



## Outcomes of Implementing Zero-Waste Pattern Cutting in Fashion Design Courses

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Key Words: zero-waste design, project based learning, pattern making, teaching

Product development and pattern making are fundamental courses in the fashion design curriculum. In these courses students develop foundational skills to build on as they progress through their design program. Product development is typically an introductory course where students learn basic sewing skills and how to apply them in simple garments, while pattern making allows students to apply construction skills while they explore their creative potential in more advanced garments. Along with increasing students' awareness of environmental problems and social issues in the fashion industry, introducing sustainable practices into selected fashion merchandising and design courses has been explored by a number of studies (i.e. Fletcher & Williams, 2013; Gam & Banning, 2011; Kennedy & Terpstra, 2013; Leerberg, Riisberg, & Boutrup, 2010). However, there are few studies which have explored ways in which sustainability practices have been implemented in product development and pattern making courses. Literature about how zero-waste pattern cutting (ZWPC) has been implemented in these types of courses is exceptionally rare.

As the conventional pattern cutting process generates an average 15-20% of waste (Rissanen, 2013), innovative fashion designers (i.e. Holly McQuillan, Timo Rissanen, Yeohlee Teng) have proposed that textiles should not be wasted in the pattern making stage at all. "ZWPC is the process of eliminating the usual 15-20% loss of fabric at the cutting stage by creating a pattern or several patterns integrated in one, using the entire width and a predetermined length of fabric, thereby creating a pattern that completely fits the dimensions of the fabric" (Townsend & Mills, 2013, p.104). This newer perspective on design requires new ways of thinking about the design process as well as the look of the final product. However, this concept has not been a part of traditional design education. Effective teaching strategies, therefore, should be developed to prepare a new generation of designers in ZWPC.

The purpose of the study was to evaluate the effectiveness of incorporating the ZWPC concept in two levels of existing design courses in an effort to increase students' awareness of sustainable fashion design practices. To realize this purpose, the project based learning (PjBL) approach was employed as a framework, as previous studies suggested that PjBL is an effective tool for teaching sustainability concept to existing courses (Jollands & Parthasarathy, 2013; McGibbon & Van Belle, 2015; Wiek, et al., 2014).

ZWPC projects were introduced in two courses mid-way through the semester. In the product development course, students were typically introduced to sustainable design as a concept, but had not applied principles of it into any project nor had they had any pattern-making experience prior to this study. The second course was flat pattern, in which students learned pattern drafting and manipulation to produce skirt, pant, and blouse patterns. Prior to this study, students had not been exposed to ZWPC techniques for any of these processes. Patterns and

instructions were obtained from Rissanen and McQuillan (2016). Among various patterns, the instructors selected patterns that students could use knowledge and skills that they learned in courses. ZWPC pant design (pg 14) was introduced in both classes, while ZWPC coat design (pg 93) was introduced only in the flat pattern class.

Data was collected before and after the ZWPC project implementation in each course. The pre-project survey included questions relating to the respondent's experience with sustainability, including whether they had taken a course focused on sustainability and the degree to which they led a sustainable lifestyle overall (Ruppert-Stroescu et al., 2015; Wu et al., 2013), as well as gauging their awareness of fabric waste generated during the apparel production process. The post project survey included students' sustainable lifestyle questions in addition to their opinion about the ZWPC assignments (Townsend & Mills, 2013).

Of the 39 students enrolled in the two courses, 33 students participated in the pre-survey and 25 students participated in the post-survey. Descriptive analyses and a series of independent t-tests were used. Factor analysis was performed to determine dimensionability of sustainable fashion and lifestyle and generated two factors, *interest in sustainable lifestyle*, and *interest in reducing footprint*. In addition, a grounded theory approach was used to conduct theoretical coding of student written responses (Strauss & Corbin, 1998).

The independent t-tests revealed that after students completed the project, students' interest in sustainable lifestyle ( $t = -2.48, p < .05$ ), interest in reducing footprint ( $t = -2.06, p < .05$ ), and conscious about generating fabric waste ( $t = -3.26, p < .01$ ) were increased. While there were not significant differences students between two courses ( $t = -1.53, p = .13$ ), if students took sustainability course ( $t = -2.51, p < .05$ ) or learned about the ZWPC concept before ( $t = -2.22, p < .05$ ), their awareness about generating fabric waste was higher than students who did not. It appears that any form of educational opportunities (such as taking a sustainability course, limited sustainability practice information from lectures, or completing the current project) helped increase students' awareness of reducing fabric waste. However, after this specific ZWPC topic was implemented, students acknowledged that the project helped them to (1) learn about sustainable design ( $M = 4.4, SD = .7$ ), (2) learn about the concept of ZWPC ( $M = 4.3, SD = .8$ ), and (3) become more aware of the different environmental issues on apparel production ( $M = 4.5, SD = .7$ ). Written comments on student experiences also supported these findings. The written comments also indicated that the ZWPC project positively influenced their awareness of sustainability practices and, perhaps most importantly, inspired them to practice sustainable fashion design.

Though this project is related to a design specific pattern cutting project, students' awareness of sustainable fashion and lifestyle overall increased after completing the project(s). While students' level of skills demonstrated little significant change, students' exposure to the topic influenced their sustainability practices (or interest) which supports why projects like this should be developed and evaluated. The instructors are planning to continue this project with revisions for helping students to improve their creativity and increase future intention in zero waste design as was indicated in students' comments.

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