



Assessing the Impact of an Adaptive Apparel Curriculum in Preparing Students to Develop Products for Diverse Markets: A Longitudinal Evaluation of Student Projects

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In 2021, 1.2 million *more* people identified as having a disability than in 2020 (Roberts et al., 2022), further emphasizing the need for apparel that accommodates people with disabilities (PWD) (McBee-Black et al., 2021; Roberts et al., 2022). This market category is called adaptive apparel (AA), mass-produced clothing for people with sensory, cognitive, or motor differences who face difficulty dressing (McBee-Black & Ha-Brookshire, 2020). Persistently, AA products prioritize functionality over style and people with varying motor capabilities over other forms of disability. The problem is that disability is rich with complex apparel needs that extend beyond functional requirements, including expressive and aesthetic desires. As the market for AA grows, apparel designers need to be prepared for this emerging market (McKinney et al., 2021). They need to be equipped to understand disability as an intersection of identities and capabilities. University programs are uniquely positioned “to address this emerging issue by developing effective teaching and learning approaches to prepare future apparel designers to design adaptive apparel” (McKinney et al., 2021, p. 1). Therefore, this Scholarship of Teaching of Learning (SoTL) study shares reflections from four years of product development (PD) capstone project data where AA was the focus. This project longitudinally assessed how the AA curriculum fostered an understanding of PWD’s needs. SoTL findings broadly serve many positive functions for higher education (McKinney, 2010). Educators may use these findings to draw conclusions and raise new questions about the effectiveness of a curriculum like this to equip students with an expanded worldview of an increasingly diverse market.

Methods

This study collected data from student projects over five course iterations from 2019-2022. Students developed a collection of five adaptive garments in 16-week semesters, scaffolded through 4 Milestone assignments. In Milestone 1, students conducted primary and secondary user needs research. In Milestone 2, students developed CLO3D renders. Milestone 3 included prototyping one garment, and Milestone 4 involved using Backbone PLM to develop technical packages for each garment in the line. The instructor contextualized lectures in theory, using the FEA Consumer Needs Model (Lamb & Kallal, 1992), universal design (Steinfeld & Maisel, 2012), inclusive design (Keates et al., 2000), and the social model of disability (Oliver, 2013). Each semester the instructor invited at least two guest speakers to the course - a PWD and an industry professional from Tommy Hilfiger or Zappos Adaptive. In 2022 the authors added a 7-person focus group with people representing a variety of disabilities and an opportunity to meet PWDs socially off campus. These activities were added to advance the user-centered design component of the course. The authors analyzed data from the four Milestones using MS Excel, pulling data on student demographic information, target disability, motivations, and design features for each garment. The authors

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thematically analyzed the data (Saldana, 2011) through the lens of the Inclusive Design Cube (IDC) (Keates et al., 2000). The final data analysis was completed using descriptive statistics and pivot tables to identify themes.

Results

The original data included 82 projects from 81 senior undergraduates and one graduate student. The authors removed 11 projects from the data set because they did not explicitly feature PWD. The final data set included 71 projects, with 8 projects in fall 2019, 13 in fall 2020, 5 in summer 2021, 21 in fall 2021, and 24 in fall 2022. There were 21 unique disabilities addressed in the projects. The top five disabilities were lower body mobility impairment (13 of 71; 18%), amputee general (9 of 71; 13%), myopathy general (9 of 71; 13%), sensory processing disorder (9 of 71; 13%), and visual impairment (5 of 71; 7%). From 2021 to 2022, the number of unique disabilities increased from 7 to 11. This trend indicated a shifting perspective to a better understanding of different disabilities. The students preferred to design for adults aged 35-65 (31 of 71; 44%) or young adults aged 18-35 (24 of 71; 34%), with an increase in young adult projects in 2022. Children (1-12 years old), adolescents (13-17 years old), and older adults (65 and older) remained consistent at 1-3 projects a year. Regarding gender, 13 projects were for non-binary/gender-neutral PWD, 72 projects were for men, and 31 lines were for women. Fall 2022 saw an increase in non-binary/gender-neutral lines.

The authors coded each project using the four levels of inclusive design defined by Keates et al. (2000) to understand how inclusive the student's projects were along each dimension of the IDC. The levels were *assisted by caregiver*, *special purpose design*, *modular design*, and *user-aware design*. Each level of inclusive design was represented in the data, but the projects were primarily split between *user-aware design* (34 of 71; 48%) and *special purpose design* (35 of 71; 49%). *User-aware design* projects used universal design features to generate products that were widely accessible for large population segments. *Special purpose design* projects were specialized for moderately to severely impaired users that use customized features relevant to specific users (Keates et al., 2000). In 2022, there was an increase in *special purpose* projects and a decline in *user-aware* projects indicating that students focused more on meeting the needs of moderately to severely impaired PWD using specific features that served the user. The students primarily focused on designing garment-based solutions for differences in motor capabilities (279 of 367, 76%), followed by sensory capabilities (57 of 367, 16%), and cognitive capabilities (16 of 367, 4%). Ten (3%) garments were coded as cognitive *and* motor and cognitive *and* sensory (5 of 367, 1%). In 2022, there was a marked increase in projects that focused on sensory capabilities (7 of 26 projects versus 0-1 projects in prior years). In contrast, interest in all other disabilities has remained relatively consistent. There were 20 unique motivations coded in the data. The most salient motivations were *unmet functional needs*, *a need for stylish clothing*, and *promote confidence*. Over time, the motivations have become more varied - moving away from garments that only met functional needs.

Conclusions

In this study, the authors observed an overall trend toward a more nuanced understanding of disability and intersecting identities in the projects, specifically, the shift from *user-aware design* to *special purpose design* projects, likely from adding more opportunities for students to

meet with PWD. However, there were still voids in level of design inclusion not addressed in the student projects. Mainly, student did not really develop projects for the *assisted by caregivers* level. The authors also found the students were hesitant to designing projects that address differences in people's cognitive abilities. The question is why?, and how can we get students to dive further into these areas of AA. The *assisted by caregiver* level and cognitive capabilities may challenging to address without proper exposure to people representing these disabilities. Third, students could be encouraged to develop products for older adults and advanced age. Lastly, students should be encouraged to explore intersecting identities, like gender, for PWD. The authors interpret student interest in gender and disability as a positive movement toward intersecting identities, moving further from function-only focused garments to garments that express individual identities. The key observations in this study may be used to drive key learning outcomes in future classrooms for educators who seek approaches to push student learning.

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