



Application of 3D scanner and 3D CAD in Apparel Design Education:
Development of Custom Dress Form

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Introduction: While body scanners and 3D CAD software are becoming more readily available throughout the apparel industry and academia, it is important to continue to explore the possible and practical uses of these emerging technologies in the advancement of the teaching environment in a traditional textile and apparel discipline (Romeo & Lee, 2103). This project aimed to study how these new technologies can be applied in the understanding of various body shapes/sizes and developing garments that fit them.

The apparel industry has recently been recognizing the importance of various markets of diverse body sizes such as plus-size, maternity, etc. Various reports and research show the growing importance of these markets in the apparel industry (NPD Group 2014; Global maternity wear market 2015-2019).

The emergence of these markets and the industry's growing focus on them make it critical for the study of various body shapes to be incorporated into the education of apparel design. Currently, most apparel design curriculums are administered around a few sample sizes: size 6 or 8. The goal of this project was for students to create custom dress forms for plus-size and maternity wear through the use of 2D/3D CAD software with a 3D body scanner. Using these new technologies, students were able to expand their understanding of various body shapes/sizes and give them better tools to embrace the challenges of emerging markets in the apparel industry.

Purpose: This project was designed to extend students' understanding of various body shapes/sizes while providing students an opportunity to practice 2D/3D CAD software with a 3D body scanner. A key result of the project was the development of custom dress forms using the new technologies available to us.

Implementation: For this project, 2D/3D pattern making software, Optitex, and TC² KX-17 body scanner were used. This project was designed for a Directed Study with 5 senior apparel design students who had knowledge of pattern making principles and CAD pattern making. First, the validity of the 3D flattening tool in Optitex was tested. 3D flattening provides an opportunity to flatten 3D surfaces to 2D patterns. Each student was scanned using the body scanner and learned how to import their scans to Optitex as OBJ files. Students practiced the 3D flattening tool by drawing sew lines directly on their body scans and building 2D pattern pieces. They were asked to flatten one side of their body scans from the center front to the center back. Body shapes were assumed to be symmetrical. Once they had one side of their bodies, the pieces were duplicated to form the pieces for the other side. Students took some time to think about and discuss the shapes and numbers of pattern pieces in order to successfully capture the body surface. After some trial and error, it was found that the width of each piece must not exceed 4". Using these patterns, each student made a test garment with 100% cotton woven fabric, and each garment was tested

on the body. All test garments were perfectly fitted with the exception of minor issues found around the bust point (Figure 1). The results showed that it is possible to obtain replicas of body shapes using the 3D flattening tool.



Figure 1. 3D flatten tool and 2D patterns in Optitex, test garment on the body, custom dress forms

Once the 3D flattening tool was found to be valid and reliable, students worked together to develop patterns for Size 12 women and women in the 7th month of pregnancy. Size 12 was chosen as a representative of the plus-size category. The 7th month of pregnancy was chosen as a sample since that is the target for most maternity wear. While most students' sizes required only five pieces, through trial and error the students found that a total of seven pieces (three front panels, three back panels, and one side panel) were needed for the body shape of the 7th month of pregnancy. The pattern pieces were cut and sewn with 100% cotton fabric. After placing the garment pieces on dress forms, polyester filling, batting, and plastic warp were used to fill the gaps between the garment pieces and the original dress form to create custom dress forms. As the outcome of this project, custom dress form for size 12 and pregnant women in 7th month were developed (Figure 1).

Implications: This project provided many benefits to both the students involved and to the apparel design curriculum. The students were able to expand their understanding of various body shapes/sizes as well as 3D CAD technology. Students showed a high level of engagement throughout the project. Afterwards, they reported feeling confident working the 3D CAD software and gained satisfaction by working together in coming up with creative solutions at each stage of a new, experimental project in the apparel design curriculum.

From the perspective of the apparel design curriculum, this project yielded a practical use of 3D technology in apparel design education and extended the curriculum to include diverse target customer categories. Not only did the creation of custom dress forms expand the scope of education but has the practical benefit of providing custom dress forms for other classes. While custom dress forms up until now were based on measurements to approximate body shapes, this innovative method serves to create more accurate replicas of different body shapes/sizes. As a continuation of this project the custom dress forms will be used for future draping classes.

Reference

Technavio (2015). Global Maternity Wear Market 2015-2019. Retrieved from <https://www.technavio.com/report/maternity-wear-market>

NPD Group (2014), "Sizing Up the Plus Sized Market: Segment up 5 Percent, Reaching \$17.5 Billion," June 30, <https://www.npd.com/wps/portal/npd/us/news/press-releases/sizing-up-the-plus-sized-market-segment-up-5-per-cent-reaching-17-billion/>