Using 3D CAD Prototyping as a Learning Tool: the possibilities go beyond its intended function.

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University apparel programs are increasingly embracing the latest industry technologies. Among those is 3D Computer Aided Design (CAD) technology for apparel pattern fit analysis. Integration of the 3D prototyping functions with the 2D patterning functions varies with different companies. The scope of this teaching case study involves three versions of the same industry software. The teaching process and benefits to students observed in the classroom/studio environment, and suggestions included here should reasonably be expected to translate to 3D CAD apparel patterning/prototyping software from other industry firms.

A primary question that led to this teaching change, was must 2D CAD patterning technology be taught first and then followed by introducing 3D prototyping after 2D CAD patterning proficiencies have been met? After all, that is the traditional accepted order and approach to teaching and learning this technology. However, the answer to that question really seems to be coming up as no, not necessarily, and there may be added benefits to introducing 3D first. There could also be useful teaching and learning benefits to extending use of this technology to non-patterning students or integrating it into learning experiences with goals other than specifically patternmaking.

Over a period of three semesters, industry software was presented to undergraduate apparel design and merchandising students with this reversed approach. These students had completed one semester of apparel construction and one semester of manual flat pattern instruction. In some cases this background was completed within consecutive semesters, while others may have completed these courses with a semester or summer break interruption. The software used was ModarisV6R1 and V7R2. The course focus for all of these groups was CAD – patterning, but none of these students had ever applied CAD technology to patterning process, whether 2D or 3D.

The patterning software has three general factors that must be identified in order to generate an accurate virtual fit 3D prototype. Needed are a 2D digital pattern, fabric choices with performance characteristics, and an avatar (parametric human form). Within the 3D prototyping system are additional database libraries including stitches, graphics, or other devices that can be used to generate 3D image simulations of fully manufactured fashion garments with visible fabrication details, top stitch details and graphics. These libraries can be customized by entering your own graphic image or stitch files with minimal effort.

At the undergraduate level, patternmaking students often have limited experience or confidence and struggle to gain proficiency that would then lead them to having the skills needed for 3D prototyping. Students are impressed with this new technology when demonstrated. They see the creative and functional possibilities. They are exposed to other video and 3D technologies constantly in other aspects of their lives. But not being able to use the 3D pattern prototyping systems until after gaining proficiency in 2D CAD patterning processes is

discouraging to them. In an effort to circumvent this situation, the teaching order of CAD patterning was reversed with these groups.

The courses began with a very basic introduction to the 2D patterning work screen in the software, then the 3D prototyping process was introduced with a simplified project that included use of stitches and with the latest student group included original graphic designs that were added to the garment prototypes. The first major course project was a simplified 3D prototyping project. After completion of the 3D project, the course focus returned to 2D CAD patternmaking with this system, followed by a culminating exercise that incorporated the complete process of design concept through patternmaking and incorporation of 3D prototyping being utilized for fit analysis and the generation of prototype images for product promotion and development purposes.

This first project was a simple four piece pattern for a men's T-shirt that included front, back, short sleeves, and a rib-knit neck band. Later, more complex garment structures were utilized. The t-shirt pattern file was prepared for students, including the required cutting list (variant), and the garment was fit-tested to one of the existing avatars before being accessible to students. The students then virtually stitched the pieces together using the system's Desk of Stitches function. Once virtually stitched, 3D prototypes were generated. On the 3D T-shirt image stitching was then added at seams and hems, along with library or original graphic designs to demonstrate a finished product look. The graphics, fabric colors and types were manipulated in placement on the body, scale, proportion, and perspective as part of the exercise.

Consistently throughout these groups similar benefits to student learning were observed by the instructor and reported by the students. Multiple benefits were observed through this "reverse" approach. Student enthusiasm at generating "real" imagery of a pattern very quickly and being able to apply their own customizable design concepts increased and improved their work throughout the later parts of the course. Through use of the virtual stitching system students reported feeling more confident in their understanding of garment construction. They seemed to have increased visual literacy in pattern piece shape recognition which later assisted in 2D CAD patterning techniques. Construction process order and logic seemed to benefit as well. There was an increase of understanding and recognition in fit analysis that benefitted later in the coursework. Increased understanding and logic in production processes and relationships between body shape and the design concepts of scale, proportion, color, pattern placement within apparel development were observed.

While these groups were all completing a patternmaking course, these observations and responses have led to the conclusion that this 3D technology could be a useful way to introduce many varied functional and aesthetic concepts, as well as apparel production concepts, even if they are not patterning students and will not be learning the full 2D patternmaking functions of the software. With prepared exercises that require minimal software command instruction, this 3D prototyping technology could be used to increase construction practice, order and logic, increasing visual literacy, better understanding analysis of garment fit, understanding the functional and conceptual design effects of fabrication and fabrication manipulation. This 3D technology presents many possibilities for other learning avenues within an undergraduate apparel program, both for design and merchandising applications.