically observed in teaching material today, such as textile material merchants or domestic handicraft practitioners.

Figure 4

Overview of textile techniques to be potentially included in the learning game.



Many relevant textile techniques were identified, some of which are shown in Figure 4. However, we wanted to keep the game relatively simple, so we agreed to include a maximum of seven techniques. Furthermore, as this was a learning game, we also wanted to ensure that representative visuals of the tools or constructions could be produced. Based on this, the learning game comprises the following textile techniques (Figure 5):

- Felting
- Knitting
- Lace-making

- Tatting
- Tufting
- Twisting
- Weaving

A visual overview of the textile techniques, each represented by four technique cards, is provided in Figure 5, which presents the game and its components.

The learning game is more than a memory game

The game is fundamentally about making matches and can be viewed as an elaborate version of the memory games we know from childhood. However, a full match is obtained only when all four cards belonging to the same textile technique are found, and matching is not necessarily something that a single player does but can instead be collaborative within the group of players.

While this might be a challenge and, to some degree, supports the ability to connect different means of describing a technique, we wanted to build another layer into the game through what we call 'discussion cards'. Discussion cards seek to unfold the matched specific textile technique through group discussion among players across three perspectives: General Technique, General Quality and Context, each represented by six cards. The discussion cards were inspired by the categories in the CraftHub Material Library and adjusted to fit the framework of the learning game. They are described as follows:

- A general technique is the fundamental means used to create a material representation. A general technique cuts across material families and crafts and may therefore appear under different names depending on the material and craft in question. The General Technique cards included in the game are 'Combining', 'Constructing', 'Forming and Shaping', 'Joining', 'Structural Modifying' and 'Surface Modifying'.

- A general quality is a universal means of design to describe the use, perception and immediate experience of a material representation across material families and craft techniques. The General Quality cards included are '2D/3D', 'Colour', 'Flexibility', 'Ornamentation', 'Strength' and 'Texture'.

- A context describes the field of application and use of a material representation based on keywords such as scale, user and target group, durability and longevity,

production, cost and materials. The Context cards included are ‘Accessory’, ‘Architecture’, ‘Art and Exhibition’, ‘Clothing’, ‘Interior’ and ‘Sample-Making’.

Presentation of the learning game

The current version of the learning game consists of 28 cards that relate to specific techniques – four technique cards for each of the seven specific techniques (Figure 5) – and 18 discussion cards, comprising six cards for each category: Specific Technique, Specific Quality and Context (Figure 6). In addition, it includes seven cards that introduce the game and outline the game rules, and three cards that each introduce one of the discussion card categories.

The cards come in a black cardboard box that also includes a folded A3 pamphlet providing background information and game rules, as well as an overview of all the cards and the *Compass of Textile Logics*. The card categories are given different colour themes so that they can be easily differentiated. Furthermore, the cards are printed at a size of 95 mm × 95 mm, which is considered large enough to accommodate both text and images yet small enough for all cards to fit on a table and in the hand (see Figure 7 for an overview of how the cards can be displayed).

Figure 5

Overview of the technique cards.



Figure 6

Overview of the discussion cards.

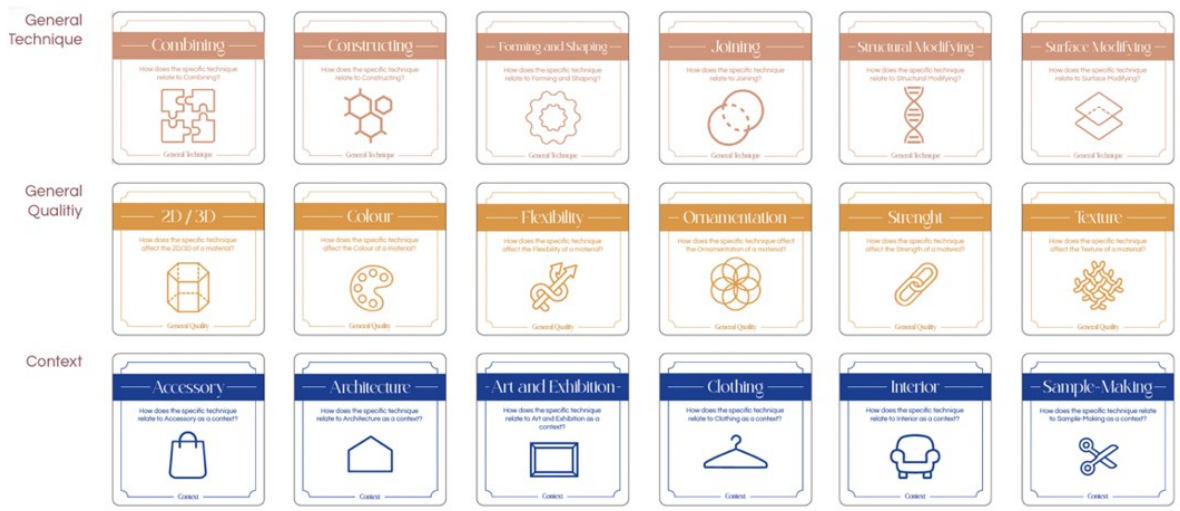
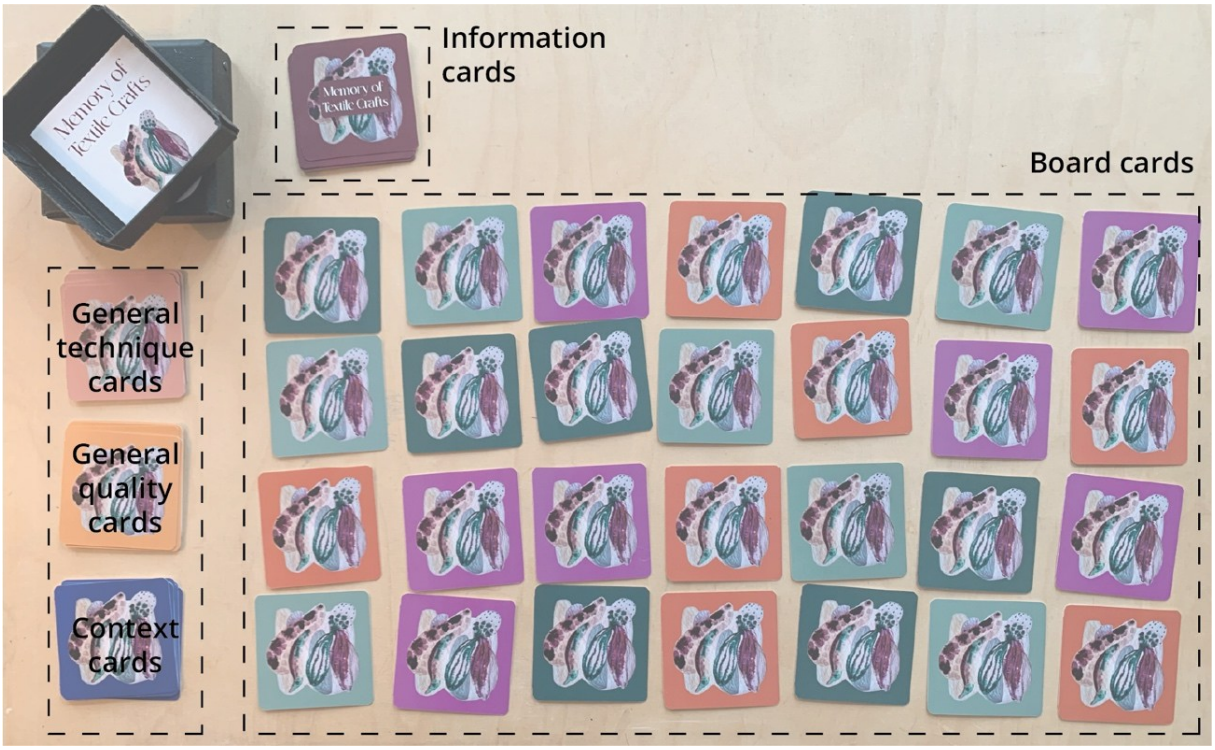


Figure 7

Overview of the different types of cards while playing the game.



Playing the game

To facilitate the game experience, the rules are described in a series of introduction cards. The rules, together with an overview of all the cards (Figures 5–7), are included with the learning game. The instructions for playing the game are shown in Table 1.

Table 1

Instructions for playing the game.

<table>
<tr><td>PREPARA-
TION</td><td>1. Form a group of 2–4 players.</td><td>2. Take the dialogue cards (General Technique, General Quality and Context) and place them in three piles.</td><td>3. Shuffle the remaining cards and place them randomly with the cover image facing upwards (e.g. in a 4 × 7 grid).

LET THE GAME BEGIN!</td></tr>
<tr><td rowspan="3">SELECTING & MATCHING</td><td colspan="3">Player A
Select and turn over four cards – one per colour. Are there any matches? Select which cards or partial matches you want to save and keep active. If you don’t have a partial match, you could choose a card you find most interesting, one you don’t know or one you’re curious about.</td></tr>
<tr><td colspan="3">Player B
You should either choose to continue with the active cards or partial matches from the previous player(s) (a) or initiate a new match (b).</td></tr>
<tr><td>1a. Select and turn over the number of cards remaining to obtain a full match.</td><td>1b. Select and turn over four cards – one per colour. Are there any matches?</td><td>2. Select which card or partial matches you want to save and keep active for your next round.
Repeat the procedure for all group members and continue until all matches are made.</td></tr>
<tr><td>HOW TO MATCH</td><td>You get a match when two or more cards from the same Specific Technique are found.</td><td>PARTIAL MATCH
Two or three cards for a Specific Technique are found.</td><td>FULL MATCH
All four cards for a Specific Technique are found.</td></tr>
</table>

	Between players, partial matches are kept active until a full match is obtained.		A card is active when the info side is turned upwards. A card is passive when the image side is turned upwards.
FULL MATCH	When you get a full match: Read through the text on the cards and use the illustrations to discuss in the group: What do you already know about this specific technique? What does the information on the four cards of the match add to your existing knowledge?		
ACTIVATING THE DISCUSSION CARDS	1. Take a card from the General Technique pile and discuss within your group the chosen general technique in relation to the matched Specific Technique.	2. Take a card from the General Quality pile and discuss within your group the chosen general quality in relation to the matched Specific Technique.	3. Take a card from the Context pile and discuss within your group the chosen context in relation to the matched Specific Technique.

Contexts of applying the learning game

In the following section, we highlight two cases of applying the learning game in classroom teaching to unfold and discuss the potential of integrating it into textile design education. The cases exemplify how the learning game may be used in different contexts of knowledge development.

Testing the learning game in classroom teaching

The learning game was developed as open-source, downloadable print files, and 150 copies were printed for testing and evaluation. At this stage, a full-scale study to test *Memory of Textile Crafts* has not been undertaken. However, as a first stage, we sought to use the first edition of the learning game to challenge and further develop the format and framework of such a full-scale study.

Even though the learning game was developed for integration into teaching at various levels of education, we identified primary areas for its testing throughout the iterative development process. Our aim was first to test the learning game among undergraduate

students in textile design. During their first year of education, these students acquire basic knowledge and skills in textile techniques, construction and material creation, and they advance their understanding of design and design processes. This group of students goes through a steep learning curve and progression of knowledge, skills and competences.

In the following, we describe two scenarios in which we tested the learning game in classroom teaching during the second semester of textile design education at Kolding School of Design.

Case 1: Playing the game

During the winter of 2025, Memory of Textile Crafts was tested in a course titled Textile Techniques and Tools, which runs over nine weeks and awards 15 ECTS credits.

The purpose of the course is for students to gain an understanding of and experience with textile tools and the characteristics of individual techniques and material constructions. Moreover, students acquire knowledge of and insight into the use of different fibres and construction principles characteristic of the textile profession. This learning includes knowledge of yarns, their properties and typical areas of application.

The course involves experimental work in textile weaving and knitting workshops (construction), as well as textile printing (surface treatment), where students develop a coherent series of textile samples based on individually created inspiration material and the learning goals of the course. These goals revolve around students' understanding of the components, constructions and properties of textile fibres and materials, including areas of application for different qualities, and their experience in using textile techniques and tools based on a simple individual design proposal, as well as their ability to work experimentally with them.

Figure 8

Testing the learning game in class – Exercise based on knowledge engagement.



At the level of textile understanding

In the third week of the course, students were introduced to the learning game. At this point, they had become acquainted with basic textile techniques, construction and material characteristics. They had also started experiments in workshops to develop their skills in using some textile tools. The pedagogical purpose of introducing the learning game was to

generate discussion among students in smaller groups and create a friendly environment in which they could discover new knowledge and, together, develop the language they used to talk about textiles. The use of the learning game was therefore based on playing it, as described in Table 1 (see Figure 8).

Insights based on Case 1

The learning game supported students in activating their newly acquired knowledge from lectures and their experiences from the workshop while being confronted with the General Technique, General Quality and Context discussion cards.

Case 1 illustrates how the learning game may be used in teaching as an exercise based on knowledge engagement, in which students pool their individual knowledge from past experiences and their shared learning from classes. Based on observations, some groups had a broad understanding of textile techniques and therefore found it easier to start discussions, whereas other groups used the Specific Technique cards, with text descriptions, to read aloud and build their conversation from common ground.

Case 2: Intertwined dimensions of textiles

The second test of the *Memory of Textile Crafts* learning game took place during the first-year exam project in the summer of 2024. It therefore involved a group of students different from those in Case 1.

The brief for the students' exam projects involved explorations, reflections and discussions of what textile designers may learn from the techniques, functions, aesthetics and use of resources in past practices. Based on the thematic title 'Learning from the Past', students were asked to address the need for sustainability considerations in the textile industry: *How can we learn from the past and create a new practice around textile materials and be inspired by contemporary and future ways of designing, producing and/or consuming?*

In the six-week course before the exam, students worked individually and were assessed on the knowledge, skills and competences they had acquired during their first year. It was up to the students to develop their project frameworks based on the brief, as well as to draw on selected textile techniques.

Reflections on textile prototypes

The learning game was introduced halfway through the course. At this stage in the students' projects, they were making samples. These textile materials were used alongside the learning game. In contrast to Case 1, the cards were used to generate discussion about

textile samples. The discussion cards – General Technique, General Quality and Context – were used to challenge the original idea of the textile sample. Figure 9 shows the discussion about one student's textile prototype, a fully fashioned knitted object constructed from raw Icelandic lambswool. The student was challenged by picking three discussion cards: 'structural modifying' (General Technique), 2D/3D (General Quality) and 'art and exhibition' (Context). These discussion cards then presented a framework or parameters to play along with: *What would these parameters mean for further experimentation with the original idea and the textile prototype? How would these parameters affect the design proposal?*

Figure 9

Testing the learning game in class – Context-specific exercise.



Insights based on Case 2

Based on their textile sample, the students in the group advanced ideas suggested by the discussion cards. In this way, they could test, challenge and change the perspective of their original textile idea by using the learning game as a tool for idea generation and concept development.

Two students described their experiences of the exercise. One said, 'It [the learning game] can help you gain a new perspective on your work … textile sample.' The other said, 'I had an idea for how I could continue working with the loom, based on my test. … Something about the setup and letting what is fed into the loom control the expression in order to experiment with it.' Just before the exercise, the latter student expressed her frustration about being stuck and not knowing what the next step of her design process would be.

Case 2 shows how the learning game can be used in teaching as a context-specific exercise. The learning game provides a framework through the different cards, which are flexible enough to act in teaching situations at various levels – both educational levels and levels of progression within a course. Moreover, the structure and challenges of the discussion cards provided a creative constraint and allowed the students to play with possible outcomes, which helped them to find flow in their process once again.

Discussion

For makers, researchers and educators at a design school, the idea-development phase is not an isolated step. Instead, it moves across stages in a fluid motion, like waves in the sea (see e.g. Krogh & Koskinen, 2021; Redström, 2017). This was also the case in developing the *Memory of Textile Crafts* learning game. Developing and testing the learning game was fruitful for us as educators in the textile field. It created common ground for developing our individual teaching, as well as a foundation for discussion, reflection and further development. Creating the learning game together challenged us, as teachers, to think about our field in a new way. Thus, we became familiar with the inherently vibrant nature of design; as educators, we can sometimes hold on to predetermined approaches in teaching. Developing the game content and structural elements of challenges, control and goals required us to rethink how to facilitate students' learning through a teaching tool that is flexible and can create playful conversations in student groups without the help of the teacher. The learning game provides a framework for learning within textile design, but the overall activities and team play generated around it are crucial to its potential outcome. Navigating this open format sparked our imaginations as teachers and motivated us to think outside the box. The process captured our attention through a mix of challenge and fun that generated a state of flow between us.

In the following discussion, we therefore address the key insights and outcomes of our collaboration. These insights and outcomes form two strands: the first is based on evaluation and reflection, and the second concerns further development. In the first part of the discussion, we focus on integrating the learning game into classroom teaching. Second, we propose a *Compass of Textile Logics* as one of the concrete outcomes of the collaboration, as

the development of this compass is also central to unfolding the discussion of why *Memory of Textile Crafts* is not solely a learning game about textile techniques but also has the potential to address wider and more complex design challenges.

Integration into classroom teaching

The cases testing the learning game showed two variations of integration into classroom teaching: one providing an example of the learning game as an exercise based on knowledge engagement, and the other showing how it may be used in a context-specific exercise. In this way, the cases exemplify how the learning game may be used in different settings of knowledge development. Both cases show how the gamified structure and selection of content challenge students primarily through the rules of play and the General Technique, General Quality and Context discussion cards.

The learning game as a tool for dialogue

The cases provide examples of the generation of discussions in class through the learning game. Both examples show how teaching exercises in combination with the learning game can act as a tool for dialogue in textile design education at the undergraduate level in the second semester. In Case 1, the dialogue among students revolved around the presented specific techniques to foster a general discussion and understanding of textile design and construction. In Case 2, the learning game supported students in unfolding the potential of their ongoing exam projects and thus added to their individual level of reflection and further development of competences. This shows how the learning game assisted in generating a sense of flow for the students (Bakker, 2005; Klein et al., 2010). Moreover, the cases provide examples of the tool's activation in teaching and its support of levels of learning (see Table 2).

In evaluating the learning game, we argue that there is potential for constructing teaching activities around it to support different cognitive levels. Inspired by Bloom's taxonomy (Anderson et al., 2014; Bloom & Krathwohl, 1956), which is well known for structuring and assessing curricular learning outcomes, we exemplified three cognitive levels – understanding, design development and reflection – to accommodate learning goals in design education (Table 2). More specifically, the teaching activity in Case 1 supports the cognitive level of understanding through recognising and recalling and by gaining knowledge based on 'interpreting, classifying and comparing, among others' (Anderson et al., 2014). Case 2 addresses the level of reflection based on the cognitive processes of 'checking and critiquing' and, likewise, 'generating, planning and producing' (Anderson et al., 2014). Therefore, the way the learning game is activated and integrated into teaching is essential to what and how it may contribute.

Table 2

Teaching activities and levels of learning.

COGNITIVE LEVEL	LEARNING GOAL	TYPE OF ACTIVITY / EXERCISE
Understanding	Knowledge	Active learning activities and knowledge engagement.
Design development	Skills	Sample creation and hands-on learning of textile materials and techniques.
Reflection	Competences	Unfolding contexts of textile samples and products.

Additional manuals and support materials

At this first stage of testing the *Memory of Textile Crafts* learning game, we succeeded in addressing some of our aims of integrating active learning into the teaching of textile design and construction – for example, by implementing game elements to create a playful approach, juxtaposing chance and structure to stimulate and motivate social interactions in the classroom (Garone & Nesteriuk, 2019) and, likewise, advancing traditional 'textbook learning', such as class discussion based on text reading. By developing this first version of the learning game and deploying it in classroom teaching, we identified areas for improvement and ways to further enhance the active learning element. These improvements rely on the agile framework that the learning game already provides, supplemented by the following:

- Examples of set-up in classroom teaching
- Manuals for teaching exercises
- Questions related to active learning situations
- A template for students to develop, collect or create a material archive
- Empty cards for students to add other techniques described in text and imagery
- Templates supporting students in desktop/literature research on designers, artists and/or craftspeople who use textile techniques in practice

Proposing a Compass of Textile Logics

We have already mentioned the *Compass of Textile Logics*, which was one of the outcomes of developing the learning game. It emphasises an integrated focus on how techniques across the textile development process relate to, depend on and inform one another –

something we have experienced as often detached in textile design educational programmes, courses and modules.

In addition to supporting practice-based design education, another motivation for the compass came from engagement with industry. For many years, the Scandinavian textile industry has been in decline due to outsourced production and, as a result, there is high demand for people skilled in textiles. However, considering forthcoming European legislation and regulations, such as the EU Strategy for Sustainable and Circular Textiles (European Commission, 2024), there is increased demand for textile know-how and skills in companies, organisations and academia. This means that many people engaging professionally with textile products do not necessarily have in-depth or long-standing textile training, which creates the risk of losing an understanding of the complexity of textile materials, including integral knowledge of the development process. However, this understanding is necessary in the circular transition that legislation and regulations seek to support as they strive to optimise resource use through longevity and circularity. Thus, textile designers, with their hands-on understanding of the sub-processes that comprise textile development, could be frontrunners.

It is anticipated that the compass can be used to strengthen understanding of the connections between techniques across levels and logics – for example, by working at similar levels with different techniques. In this sense, we see the compass as providing a shared framework for engaging with the wealth of textile material literature used in design education, such as the classic books on textile science by Gohl and Vilensky (1984) and Hatch (1993); newer books on textile materials for clothing, such as those by Fashionary (2021) and Hallett and Johnston (2014); and, of course, the many wonderful books describing families of textile techniques, such as in weaving (Dalgaard & Adam, 2024; Salolainen et al., 2022).

How to read the compass

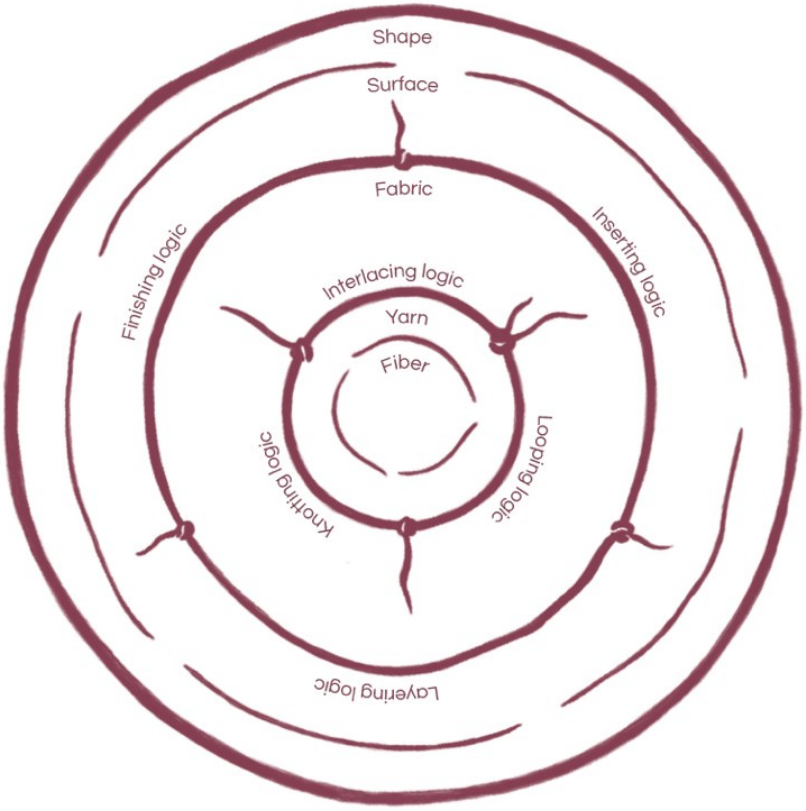
The *Compass of Textile Logics*, as shown in Figure 10, builds on the idea of levels between different dimensional representations of textile materials, such as fibre (½D), yarn (1D), fabric-making (2D), printing (2½D) and shaping (3D). In the compass, the main levels (1D, 2D and 3D) are emphasised as thicker lines.

A textile technique can be seen as a transition that will either offer a material representation at the same level, such as twisting yarn (1D to 1D), or at an elevated level, such as basic weft knitting (1D to 2D) or fully fashioned knitting (1D to 3D). The applied textile technique will therefore affect which technique should be applied afterwards, as well as the final application, but it should also be affected by textile techniques that have come before in the

process. Therefore, it is essential that information on applied techniques, or processes, is available across the development process.

Figure 10

Compass of Textile Logics.



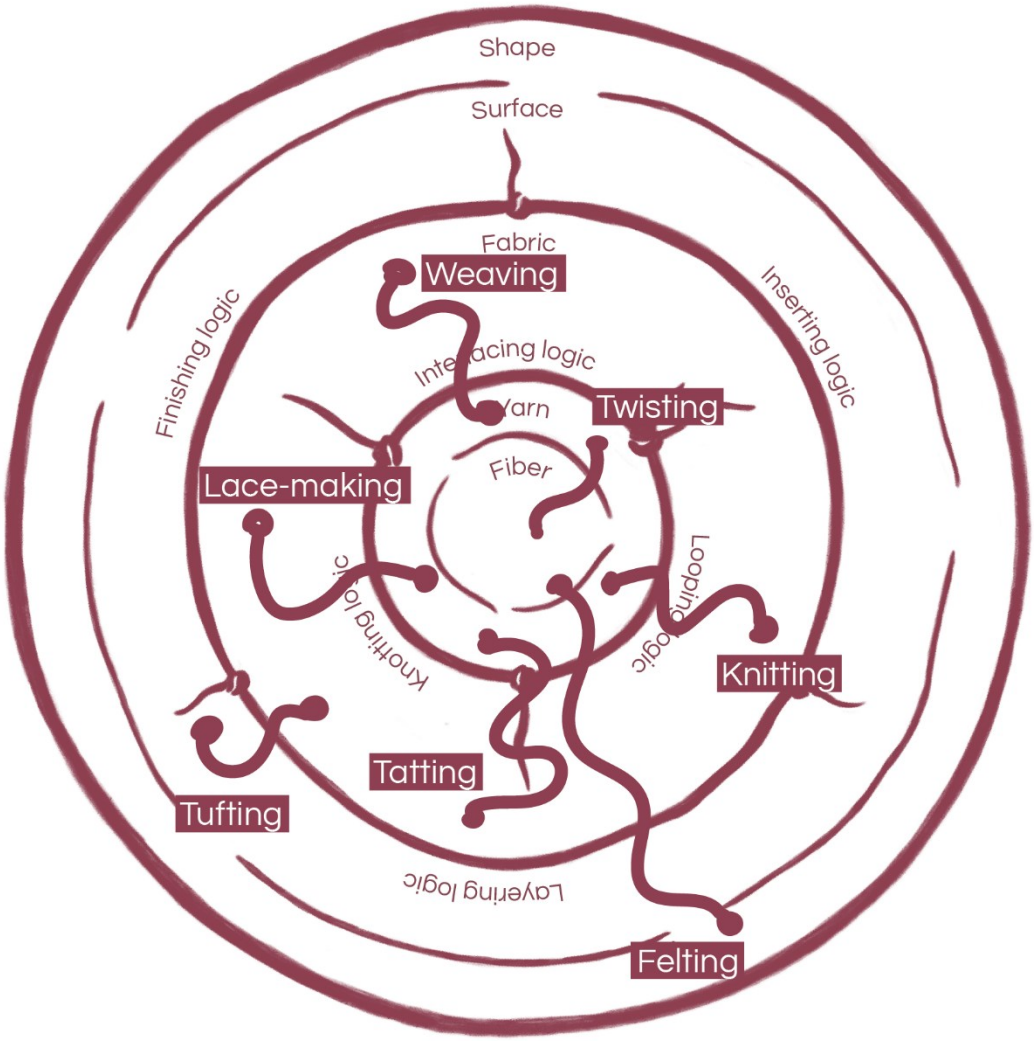
In the dimensional transitions, different logics are used. In the transition from yarn to fabric (1D to 2D), three construction logics can be applied: 'interlacing', such as braiding and weaving; 'looping', such as crocheting and knitting; and 'knotting', such as tatting. Similarly, the transitions that influence or work between textile surfaces (2D to 2½D) can be described as 'inserting', such as tufting and embroidery; 'layering', such as quilting; and 'finishing', such as print.

The compass exemplified with the specific techniques in the game

Of the specific techniques included in the learning game, twisting represents transformations from 1D to 1½D; knitting, lace-making, tatting and weaving represent transformations from 1D to 2D; felting represents a transformation from 1D to 2D, or even 3D if made directly into a shape; and tufting represents a transformation from 2D to 2½D. To exemplify how the compass can be used to gain an overview, the seven specific techniques are inserted into the compass in Figure 11.

Figure 11

Compass of Textile Logics with the textile techniques included in the learning game.



In Figure 12, three techniques that transform at different levels – twisting (1D to 1D), felting (½D to 2D or 3D) and tufting (2D to 2½D) are included.

Figure 12

Examples of levels of techniques.



Figure 13 shows three techniques for transforming yarn into fabric (1D to 2D) that use different construction logics: knitting, weaving and tatting. These represent the construction logics of looping, interlacing, and knotting, respectively.

Figure 13

Examples of different construction logics: looping (knitting), knotting (tatting) and interlacing (weaving).



Expanding on the scope and potential of the tool

The cases above describe how the tool is being investigated through engagement with students and colleagues. This process is ongoing and will continue to be informed by insights and learning along the way. Some of these will unfold the game's potential in use and outreach, while others will consider its challenges and possible limitations.

The main weakness of the learning game is its greatest strength. The flexibility of its structure challenges players by asking them to actively bring their existing knowledge into play. We have experienced this as an advantage in the way it generates fruitful conversations that may lead to the sharing of individual experiences and skills. On the other hand, when students are novices in the field of textiles, the challenge may undermine their confidence in sharing uncertain ideas and knowledge. As the learning game draws on knowledge and experiences from participants, this can limit its rhythm. Therefore, it would be helpful for teachers to facilitate the game through either dialogue input or supplementary material. We have found that additional manuals and support materials are valuable for directing the teaching situation towards the desired kind of activity and level of the teaching. This means that the learning game can be played as it is; however, it can also be useful to combine it with additional teaching activities to strengthen students' reflective level, whether it is used in combination with material-making activities or exercises involving desk research. Furthermore, this flexibility allows for advancement beyond the game's

framework, so that learning is balanced in relation to the selected techniques or can be expanded through further research and material experiments. In further developing the learning game, we see a natural design direction in examples of set-up in classroom teaching, manuals for teaching exercises and questions related to active learning situations.

While developing the learning game, we considered how many techniques it should include to cover the diversity of relevant techniques, how these could be represented and how the game could avoid becoming overwhelming and practically impossible to play with too many cards. The specific techniques chosen represent technique 'families', such as weaving and knitting, with characteristics that students and other players new to textile techniques will quickly learn. A possible further development of the learning game could therefore be to expand into different sub-techniques within the same family or to add 'fibre types' as a discussion card category. This could support students' progressive acquisition of knowledge and skills and thus strengthen their understanding of textile hierarchies and logics.

Moreover, throughout development, we discussed whether and how the learning game could be expanded to cover special techniques that go beyond the textile domain. Textile design practice is inherently material- and technique-driven, and practitioners are required to have a deep and reflective understanding of how different techniques influence the making of physical objects. Furthermore, while textile design practitioners can work with a broad range of techniques, conventional textile design practice refers to certain techniques that help frame and structure an otherwise scattered landscape of levels and logics. We therefore see textile design practice as exemplary for developing the learning game and as something that practitioners from other product domains could learn from and translate into other techniques.

Conclusion

In this article, we introduced *Memory of Textile Crafts* as a learning game and dialogue tool in textile design education. By presenting the learning game, outlining the work behind its development and exemplifying its use, we aim to reach other educators in the field of textiles and assist students in building bridges between different ways of working with materials as well as between hand-crafted and industrial production. We argue that supporting the strength and importance of physical prototyping in textile material innovation may assist students and the designers of tomorrow in activating a material-based approach within embedded design-for-sustainability practice, where an in-depth understanding of textile materials as resources and materialised products, as well as strong means of interaction and dialogue, can support learning at a higher cognitive level.

Moreover, students at this reflective level may influence textile design beyond the product level by being able to address various levels of logic.

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