Exposing 3D printing to undergraduate fashion merchandising students

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Introduction

Three dimensional (3D) printing has been around since the early 1980's (Schubert, Van Langerveld, & Donoso, 2014) and is gaining popularity quickly. Experts in the fashion industry predict that 3D printing has the potential to be as revolutionary as the sewing machine (Tarmy, 2016). Although this emerging technology is not mainstream just yet, educators are looking to incorporate it more into their curriculum. An opportunity that comes from 3D printing in the classroom is that students can come up with an idea, design it, and then print it all in the matter of hours. According to Greenhalgh (2016) students connect ideation to implementation, and allowing them to use technology impacts the design process. Students also transform from passive consumers of goods to actively engaged inventors who are in control of their own learning (Slack, 2014). 3D printing has many benefits, but are fashion educators taking advantage of them at the undergraduate level? This presentation will explain the ways that a Midwestestern University has successfully incorporated 3D printing into their curriculum at the undergraduate level.

SAMR Model

The **S**ubstitution **A**ugmentation **M**odification **R**edefinition model is a way to model the use of technology in a classroom from no technology use to reaching transforming learning through technology (Puentedura, 2006). The SAMR model encourages reflective teaching, which gives educators more time to prepare transformative digital learning experiences that will improve student outcomes. The SAMR model was developed not only for teachers to reflect on how effective their practices were, but to show progression through the ladder of learning by encouraging students to use higher order critical thinking skills with technology. The higher you climb up the ladder of achievement, the higher the level of use of technology.

The first and second levels, augmentation and modification, in the SAMR model would include simply replacing a written assignment with an assignment done in word processing software, which is a low-level use of technology that has some functional improvement. The use of 3D printing technology climbs the learning ladder to the third and fourth level of the SAMR model, which are modification and redefinition. In these levels the technology tool makes a significant change in the lessons throughout the curriculum and the technology allows for new tasks that could never be done without technology.

Curriculum Development

In the fall of 2017, a grant was obtained to purchase a MakerBot Replicator+. The purpose of the grant was to bring this newest technology into the classroom, so that students could gain first-hand knowledge of it and gain real world experiences. Since this technology was brand new to the program, much deliberation and curriculum preparation took place. The technology was incorporated into three fashion courses which were Product Development for Consumers, Apparel Quality Analysis, and Branding and Fashion Technology. Instead of using

traditional projects, students were able to expand their critical thinking skills using the 3D printer.

Implementation

In Apparel Quality Analysis instead of finding pictures of garment components on the internet students used the 3D printer to design and print a fashion library of trims and details. In Product Development for Consumers, in addition to a digital apparel clothing line, students designed and printed a coordinating accessory. In Branding and Fashion Technology, which is a new course, students created a branding package and 3D printed a part of that, such as a hang tag, keychain, or packaging material.

The 3D printer has also proved valuable for undergraduate research. While all students print simple items, others research on their own to develop more complex projects. For example, a junior fashion student researched and developed a 3D printed athletic shoe. Testing was done with flexible and foam filament before printing a sole and upper portions of the shoe.

Recommendations

Since 3D printing will revolutionize the fashion industry, it is important for students to have exposure to the process, even if it is on a simplified level. This experience not only helped students learn existing concepts in the course, but provided them with a competitive advantage when they enter the job market from experience with 3D printing. The 3D printer was implemented as an engaging tool to provide higher order thinking, where students can analyze and design tangible items; as opposed to simply learning about a concept.

3D printing is not just a learning tool, it goes beyond that. Since technology is key to college students' future success, it is important that educators constantly evaluate teaching strategies to align with this. In the SAMR model being 'above the line' is when technology is used beyond the substitution and augmentation levels to create transformational learning at the modification and redefinition levels. This is a great goal for college educators as we prepare students for future careers.

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