Knitted objects
Exploring flat knitting as a technique to design form
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1.1 Representative images of work

Collection *Knitted objects*
1.2 Abstract

This work places itself in the field of textile design, knitting and three-dimensional objects. The primary motive is to investigate flat knitting as a technique to design form. The aim is to explore the possibilities within flat knitting in order to explore the relationship between knit and non-textile components to achieve three-dimensional forms for sitting. The design process consisted of experimental sketching on a flat knitting machine and small prototypes were produced. Rib, plain knit and mesh structures were tested in combination with partial knit, intarsia and plating. These bindings and techniques were combined with steel constructions to explore possibilities for shaping and function. By integrating a non-textile component as support in the knitted samples three-dimensional objects are created. The outcome of the study is a collection of knitted objects. Common for these is that they all suggest a function in relation to seating. The textile in the construction serves a function, an aesthetic expression and as the connection material in the construction. For further development, the possibility of creating textiles for furniture with capabilities for changes in expression and function can be explored.

1.3 Keywords

Textile, design, knit, flat knitting, form, plating, rib, mesh, construction, function
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2.1 Introduction to the field

Various textile techniques are used in different areas depending on their properties. Knitting is often seen as a technique used to make clothing because of the flexibility and adaptability. Traditionally the knit follows the body’s movements and adapts easily to the shape of the body. The knitted fabric used for clothing is often produced on a circular knitting machine. Then cut into garment panels and sewn together to form a garment. On a flat knitting machine, it is possible to do integral knitting where garment panels are knitted directly into shapes and afterwards sewn together. In addition, there is complete garment, where a whole garment is knitted directly into a finished piece (Peterson, 2018). The benefits of these two techniques are minimal waste of material and time-saving in production. The possibility of knitting form directly in the machine creates new opportunities for use.

A piece of knitted fabric can be used to dress a form or even more intriguing, it can be knitted directly into a form. In the shoe industry, sneakers are knitted as a combined form on flat knitting machines. It is possible to knit different properties into textiles by combining different materials and bindings. The Nike Flyknit (2012) is a sports shoe which is created with integral knitting techniques. The combination of bindings and materials makes the shoe lightweight and creates support for the athlete’s foot. Other shoes are designed to be more flexible or breathable depending on the purpose.

When the textile comes out of the machine, it is flat. Depending on the choice of material, it is possible with an after treatment to change the form and its qualities. The chair Tent (fig. 2) by Benjamin Hubert (2017) is 3D-knitted. Small cushions are created in the textile, when it is activated by steam.

Another example within the field is the Shift chair by Jonas Forsman (2014) where the properties of the knit are seen in the movement of the foldable chair. When used, it forms around the structure, whereas when not used it is flat and easy to store.
3D-knitted textiles can advantageously be used in an architectural context. In *KnitCandela* by Zaha Hadid Architects (2018), the knit is used as a shaping element in a concrete construction. The knitting technique minimizes the cutting process and pockets are knitted in the textile, which is used for small modelling balloons in the process of shaping the form with concrete.

### 2.2 Motive and idea discussion

In this degree work, the knitted textile is used to join non-textile materials together that create, support and reinforce the knitted form. The same approach for joining materials together in order to create form is seen in *The Thread Wrapping Architecture* by Anton Alvarez (2014). Objects are created by joining together many wooden components in threads while coating them in glue (fig. 5). This technique replaces the traditional thinking of joining together with screws but instead it uses an unconventionally material as a thread. In this degree work, the knitted material is used to join together the construction.

Another aspect of joining materials is shown in *Latta Chair* by Anne Von Schewen (1997), where the combination of textile and wood gives a three-dimensional form (fig. 6). The two materials create a form where one of the materials could not be omitted because they depend on each other. The textile material is woven. The size of the textile depends on the width of the weaving loom and the length can be several meters. However, in this degree work, the properties of flat knitting are used to shape the knit directly in the stage of programming.
In Nando Dolleman’s (2018) *Local Optimum* (fig. 7), circular knitted fabrics are stretched out on a metal frame. The textile is used as the main element in the construction, and the tension of the fabric makes it useable for people to sit on it.

In these examples, the textile is essential for the design. The objects would not work without the presence of the textile. Usually, when creating furniture with textiles, the fabric is often placed at the end of the process (Agesund, 2008). An idea is to change the order of the process and incorporate the textile as the first component when creating form, and let the properties of the textile in combination with the non-textile components control the form.

Deconstruction is the word that captures the essence of the table Seven by Lith Lith Lundin (2013). The concept is an easy-to-assemble furniture (fig. 8), where the leather straps are the important connecting material, that hold the construction together by the combination of tensile and compression. Sustainability is also a central part of the design, as all materials can be separated at the end of the products life and be recycled. The possibility of separation and deconstruction is likewise a quality used in this degree work.

Several forms can emerge from one specific form depending on the material and interaction. In *Moving meshes*, Maria Blaisse (2008) is exploring how several forms emerge from a form made of bamboo, while interacting with the movement from the body (fig. 9). The expression of the form is affected by the dancing person. In this degree work, the weight of the body is used to explore the properties of the knit and its abilities for shaping.

The primary motive for this work is to investigate flat knitting as a technique to design form. Form that is flat knitted but designed to become three-dimensional when combined with a non-textile component. The textiles are designed to be the main component of the construction, where it is possible to change the textile through an action. The textile in the construction serves a function, an aesthetic expression and as the connection material in the construction.
2.3 Aim

The aim is to explore the possibilities within flat knitting in order to explore the relationship between knit and non-textile components to achieve three-dimensional forms for sitting.
3.1 Design method

In this study, the design method is based on practical work. A practice based research means that during the process of practical work new knowledge is gained by conducting practical work (Muratovski, 2016). The process is carried out as follows:

Research: The research is related to the aim. Literature and visual references were conducted to place the work in the field of the state of the art.

Pre-study: Analysis of the results from the pre-study.

Limitations: Samples from the pre-study were selected and carried on in the process.

Experiment: Experimental sketching was a part of the process. Sketches were done in other materials to do quick experiments. Photographs were used as sketch method and drawings were outlined in photoshop. Knitted samples were made on the flat knitting machine.

Prototypes: Prototypes are important in terms of getting firsthand insight on how a form is experienced, used and designed (Koskinen, 2012). Small-scale models and knitted samples were conducted to investigate form and material.

Material: Different materials were explored.

Colour: A moodboard was created to frame the visual expression of the work. Colour experiments with comfil or plating were established to explore how colours affected each other.

Construction: Small-scale models were analysed and produced in a larger scale.

Technical development: The knitted samples were knitted on a flat knitting machine and programmed in the knitting program. When programming, the mindset is in 2D but the outcome will be in 3D. The process was constantly moving between these two stages.

Production: Samples were chosen and produced for the three final pieces.
3.2 Pre-study

In the pre-study, a choice was made to explore the techniques; partial knit, intarsia, plating, and the bindings; rib, plain knit and mesh structure. The decision was based on what properties the techniques could add to a textile. The rib has good flexibility and sideways elasticity that makes it suitable for shaping. A mesh structure can either be stable or flexible depending on the material used. Three different directions to create form were explored: drawstring, stretching out and contrasting areas. The aim of the study was to explore knit as a technique to design form by exploring different bindings and materials. Here it was found that the textile can contain different properties depending on which additional materials are inserted in the textile. Depending on the material inserted, various possibilities for creating shape occur. The same form of knit technique could be used to either stretch, compress or change the material.

3.2.1 Drawstring

Fig. 10: Drawstring used to pull together the material.

Fig. 11: Drawstring used both to pull together the material and clamp the material to the frame.

Fig. 12: Drawstring shaping the knit when pulled.
3.2.2 Stretching out

Fig. 13: Mesh knit stretched out with painted wood sticks.

Fig. 14: Partial knit used to increase the form, so the surface is stretched out when in combination with the metal frame.

Fig. 15: Knit stretched out with plastic

3.2.3 Material and binding combination

Fig. 16: Comfil in the pink area creates a firm surface and the form becomes stable.

Fig. 17: A combination with 2:2 rib and plain knit. Plain knit creates tension and the rib is stretched.
3.3 Small-scale models

With the knitted textile in mind, small constructions were created in a flexible metal thread. This way of sketching made it possible to do quick sketches and explore the possibilities for shaping the textile in combination with the construction.

Fig. 18: Form experiments in small scale is approx 10x10 cm.

Fig. 19: Collection of small scale models. It is possible to flatten the shape and examine it.
Fig. 20: Sketching on shape.
3.4 Construction

Based on the small models, larger models were created. A more stable material was necessary, therefore a 18 mm non-alloy steel and outside galvanized tube was bent but without success. The tube was too thin and it cracked along the way (fig. 21). It was also tested to heat the tube or fill it with sand and subsequently bent, this did not work either. A decision was made to test 1/2” galvanized steel tubes with a larger thickness. These were easier to bend and it worked successfully (fig. 22).

Fig. 21: 18 mm non-alloy steel and outside galvanized tube.

Fig. 22: 1/2” galvanized steel tube.

Fig. 23: A 15 mm tube used as joint to connect the 1/2” galvanized steel tubes to each other.
3.4.1 Construction process

**Fig. 24:** Tool for bending steel.

**Fig. 25:** Sketches on wooden board used as a template to measure the shape along the way when the steel was bent.

**Fig. 26:** First test was unstable because of the angle of the bending. Tubes in a larger scale were welded to the construction. These tubes make the construction stable but still conserve the possibility for movement in the rocking quality.
Various experiments with plating in knitted samples have been made to explore how colours affect each other (fig. 31). Two colours that are close or similar in the light intensity but contrasting in their hue can create a vibration together (Albers, 2013). This also applies to the knitted fabric.

Depending on the proportions in the rib, the amount of each colour will change controlled by the placement of the colours in the plating. All yarn colours were also tested in a plain knit with a comfil thread to see how the colour would turn out when the material was steamed (fig. 30).
3.5.1 Colour on textile component

Fig. 32: Elastic band dyed with disperse dye at 60 degrees. It lacks colour due to the low heat.

Fig. 33: Elastic band spacedyed with disperse dye. Uneven dyeing due to the dyeing process.

Fig. 34: Elastic band dyed with disperse dye at 90 degrees.

Fig. 35: Polyester and comfil knit dyed at 90 degrees with disperse dye. Material is not stretchable after heating.

Fig. 36: Selection of knitted bands with polyester and comfil. Mixed colours create a melange effect. These were not used further in the process due to too much structure and melange effect in relation to the knitted material.

In all knitted tubes, a drawstring was necessary. These drawstrings should also match the colours of the knitted materials. White elastic strings and bands were dyed with disperse dye at 60 degrees to test the reaction of the material with the heat (fig. 32). It lacked colour and the elastic was still elastic after being exposed to 60 degrees. The same colour receipts were tested with the materials at 90 degrees and the colour nuance turned out successful (fig. 34). Samples from both tests were selected for the pieces.
3.5.2 Colour on non-textile component

Based on the colour moodboard, different shades of spray colour were selected and the test painted on the steel tubes (fig. 37). Either the colours on the steel tubes could be in the same nuance or create a contrast when combined with the knitted material. A decision was made to use colours that matched the colour of the knit the most, so the expression between the two materials were equal and balanced.
3.6 Development of piece 01

Textile samples

Fig. 40: Mesh knit stretched out and shaped by plastic tubes.

Fig. 41: Mesh knit stretched out with painted wood sticks.

Fig. 42: Rib with tubes.

Fig. 43: With the same principle as fig. 43, a sample was made with tubes in a bigger scale.

Samples were chosen from the pre-study as they show the flexibility of the knit when it is stretched out by another non-textile component (fig. 40, 41, 42, 43). The form of the construction is based on the textile samples and different small-scale models were selected and analysed (fig. 44, 45). A sketch was conducted for the final form (fig. 46).

Form and construction

Fig. 44: Small-scale models are approx. 10x10 cm.

Fig. 45: Photoshop sketch.

Fig. 46: Sketches for the final construction.
3.6.1 Development 1:1 scale

Fig. 47: Plain knit in red areas with purple partial knitted tubes in plain knit.

Fig. 48: Knitted tubes filled with plastic tubes. Contrast is created between the non-filled and filled areas.

Fig. 49: Two different sizes of tubes filled with plastic tubes.

Fig. 50: Photoshopped collage sketch to explore the volume of the textile.

Fig. 51: Mix of flat and outstanding tubes. Knitted sample is too loose on the frame.

Fig. 52: Close up on knitted sample with flat and outstanding tubes.

Fig. 53: Red flat tubes knitted with mesh structure in between.

Fig. 54: When the knit is stretched out, a tension is created and it is possible to sit on it.

Fig. 55: Dark blue flat tubes knitted with mesh structure in between.

Fig. 56: Three knitted pieces connected with turquoise elastic band. The knitted textiles in combination with elastic bands holds together the metal frame. Without the textile the frame is not durable.
The prototypes with plain knit and filled knitted tubes (fig. 47, 49) were not chosen because the plain knit is loose in the structure. The textile was not functional and a decision was made to replace the outstanding tubes with flat tubes. The area between the tubes was replaced with a mesh structure. A mesh structure is more stable and it is possible to still have the flexibility (fig. 55, 56, 57, 60). By changing the mesh (fig. 57, 60) with a spacer knitted mesh (fig. 58, 61) a more stable quality has been achieved.

Fig. 57: Mesh knitted with plating. The sample consist of only polyester threads.

Fig. 58: Mesh knitted as a spacerknit, with one comfil thread + one polyester thread as inlay threads to strengthen the material when steamed.

Fig. 59: A smaller scale on the tubes than the other samples. The size of the tubes is approx. 1 cm.

Fig. 60: Thin material, loose structure and very stretchable.

Fig. 61: Compared to fig. 60 the material is still stretchable, but with more resistance and strength in the material due to the knit binding and extra yarns.

Fig. 62: Less material in combination with comfil makes the sample shrink even more. The mesh structure is not visible.

Fig. 63: Colour experiment. Same colour on the backside tube as seen in fig. 64. The frontside of the tubes makes the purple mesh paler.

Fig. 64: Colour experiment. Same colour on the backside tube as seen in fig. 63. The dark purple frontside makes the colour of the backside mesh brighter and a higher contrast occurs.
3.7 Development of piece 02

Textile samples

Fig. 65: Rib knitted with small tubes. It is possible to insert a drawstring in the tubes. When pulling the string, the textile is formed. Different tension creates different qualities.

Fig. 66: Knitted rib mixed with partial knitted tubes. Drawstrings make it possible to compress the material. When the rib is pulled together, wrinkles are created.

Two samples from the pre-study (fig. 65, 66) were selected as they show opportunities for changes in a textile. Different length of knitted tubes made it possible to change the form when a drawstring was going through the tubes. The areas between the drawstrings were still flexible because of the elastic properties from the rib.

Based on the shape of the textile, small-scale models were selected and analysed (fig. 67). A sketch was made for the final construction (fig. 68).

Form and construction

Fig. 67: Small-scale models are approx. 10x10 cm.

Fig. 68: Sketches for the final construction.
3.7.1 Development of textile

A flat knitted and circular knitted rib were tested on the construction to explore how the form worked in combination with textile (fig. 69). The rib is very flexible and stable, therefore, tension is needed so that the weight does not touch the floor.

A decision was made to create a textile with more volume to create a more compact material with higher resistance. The volume of the knitted textile complements the construction (fig. 74).

Fig. 69: The textile needs a point for the weight can lie on, so it can be used to sit on. If the fabric is placed on the side of the frame there is no resistance and it will slide down.

Fig. 70: Two colors mixed with one comfil thread. When steamed the whole sample shrinks.

Fig. 71: One thread of comfil in the purple area. When heated it shrinks and the knit captures the foam. The green area is transparent because the back side shrinks and therefore the front side is stretched.

Fig. 72: Comfil in both colors makes the sample shrink on both sides.
3.7.2 Development 1:1 scale

Fig. 74: A larger piece of the chosen sample was knitted to explore its properties.

Fig. 75: Drawstring in the small tubes are used to form the textile and create form and density.

Fig. 76: Photoshop sketches for exploring the possibilities.

Fig. 77: When the weight of the body is placed on the textile it stretches out and the tubes on the sides get a new form. The filled tubes make it comfortable to sit on.

A larger scale was conducted to explore the qualities and possibilities within the chosen sample (fig. 74, 75, 76, 77). The textile showed good properties for sitting since the fabric had the potential to be changed in density, which created a more stable material. A decision was made to knit the final piece 2 meters long to create a voluminous form.
3.7.3 Assembling process

Fig. 78: The process from filling the textile with foam and drawstrings, steamed to shrink and assembled with the steel construction.

Fig. 79: Filled textile with foam. When steamed the textile shrinks and captures the foam. In addition, the colour changes and the textile becomes more compact. Size of the textile approx. 2 meters.
3.8 Development of piece 03

Textile sample

Sample from the pre-study (fig. 80, 81) was chosen because it shows the possibilities within the partial knit to increase and decrease a material to create shape directly in the knitting machine. Furthermore, two different qualities are created in the textile by breaking up the elastic rib with small tubes. The area with the tubes is stiffer. This makes it possible to shape the textile into new forms.

Based on the shape of the textile, small-scale models were selected and analysed (fig. 82). A sketch was made for the final construction (fig. 83).

Form and construction

Fig. 81: Partial knit.

Fig. 82: Small-scale models are approx. 10x10 cm.

Fig. 83: Sketches for the final construction.
3.8.1 Development of textile

The ratio between the scale on the two surfaces was explored (fig. 84, 88) in relation to the steel construction (fig. 102, 104). The first sample (fig. 84) divided the form into two because the dividing line was placed in the middle, therefore, a sample was conducted with a smaller amount of the stiff area to explore the difference (fig. 88). This sample was better suited and it matched the expression of the shape.

The line between the two areas showed possibilities for shaping the textile when a string was going through the already existing holes in the knit. This was experienced, when the string was pulled a tension was created in the textile (fig. 105).
3.8.2 Development 1:1 scale

Fig. 89: Sewn sketch in elastic fabric for measuring and exploring the form.

Fig. 90: A large knitted piece of textile. The rib is enhanced by the movement of the form.

Fig. 100: When weight is placed on the textile, it stretches out. The textile does not have enough tension and the placement of the person is lower than expected.

Fig. 101: Textile on the form without string.

Fig. 102: Knitted sample (fig. 84).

Fig. 104: Knitted sample (fig. 88).

Fig. 105: Tension in the material is created when the string is pulled.
Since two of the pieces have different colours on each side, a decision had to be taken in relation to which side should appear as the front side. A cold colour scheme was chosen. The blue piece has a dark and a light side. The dark blue side was chosen because it matched the other nuances the best. The light blue created too big a contrast between the pieces. The amount between the dark blue and light blue makes the light blue colour to pop out (fig. 106).
4.1 Result

The result consists of a series of three knitted objects where the possibilities within flat knitting have been explored to achieve three-dimensional forms for sitting. The pieces demonstrate different qualities in the knitted material and suggest another aspect of what the textile design field can include in terms of technique, expressions, and context.
In piece 01, the knitted textile is stretched out and it holds the steel construction together. The textile is knitted as a spacer fabric, which means that extra material is inserted as inlay threads in the material. Therefore, the material has good resistance, which makes it suitable for sitting. The textile has two different colour surfaces so it is possible to change the expression of the form.
Fig. 110: Programming for the spacer knit mesh. Red color is the inlay thread that consists of one comfil and a colored polyester thread. The blue area is the knitted tube. The tube is knitted with two colors, one on the front and another on the back.

Fig. 111: Yarns.

Fig. 112: Material and color sample.
4.1.2  02

Comfort is created in piece 02 when the knitted tubes are filled with foam. Through the smaller tubes, an elastic string is used to shape the textile when it is pulled. When pulling the string, it shows the ability to change the shape and density of the textile. The density makes it possible to use for sitting.

The textile has two different colour surfaces so it is possible to change the expression of the form.
Fig. 115: Material and colour sample.

Fig. 116: The yellow area is programmed, thus the blue tube is closed and the purple tube is open. The orange and blue areas are tubes used for steel construction. The light blue is filled with foam and the purple area is filled with an elastic string.

Fig. 117: Yarns.
The textile in piece 03 (fig. 118,119) consists of two contrasting qualities, stiff and flexible that shapes the form. An elastic string is used to change the tension and shape the textile even more. The tension creates possibilities for sitting.
Fig. 120: Programming with partial knit. Orange and blue areas are knitted tubes used for the steel construction. The yellow and green area is a rib 4:4 and 2:2. The yellow area is partially knitted tubes.

Fig. 121: Colour arrangement showing bindings for the different coloured areas.

Fig. 122: Material and colour sample.

Fig. 123: Yarns.
4.2 Presentation

The pieces were presented standing on podiums. The fundamental idea was that the objects should all be strong and sufficient enough to clearly communicate the overall concept.

Piece 02 and 03 were placed on a podium in the height of 20 cm to match the scale of the pieces. Piece 01 were presented on a podium in the height of 50 cm due to the small scale. The height difference between the podiums created a good balance in the exhibition (fig. 124, 125). Small signs with the text ‘please do not touch’ was placed on each podium.

A sample room was created for the audience to be able to experience and touch the materials (fig. 126). Placed next to the samples was a book showing pictures of the process from the pre-study.

In addition to the pieces, three short videos were presented on a screen showing the qualities within each piece. The videos showed the assembling process, the ability of the textile to change function, and possibilities for sitting.
Fig. 125: Exhibition TXTL at The Textile Museum in Borås.

Fig. 126: Samples placed in the sample room at the exhibition.
4.3 Conclusion

This work has explored how to use knit as a technique to design form. A form can be shaped by combining different knitting techniques, bindings and materials in combination with the non-textile component - steel tubes. By using intarsia, it is possible to separate materials and bindings in areas. This means that contrasting areas can be created in a knitted material. These contrasting areas can give textiles different properties and functions such as shaping qualities and higher resistance for weight. Partial knit is a useful technique for increasing or decreasing with extra material when creating shape in the knit.

Knit is important for this project because it is possible to create form directly in the knitting machine without creating any waste material. Besides that knitting is very flexible - its possible to create textures, surfaces and properties for function by using different bindings. I have used partial knit to create tubes, which are filled with a non-textile component to support the knitted shape. With this knitting technique I have created a functional object for sitting.

All three pieces are prototypes that demonstrate the potential for sitting. When the knit is stretched out on a steel frame, the tension makes it possible to sit on. This is seen in piece 01 (fig.108,109) where a plain knit is used for the flat tubes in combination with a spacer knitted mesh. Two different qualities are thereby created in the textile. The mesh is stable and firm, however, the tube is flexible and stretchable. An elastic band going through the tubes enhances the elasticity when stretched out on the frame.

Piece 02 (fig. 113,114) is knitted as plain knit in tubes where it is possible to use both sides as the textile is inverted in the colours. This means that the object contains two different expressions. The tubes are knitted with nylon and polyester yarns in combination with comfil. The tubes are filled with foam and afterwards steamed. The comfil shrinks when exposed to steam so the knitted material compresses the foam in the tubes. Drawstrings are added in the small tubes, which makes it possible to change the form, expression, and function of the textile.

In piece 03 (fig. 118,119), tension is also created when pulling in the drawstrings to tighten the material. Depending on how much the elastic thread is pulled, the tension changes and creates different comforts for seating. Two contrasting areas are created in the textile. A rib 2:2 are expanding when sitting on it. A more stiff area is created when a rib 4:4 is broken up by knitted tubes. These tubes are filled with wooden sticks to enhance the stiffness even more.

All pieces are designed so that they can be taken apart, which is also seen in the table Seven by Lith Lith Lundin (Fig. 8). The ability to separate all materials has many advantages. Seen from a sustainable aspect, there is the possibility of separating all the materials, so when the products life is over the materials can be recycled. In addition, it is possible to change the expression of the knitted forms since two of the pieces are double-sided in the textile. For further development, the steel frames can be developed so they can be assembled in several different ways to create new forms. For each new form, which can be developed from the steel construction, the textile should be able to adapt. This is my vision for this concept for further research.

We are used to static furniture, which can not be adapted to the users’ personal needs. I want to challenge the way we perceive textile furniture. Forms developed for clothing have possibilities to adapt to the body by using for example drawstrings. I have worked with incorporating the same properties for textiles used for objects that can be used for sitting. I want to give the user the opportunity to shape the form as the person finds interesting, aesthetic, or comforting.
4.4 Discussion

In the field of furniture design, there are many different aspects of sustainability, for example, using sustainable materials or designing products with multiple functions. The chair Tent by Benjamin Hubert (fig. 2) consists of a technical textile, which is flat knitted in recycled nylon. Comfort is incorporated into the textile by using a special knitting technique to insert extra material seen as small cushions. The textile is fixed on the frame and it makes the chair possible to use for sitting.

For me, as a textile designer, the textile has been the starting point of this project. The knitted textiles properties have been explored as the first to see which possibilities for form that could occur, and which qualities that could be achieved. These forms and different qualities were afterwards analysed, in combination with a non-textile component, to explore how a function in relation to sitting could be applied to the design. My project differs from Benjamin Hubert's design as the textile in my objects is able to be changed after assembling. For example, you can tighten the strings to adapt the shape to the users' needs.

Flat knitting creates an opportunity to create a sustainable design as it is possible to knit an entire shape without having any waste material from, for example, cutouts. Therefore, it is important to incorporate all elements in the design from the beginning of the design process. Either to design a form and afterwards design the textile, or to apply the same method as used in this degree work. By working simulations with all elements at the same time, it makes it easier to get an understanding of creating form and how the different materials work together. Instead of adapting one material to another, you can make them work together and create a more fulfilled expression.

All three pieces, in the collection, have the ability to change in one way or another. The possibilities for change are seen, as some of the textiles are double-sided, which mean they have different colours on both sides. Thereby, the expression of the object can be changed depending on which side that is used as the front. In addition, it is possible in two of the pieces to change the function and shape by using drawstrings. The ability to change the expression of the textile and form helps to extend its life since new aesthetic expressions can be achieved. For me, sustainability can be achieved when incorporating several possibilities into a design. I believe that a multifunctional product gives more value to the user since the user decides how to use the object and, consequently, it can be changed so it adapts to the person's needs. In this multifunctional degree work, the textile in the construction serves a function, an aesthetic expression, and as the connection material in the construction.

Furthermore, the assembling of all three constructions can easily be done. The possibility to take apart and re-assemble the constructions makes the objects easy to package and move. These designs take up minimal space when not in use. To prevent the design from not being used a further development of the concept on the steel constructions could be explored even further. The possibilities for assembling the frames in new combinations could be an interesting approach. The textiles could contain more options and be able to adapt to several forms.
5.1 Table of figures

Representative images of work.
Photographed by Jan Berg

Fig. 1

Fig. 2

Fig. 3

Fig. 4
KnitCandela

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10-107
Photo: Christine Snedker.

Fig. 108-109
Photo: Jan Berg

Fig. 110-112
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Fig. 113-114
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5.2 References


