RE-DESIGN FOR PRE-DESIGN: discarded garments as a tool for garment-based learning in fashion knitwear design education

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Abstract

The level of complexity in designing and making knitwear is high, as it entails learning about both textile construction techniques and form-building. This research explores the potential of discarded knit garments as a learning tool in fashion knitwear design within higher education, to bridge the gap between translating small-scale two-dimensional knitted samples into a garment collection. Digital sketching and virtual sampling are not sufficient for the full understanding of knitwear design. Practice-based learning is key to fully grasping the potential of the knits. In addition to foundational technology and practice, existing garments can also be considered to be an open source for deriving technical knowledge and a basis for design ideation. In order to explore the potential of garment-based learning in knitwear design processes, a three-and-a-half day workshop was conducted within a basic knitting course for first-year BA Fashion Design students. The participants were divided into groups and instructed to select, analyse, and create new knitted designs using discarded garments, and to reflect on their learning outcomes. The knowledge gained during the workshop bridged the gap between the knit samples and the garment collection making. In their reflections, the students expressed a deeper understanding of various knit properties, structures, and technologies in relation to knitted garment forms and details, as being useful learning outcomes from the workshop, which they were then able to apply to their collection making processes. The collaborative, interactive, and communicative nature of the group work in relation to processes and actions was expressed to be highly beneficial, and the inclusive approach of sharing knowledge and joint learning facilitated creative and technical development. This ‘re-design for pre-design’ approach deepened the understanding of knitwear design using existing garments – constituting garment- based learning – and suggested a sustainable, practice-based method of learning with a high potential within higher education in fashion design.

Introduction

The design process for knitwear is complex, since it requires knowledge of various factors relating to yarns, stitch patterns, colourways, three-dimensional forms, details and finishes. This often presents a challenge when beginners are designing knitwear. This project explored the possibilities offered by using discarded knitted garments as a methodological tool for learning knitwear design in order to connect the processes of making knit samples and garments. A workshop was held for first year BA Fashion Design students, which was intended to facilitate the transition between a foundational technical knitting course and the making of a knitwear collection.

The basics of knitting

In a basic sense, learning about knitting involves the obtaining of practice-based knowledge to a great extent: understanding of the stitches as a construction system, the handling of the knitting machine, the feel of the yarn and its properties, and the relationship between yarn andstitch pattern. All of this requires practical interaction with booth the tool and the material in order to explore and understand the consequences of decisions (Holroyd & Hill 2019, Sissons 2011). When one is learning to design knitwear there are many knowledge variables and stepsthat need to be considered. With regard to the yarn, there is knowledge and understanding of the specific properties and expressions of each yarn type and the fibre, as well as the consequences of different combinations of these. In terms of stitch, one must understand the different properties and expressions of each stitch type, and their combinations when used to create stitch patterns (Affinito et al. 2017, Motta & Conti 2018). Knitting gains in complexity when more than just one yarn type is used, or when stitch patterns are combined and explored through different densities, scales, repeats and regularities. Adding yet another layer to this complexity is form-building (Kalyanji 2020, Landahl 2015) which is created by how the textileis constructed.

Understanding and exploring different stitches, yarns, patterns and their accompanying design variables constitutes a basis for making and developing knitted samples. The design potential identified in relation to a knitted sample can in turn feed into the process of garment development, although it is not always a smooth transition from knitted sample to garment at the beginning of the learning process. Otto von Busch argues that “a good handling of stitches does not guarantee a good design of a sweater” (2015, p.13). What constitutes a good design is far more complex to understand, the transition from knit sample to garment takes place on both a dimensional level – from two to three dimensions – and in terms of the shift from designing separate units to designing a composite whole. Changes in form and scale affect each part and each part affects other parts, constituting a system wherein variables are in interaction. What is learned from each design segment and phase, along with how choices and decisions affect the final outcome/design, constitutes knitting knowledge.

Digital tools such as CLO and the SDS-One Apex system are becoming increasingly integral in fashion knitwear design education, enabling three-dimensional experimentation, prototyping, and simulation and thus facilitating the transition from knitted sample to garment.

Whilst these tools open up for new possibilities, they do not facilitate the complete transmission of knowledge regarding the physical, tactile material, nor garment qualities such as material behavior, elasticity (of different stitch patterns), weight, drape, and movement.

Garment as a knowledge generator

The form and material properties of existing garments could play an important role in bridging the transition from knitted sample to garment. Garments are generally recognized as containing knowledge, as with e.g. archive pieces that are collected by museums, fashion houses, foundations and in factories and educational institutions. They can be used to study form and material characteristics or for replication, analysis, or reverse-engineering, which are integral parts of fashion learning. More recently, re-design and upcycling practices have focused on garments as central design elements. The selection of garments for such processes differs from those used as archive garments in terms of status and quality; the former is often worn out, damaged, obsolete and devaluated, they present a design challenge that involves recreating value by revising the appearance, function, and content of the chosen items. The skills of reknitting and deconstruction of garments are highlighted as aspects of the domestic circular economy (Holroyd, 2018), and were felt to be equally valuable during the process of this research with regard to providing a deepened understanding of the system of knitting in order to design from an informed standpoint.

Discarded knitwear

The most common materials used for practice-based learning in knitwear design are fibre-based materials, often virgin yarns. Knitwear can be produced without a large quantity of pre-consumer waste due to the fully fashioned and whole-garment technologies. However, there is a high rate of post-consumer waste; Björkåfrihet, a non-profit organisation in Sweden, which collects and resells discarded garments, states that knitwear is among the most difficult of garment categories to resell due to the changing properties of knits in terms of both form and surface and wearers' narrow acceptance of this type of property change (personal communication, Nije 2019). As compared to the popular wear-and-tear concept of denim, worn-and-torn knitwear is generally not looked upon as trendy or stylish, and is consequently not as desirable.

This background knowledge led to reflection on this unwanted resource and recognition of the potential that it might contain as a learning tool for knitwear design processes: discarded knitwear could open up for profound learning with regard to understanding materials, techniques, form construction, and design, and furthermore initiate reflection and ideation. This transformation of resources, from post-consumer waste in one context into a highly beneficial learning material in another context, relates to the social process of 'resourcification', the ability to see another potential and use it for new purposes, as defined in the manifesto by Hultman et al. (2021) are relatable for the idea of material use, as pursued in this research.

A workshop was tested in a basic knitting course to test whether this sustainable design approach could provide a better understanding of the different stages of the knitwear design process.

Workshop methodology

The workshop was held in April 2021 over the course of three and a half days (spread over two weeks), and was attended by 16 students who were divided into four groups of four. The participants were BA Fashion Design students in the first year of their studies at the Swedish School of Textiles, University of Borås, Sweden, and the workshop was intended to test the concept of learning knitwear design processes based on post-consumer waste knitwear as a tool for analysis, ideation, and experimentation. The sorting facility of Björkåfrihet in Gothenburg provided material to the workshop in the form of discarded donated knitwear that had not been possible to sell. The participants were informed that the workshop was a research project and that the process and results could be published, and all gave their consent for publication. Presentations were audio-visually recorded and PDF files containing visuals and text, which documented the design processes, were obtained from each group. All photos published in this research article are taken by and belong to the workshop participants.

The workshop was conducted as a module in a five-week basic knit course, the aim of which is to teach basic knitting through modules such as knitting technology, material theory, and practical skills and experimentation on domestic and hand knitting machines. The knowledge acquired on this course forms the foundation for a following design project course, wherein students create a number of outfits in a knitwear collection. The workshop had a two-part structure: the first part involved analysis, reflection on, and categorization of knitwear reference images, which were selected by the students, while the second introduced physical material in the form of discarded knitwear as a tool and starting point for analysis and exploration. In relation to unwanted changes in the provided knitted garments, such as pilling, twisted seams, stretched- out rib hems, and elongated garments, three categories were created – Form, Surface, and Detail – in order to facilitate focus and direction in terms of the explorations. After a selection phase in which 10 items were selected by each group, the garments were laid flat and their front and back side were photographed; they were then analysed using the knitting knowledge that had been obtained already in the course. The garments' materials, forms, technical data, details, fit, state, and quality were identified and categorised during this process. The garments were to be used to trigger ideas and conduct experimentation in relation to the categories that were created. Sampling or prototyping was used as a method of learning, understanding, and reflection (Koskinen et al. 2011). Each group were to explore independently and without our interference in the process.

The workshop format is recurring in collaborative research and according to Scott and Gaston "offers the opportunity to explore materials and techniques suitable for knitting leading to greater understanding of the potential of the material system" (2020, p.269). The possibilities of materials and techniques in relation to each other was at the core of the investigations and was approached differently by each of the four groups.

Workshop process

Group A

Group A selected six garments for their exploration, two in dark colours, three in a light colour shade and one in a two-colour pattern (Fig. 1).

Fig. 1: Garment selection

For the analysis of the potentials of each item, a system of plus and minus was used by the group. While the plus category was pointing at positive features of the item, the minus category was highlighting the challenging aspects of the piece, deviating from qualitative standards. However, from an ideation and exploration point of view/perspective, both evaluation features, plus as well as minus could initiate design processes (Fig. 2).

Item	Plus (+)	Minus (-)
Sweater 1	Shrunken/felted Easy to sew Not unravelling	Shrunken/felted
Sweater 2	Rib details	Pilling
Sweater 3	Stretch Thin Shape	Fit
Sweater 4	Rib details	Pilling
Sweater 5	Quality Stretch	
Sweater 6	Pattern Dense	Pattern Fit

Fig. 2: Garment evaluations

The group started out to explore garment characteristics, such as the form, the fit and the overall expression (look) with a strong emphasis on the final result. Draping experiments were

conducted either on person/life model or on a dress stand. Rather than working with small material samples the forming possibilities in relation to the given material properties were tested in a whole garment approach of single garments or combinations. The final garments were seen as the main results rather than the process. Analysis and ideation were conducted collaboratively within the group, while the making was partially conducted individually and partially as teamwork. The explorations led to 6 end results, presented as 6 garment suggestions for the upper part of the body.

Fig. 3: Explorations of elasticity

Fig. 4: Exploration using rib details

Figure 3 demonstrates the exploration of form in relation to stretchability/elasticity through insertion of a circular shape/hula hoop. The result was tested on a life model in relation to movement. Another experiment (Fig. 4) focused on the exploration of fusing/combining two sweaters with a focus on their rib details. The rib details were arranged on the body as a graphical pattern with two contrasting colours (light grey and dark grey). The contracting- stretching potential/property of the rib structures enabled circular arrangements and form compositions on the body without the problematic of creasing parts.

Reflection from a student in group A, expressed in writing at the end of the workshop: *"To see an already made garment and then try to see beyond the given form and only the potential in material, I think is a very fun way to train my fantasy and designing skills. I also learned that I really enjoy working with knit because of its ease to both form against the body/forms and also expand to big forms with a lot of movement."*

Group B and D

Group B and D worked in a similar approach. Six discarded garments were used for analysis and exploration. The knitwear items were analysed and grouped in the categories: *form*, *detail*, *surface*, *structure and intentional holes.* The sweater (Fig. 5) was for example allocated within the category *detail*, and the significant feature; the cable knit, triggered the ideation and gave direction to the exploration process. Possibilities and ideas were tested and communicated through sketches and notes. (Fig. 6) The cable knit structure was then explored through the action of unravelling, located around the cables or within its structure, generating diverse expressions as well as properties. (Fig. 7) Placements, directions and draping possibilities of the altered material were explored in relation to the body (Fig. 8).

Fig. 5: Discarded cable knit sweater

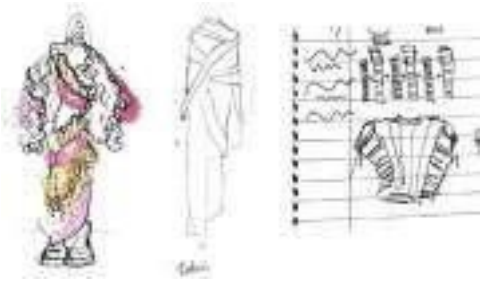

Fig. 6: Sketch work

Fig. 7: Explorations of cable knit

Fig. 8: New design example derived from cable knit

The final result for group B consisted of three experimental garments, one from the category *detail*, and two from the category *form*. Group D also tested their ideas through sketches before conducting the practical explorations. Each experiment was building on a prominent feature of the selected garment. In one example combinations of stitch structures in different gauges and expressions of different assembling techniques were tested. Both group B and D focused on the process and the exploration of possibilities as well as on a final outcome. All of the phases; analysis, ideation, exploration and finalizing were conducted in collaboration.

Reflection from a student in group D, expressed in writing at the end of the workshop: *"Upon reflection I really enjoyed this workshop, mostly for looking at previously knitted garments then taking what parts I enjoyed and appealed to me then applying them to the body via draping, this helped me to start to think how various gauges and knit techniques looked in a "garment" context. Just draping with the stretch properties of knit fabric was really fun as it could be manipulated to easy in many ways and have many fitting styles and feelings of directions."*

Group C

Group C selected nine sweaters for their explorations. The following characteristics were identified in the garments: plain knit, rib knit, short sleeves, long sleeves, monochrome and striped colour patterns. When analysing each item, they noted their thoughts, findings, potentials and ideas on black and white photo copies of the garments. The notes described stitch structure, yarn composition, fully fashioned or cut and sew, colours and finishing details (Fig. 10).

Fig. 10: Garment analysis

The group stated to focus on the process rather than the final result. Emphasis was put on an experimental, playful approach to the assignment, and to conduct every step as a collaborative act. Design potentials, new forms and garment types but also the limitations of the knit structures were tested on the group participants acting as life models. Domestic knitting machines were used as tools, metal wires were incorporated for form manipulations of the garments. Actions like cutting and assembling were performed in interaction.

Experiments were conducted both as small-scale material samples and technique manipulations as well as on garment or body level (Fig. 11).

Fig. 11: Experimentations

In the last step of the process, the participants put their design examples together as one outfit, consisting of hat, top, pants, stockings, shoe accessory and bag. All examples except one, which was about structure dealt with the category form. The explorations were developed from the findings of the analysis phase. Approaches with one as well as with several garments were performed.

One idea was triggered by a material property - the fluffy hairy texture of the material. Actions like cutting and gathering were used to create volume, and metal wires used to further manipulate the forming capabilities (Fig. 12). Another design example explored the draping possibilities triggered by the direction of two stitch structures in interaction, for the creation of a new garment construction. Through the unravelling of parts of the garments, another surface texture, fringing and a semi-transparency was achieved (Fig. 13). In Figure 14, a sweater with a grey and green stripe pattern was unravelled and the yarn was reknitted on a domestic knitting machine into a bag. Through the act of reknitting and yarn sequence, the stripe pattern was transformed into a gradient pattern.

Fig. 12: Re-forming

Fig. 13: Combining

Fig. 14: Re-knitting

Group A, B, C, D

Upon analysis of the workshop outcomes and reflections of the participants, certain patterns regarding methods of exploration and learning outcomes could be identified within all groups.

Common methods were identified as:

- Explorations of unravelling.
- Explorations of elasticity.
- Interplay of different knit structures.

Common learning outcomes were identified as:

- A new understanding of the potentials for forming and draping based on garment properties.
- Positive aspects of collaborative work in regard to diversity in ideation and finalization phases as well as in regard to quality (of design work).
- Understanding of the impact and the consequences of design decisions.

Garment-based learning

Garments as methodological tools

Garments can be described as a foundational source for analysis, ideation, as well as for design and method development. Existing garments have been widely used in the context of learning purposes by museums, industry or educational institutes. They have been studied, replicated and transformed. Knowledge has been generated from garments through various methods in relation to form and material but also technical, social or cultural aspects.

A knowledge acquisition based on garments has tradition, however to further reflect upon the garments' role as a knowledge generator and in a pedagogical context as a source for learning is valuable in regard to design making and sustainable thinking, moreover when it comes to the training of fundamental design skills. Unlike archive garments, discarded garments offer, next to the information of technical data, the possibility for direct, practical exploration. As waste materials they can be disassembled, cut, unravelled, altered or reworked, and consequently be used to develop artistic and technical skills, design sensitivities and methods. A garment-based

learning approach means focusing on garments as a knowledge source, to learn from (analysis) and as a source to learn through (practical exploration/doing).

Re-design for pre-design

From a perspective of garment-based learning a re-design approach was used for exploration, though with a different aim than that of re-design practices. The acts of re-designing were used within this workshop as a methodological approach, with the focus on how garments can function as a source for learning and knowledge assimilation rather than creating a new product. The learning outcomes resulting from these acts were evaluated in regard to how the students' level of knowledge had expanded and how these learnings could then feed into future design work**.**

Conclusion and discussion

The knowledge gained during the workshop provided the students with an understanding of the design possibilities of knits and assisted in the development of ideas in relation to garment- and collection-making, and helped bridging the gap for the students in their transition between designing small scale knit samples and garments. It was expressed that the understanding of the differences between various knitting properties, structures, techniques, garment forms and details had been deepened, and that these learning outcomes could be applied to their own collection-making processes. Ideas, methods, and knowledge gained during the workshop were used and further developed by the students in the subsequent design project course, wherein they design individual knitwear collections. As a teaching method, the re-design for pre-design approach showed high potential for knowledge assimilation on different levels.

On a concrete making level: Through the actions of unravelling, cutting, destroying, stretching, assembling, wearing, repeating, positioning, restitching, and reknitting, knowledge was gained about stich structures, materials, form properties, and the relationships between them, as well as garment details and finishing. This facilitated knowledge acquisition regarding making design decisions in a deliberate way and experiencing their consequences in a concrete way.

On a fundamental level: The participants stated that the existing items invited the 'seeing of possibilities' in terms of directions that could be explored. The garments were understood to be systems of design components, catalysts for ideation and exploration, and carriers of technical information, all in relation to design decisions. They furthermore indued in-depth explorations that aimed to define and test the implications of expressions (Hallnäs, 2017). Traditions, norms, potentials, and challenges consequential to previous design decisions were identified in the garments, and contributed knowledge for future design decisions.

The group work, which involved collaboration, interaction, and communication in relation to processes and actions, proved to be highly beneficial. It was pointed out by the participants that the inclusive approach of sharing knowledge and joint learning facilitated the creative and technical development. Fashion design education often builds on an individualistic approach to designing, though in transitional thinking in relation to a sustainable future, collaboration has been highlighted as a key factor (Fletcher & Tham, 2019), pointing to the value of further developing the collaborative aspects in fashion design education. With regard to future research, the problem of the large quantity of post- consumer waste relating to knits could initiate practice-based explorations with the aim to design knitwear in such way that the factors

that cause its devaluation are reduced. In this context, these factors could initiate design challenges and become a point of departure for new suggestions for more enduring knitted designs. The workshop demonstrated great potential to become a course or course module with the intention of teaching knitwear design through garment-based learning, in addition to existing teaching methods.

In conclusion, the *"re-design for pre-design*" approach constitutes a sustainable, practice-based design method that deepens the student´s understanding of designing knitwear througha *"garment-based learning".*

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