The (r)evolution of Virtual Prototyping

→ Implementing CLO3D Software in Fashion Education

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DIGITAL FASHION · NEW TECHNOLOGIES · CLO3D · PROTOTYPING · IMPLEMENTATION IN TEACHING

Abstract

In this chapter, I will address how implementing the CLO 3D software within the fashion education may support the green transition and how dedicated 3D teaching methods help support students in making meaningful, responsible and creative designs.

As The Programme manager of Fashion and an educator, I am part of the Planet Lab at Design School Kolding. Together with my colleagues, we work towards making a relevant and responsible fashion programme where sustainability is a given. Since starting to implement the CLO 3D software in 2018, I have developed teaching methods to match the study progression and support the way we teach fashion at DSKD. By elaborating on these new teaching methods, I hope to show that existing courses at all levels can benefit from integrating digital 3D software to visualise a wide range of creative ideas virtually. By cutting down physical sampling in the fashion industry, textile waste can be minimised and even avoided if virtual prototyping

becomes an integrated part of design for sustainable business models reinventing fashion for green transition. Unfortunately, like other new technologies, it can also be used to accelerate the fast fashion industry if we stick to the currently unsustainable system.

1

DSKD Fashion

how and what we teach

The fashion education at DSKD is artistic based with a hands-on approach to clothes making in combination with digital tools. The teaching is backed by general design theories, including various approaches to design for sustainability. The design process is initiated through 2D sketching, research for inspiration, literature, data gathering and analysis leading to concepts for the actual project. Through pattern development and draping, the students explore making clothes in an inquisitive, investigative and experimental way using both half- and full-size dress mannequins for trying out ideas and informing possible solutions. The silhouette is made in calico and fitted on a model to check for fit, and finally, the design is made in the chosen material and colour. The process is long and laboursome and doesn't leave the students much time to try out various solutions, but physically realising the design in full scale is key to understanding a good fit and finding the right balance between shape, material and colour.

2

WHY 3D

The 3D software allows the designer real-time interactivity with 2D patterns, 3D form, and digital simulation of materials. It enables the designer to visualise the design before it is physically made or simply kept as a digital fashion item.

For some years, the fashion industry has been able to work with virtual prototyping through programmes such as CLO3D, Optitex and Browzwear, to mention a few. Some of these are based on 2D and 3D CAD programmes used for pattern making in the fashion industry, whereas CLO3D is based on Marvelous Designer, a software for making clothes and skins for avatars within gaming.

Although 3D prototyping is still to be fully embraced by the fashion industry, an increasing number of companies are starting to com-

bine traditional digital tools with 3D software. For those companies, the benefits are usually: time to market, flexibility, and saving costs on samples. Since production is mostly outsourced, companies can make significant cost savings by no longer having to send physical samples back and forth when getting ready for production. A simple style can easily be sent to a production site 3 times, and more complex styles, such as outerwear, may need to be shipped 7 times before it is ready for production. When using digital 3D software, the number of samples can be minimized as the digital rendering of the style provides an accurate impression of how the finished style will look. So, from a sustainability point of view, the immediate benefits of virtual prototyping can be listed as: minimizing the number of physical samples and saving fuel on transportation, visualization of styles for on-demand production, local production, and inclusion for end users. [a]industri in Göteborg, Sweden is an example of a visionary company that uses 3D software in very creative ways (https://aindustri.com/about), I will get back to this example when discussing the perspectives of implementing 3D software in education and the industry.

3

Three methods of implementing CLO3D into existing courses

When I started working with 3D there was no literature on how to implement it into a fashion educational context, so I looked towards research on implementing 3D for architecture students. I also used my network within CLO3D to discuss topics such as sustainability through minimizing waste, the possible effect on craftsmanship, how to secure physical experimentations, and the overall progression within the education.

The implementation of CLO3D has grown organically but steadily based on pedagogical theories used for cultivating students´ competencies and self-efficacy through scaffolding of the proximal goal setting via introduction, group work, and individual supervision.

Over the past years, I have developed new teaching methods and categorized the used methods as follows: The Linear, The Contextual, and The Hacked. In the following, each method is described through what and how we teach. Furthermore, they are evaluated in terms of their impact on learning outcomes and how 3D software can support a sustainable approach.

The examples in this chapter have been created by our talented students and demonstrate how 3D can be used as a tool for production, digital fashion and speculative design.

4

The linear method

teaching the software

In 2018 I attended an intensive 3-day academic training for educators at the CLO3D European Headquarters in Germany. The thorough introduction required knowledge of pattern making and clothes designing in general. It was taught step by step through exercises and covered all the tools in the programme - with a linear build-up and clear progression.

Back at DSKD I set up a pilot project for students in the Master's programme Planet as I wanted to learn how to teach CLO3D to the fashion students. The course was closely modelled on the introductory training I had attended and was technical, focusing on developing a pedagogical form rather than the content. The pilot project was not part of an existing course. It, therefore, lacked additional learning on, e.g., sustainability, pattern cutting, fit and sizes, and not least, it was without a design assignment to work towards. For these reasons, I believe it took the students longer to be experimental in each their individual way and to figure out how to make the most of the programme.

The Linear Method is now only used for Master Classes and has been refined with requirements of documentation of design process and deliveries to support the students' learning outcome.

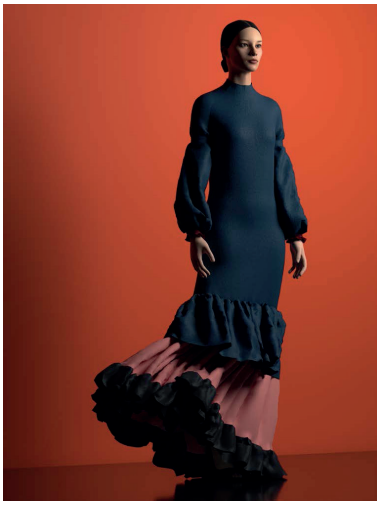

Figure 1. Examples of students' work based on The Linear Method.

Lærke Olesen, 2021

Figure 1-1. Examples of students' work based on The Linear Method.

XiBao Yeh, 2020

The contextual method

teaching 3D and pattern development

The Contextual Method is used in the 2nd year course Collection and Production, and the students have at this level some prior understanding of pattern cutting. The overall aim of this method is to teach pattern cutting using 3D and for the students to use virtual prototyping in both the design process as well as for planning production and communication. This means the students are taught both the software and new pattern-cutting skills simultaneously. Here it is important for the students to understand the transition of a digital asset into a physical product. To do so, digital patterns are printed on paper using a large format plotter in 1:1. This is used for making physical toiles for fitting on a dummy and a person. This process leads to corrections that are then applied to the digital pattern.

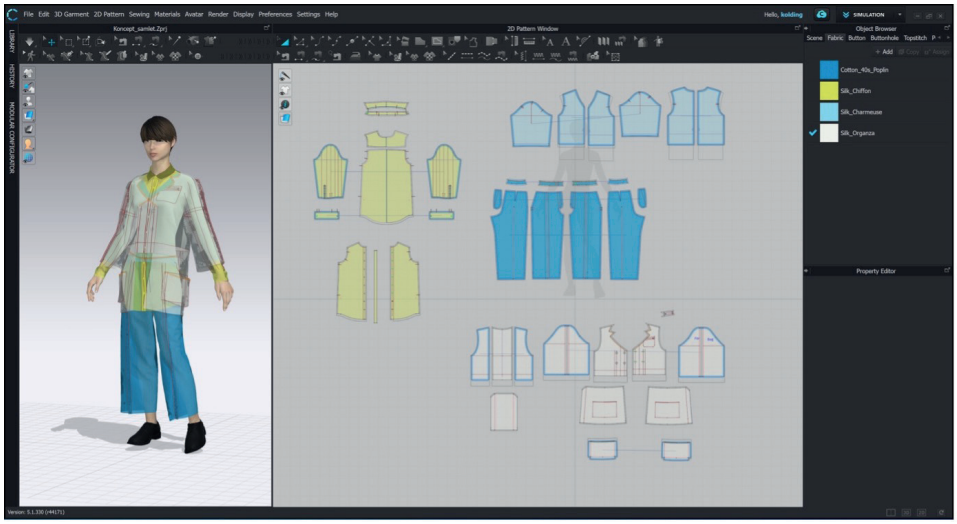

Figure 2. Example of work in CLO3D - display of 2D pattern and 3D garments, Vibe Juul Thomsen, 2019.

Figure 3. Virtual prototype on avatar, and final design, Vibe Juul Thomsen, 2019.

The alternating digital and analogue design process and prototyping help the students understand the digital version of the fabric, garment shape and simulation in relation to choosing the physical material with the right hand and drape for their style. Further focus on teaching the importance of fit, materials and pattern making, such as Zero Waste, can strengthen the sustainable design solutions. Pairing the contextual method with introductions to Corporate Social Responsibility (CSR), new business models and circular economy support the designer/student in decisions that contribute to more sustainable products and responsible production.

Whereas the linear method offers a complete overview of CLO3D's principle software tools, the contextual method is more goal-oriented and therefore leaves out certain aspects of the software. Through individual supervision and online tutorials, the students learn the specific tools required for their specific design.

The following two examples show how CLO3D is used by the students in the course Design for Change, which specifically focuses on designing fashion concepts for more sustainable futures.

5.1 Example 1, Future Fashion, Design for Change

"Exploring sustainability through technically enhanced garments, aiming for versatility and longevity", was the headline for the following example based on a collaboration between fashion and textile students from the second year in the course Design for Change. The students wanted to find a sustainable design solution where the end-user through an app could make a style that could: be genderfluid, fit various body shapes, be adjusted in size, and be customized using shape memory alloys.

The students based their speculative design on technology from self-lacing shoes and articles on development of shape memory alloys. As the technology is not fully developed yet they could only simulate the basic styles using CLO3D. Below are visualizations on where to weave and knit using shape memory alloys, and the final designs.

Figure 4. Knit with shape memory alloys, Isabella Nicholaysen, Maria Glintborg, Philip Johannesen, Clara Emmerling, 2021.

Figure 5. 1 style - 5 transformations using shape memory alloys, Isabella Nicholaysen, Maria Glintborg, Philip Johannesen, Clara Emmerling, 2021.

Figure 6. 1 style - 5 transformations using shape memory alloys, Isabella Nicholaysen, Maria Glintborg, Philip Johannesen, Clara Emmerling, 2021.

The second example is from a Bachelor Project based on the theories of the importance of a good garment fit leading to design for longevity (Steenstrup & Skjold, 2020).

Through a study of women, their measurements and preferences within fashion and fit, the fashion student wanted to design clothes that span 3 sizes and that the end-user can and wants to wear for years.

The student set her goals by working with the Sustainable Design Cards (Ræbild and Hasling, 2018) and based on the Functional, Expressive and Aesthetic model (Lamb and Kallal, 1992). In order to visualize the variations in body measurements the student made a digital version of each participant, making it visually instantly clear how different their shapes are.

This is a fine example of how using 3D can: add to exisiting fashion competencies, underline the need for knowing your end-users, and support making meaningful and responsible clothes design.

Figure 7. Diversity in body shapes and sizes – an extract of the visualization of a study group, Vibe Juul Thomsen, 2021.

The 'Hacked' Method

exploring the software in an intuitive way

This method was developed for teaching first year Fashion & Textile students. I thought it would be an advantage for them to learn CLO3D at an early stage, leaving them more time in the bachelor programme to practice and refine their 3D skills. Students in the first year do not have the same knowledge, skills and competencies to draw from as second year students, and therefore a much tighter course was developed which could support their Zone of Proximal Development (Vygotsky,b.1934/1978) and scaffold their learning (Bruner, 1978). Furthermore, the course does not focus on pattern cutting nor is there a demand for a delivery of a realised design - so the contextual method was not applicable.

Figure 8. Digital fashion; Experimenting using few 3D tools, Marie-Louise Guldager-Nielsen, Felicia Cherry, Thomas Bendtsen, first year students, 2021.

The students were provided with readymade digital styles and patterns of tops, shirts and dresses and asked to bring their individually developed colour palettes and designs from the Colour and Visualization course. The focus was on designing through pattern development of the existing styles using only a few tools regarding: materials, print, colour, texture, cut & sew and quilt. For the Textile students it was also possible to visualize their print design on virtual prototypes of curtains, blankets, and tablecloths.

The Hacked Method turned out to be a very creative tool for the students to easily generate and test ideas without using any fabric. The intuitive design process matched the playful method of testing ideas in a physical mock-up, and as there were no requirements for a physical delivery the Hacked Method was perfect for making digital fashion and communicating ideas that do not need to be materialised.

The below example shows how the 3D tool can be used in the hands of an inquisitive student. CLO3D allows the student to work through the creative process and questions of “What If and Why Not”. The Hacked Method leaves the student with ample opportunities to make mock-ups that in the physical world would require time, space and, not least, much material. The student has used CLO3D in a very creative way, sketching on both shape and material, and the outcome shows two takes on the same shape.

Figure 9. Andreas Baggesen, Two takes on the same shape, first year student, 2021.

Perspectives

The use of 3D has grown exponentially throughout the Covid-19 pandemic, especially within fashion, where established brands such as Gucci, Nike, H&M are also designing digital fashion to strengthen their market position. Another example is the collaboration between high-end brand Balenciaga and the video game Fortnite where gamers can buy skins, a purely aesthetic addition to a character, based on Balenciaga collections and buy Balenciaga's Fortnite merchandise such as a hoodie for the real world.

Indeed, we are entering a phase where fashion can be consumed within a virtual environment and where aesthetic trends may stem from the gaming world and even start to influence the physical world of fashion.

Many digital fashion brands, such as The Fabricant, just to mention one digital brand, are established by animators and gamers and not by clothes designers. It may change the aesthetics as designers from the gaming industry fill the metaverse and possibly pushes the boundaries of how we perceive clothes. Digital fashion offers so much more playfulness as gravity and boundaries of real materials are not restricting the creative minds. This development could possibly lead to fashion being used mainly within the metaverse and through immersive technologies, with capsule collections of sustainable design to be used in the physical world.

When making clothes for the physical world, using 3D may support a green transition through new business models. An example is the Swedish company [a]industri, which describes its goals as: "the future of garment design and production towards financial, social and ecological sustainability". One of the company's founders is Rickard Lindquist, who trained as a men's tailor and fashion designer. Since then, he has worked both in academia and industry and, in 2015, completed his PhD thesis, "Kinetic Garment Construction".

[a]industri bridges innovation and craftmanship through new business models where clothes are only produced on-demand from their small and local factory when ordered online. The company consists

of both fashion designers and digital designers. It merges the best of the two worlds to secure the garment fit essential to physical design and the renderings that convincingly inform the end-user.

3D design software is a highly useful tool which will revolutionize the way we make clothes. However, precisely because of the speed and accessibility of the technology, it becomes all the more important to emphasize and teach 'good design principles' such as traditional skills, craftsmanship and an unwavering focus on sustainability and concerns of the end-user. Only by combining the technology with good design principles will we be able to deliver on the promise of meaningful fashion with less waste and reduced CO2. The challenge for fashion educations is to focus on the even more complex and changing competency profile of a fashion designer of the future (bearing in mind that working with advanced digital tools is not for everyone) so maybe various specializations could be the solution since it is already what informally takes place. Furthermore, even if a student doesn't take to the digital tools building a digital mindset can enhance the possibilities for cross-disciplinary collaborations and innovation.

The next natural step in the digital evolution within fashion at Design School Kolding will focus on how to create both physical and digital clothes through 3D, Virtual Reality, Augmented Reality and using Artificial Intelligence for meaningful, responsible, and creative design.

As of September 2022, Design School Kolding has received funding from the EU for a 3-year project, where we, together with Willem de Kooning Akademi, The Netherlands, and the University of Fine Art Ljubljana, Slovenia, will develop teaching materials for educators in higher educational institutions. We see implementing digital tools as an important part in: a green transition, working towards inclusion and securing fashion students new skills and competencies for future job possibilities nationally and across borders. The digital tools will be implemented in a meaningful and pedagogic way focusing on progression and the already existing teaching methods of the HEIs.

Our end goal is to make a collection of 9-course modules at 3 levels

where digital tools and technology such as 3D, AI, VR, AR are implemented in an artistic fashion education. Developing the collection amongst 3 HEIs and Associated Partners will strengthen the process and outcome as the different cultures give insight into various methods, possible obstacles, and how to communicate both existing and future approaches to teaching. Furthermore, the collaboration and deliveries will enable further collaborations across disciplines and secure HEIs within the EU an international place in digital fashion education.

Our deliveries will consist of online material for fashion educators. They will cover elements such as video tutorials, downloadable and printable tutorials, module description examples, teaching workshop formats, teaching cases, a library of student work examples, articles, and learning & teaching tools.

The collection of modules will unfold organically, with deliveries to be available as the modules are made and can be used and given feedback on. Each module will be shared, evaluated and revised before eventually being summarized as a full collection. This is an important step, as digital technologies develop fast, and modules could end up obsolete if not shared till the end of the whole project. All the material will be available through the website and video tutorials also through a YouTube Channel.

Alongside this project, we at Design School Kolding keep developing and refining the pedagogical approach to teaching and building the bridges between digital and physical tools, technology, and design wherever it adds value to people and a green transition.

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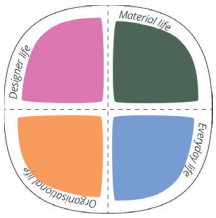

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