Are Fashion Majors Ready for the Era of Data Science? – A Study on the Fashion and Apparel Curriculum in U.S. Educational Institutions

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Background: As one of the most popular college majors among Generation Z, there are over 50 undergraduate fashion programs currently offered by U.S.-based educational institutions (Fashion Schools, 2019). While the traditional fashion curriculums focus on either apparel design or merchandising courses, employers are increasingly expecting future professionals working in the fashion industry to obtain data-science related skillsets as fashion business is becoming ever more data-driven (Silva, Hassani, & Madsen, 2019).

The purpose of this study is to explore the effectiveness of fashion curriculums in preparing students' career readiness in the new data-intensive fashion industry. While a few existing studies have evaluated the preparedness of fashion majors for traditional apparel design or merchandising positions, whether the current fashion curriculums have sufficiently exposed students to the topic of data science and improved students' related competencies remain mostly unknown (Lyu & Leslie, 2017). The findings of the study will fulfill a critical research gap and provide valuable inputs for fashion educational programs to develop a next-generation curriculum suitable for the data-driven fashion industry in the 21st century.

Literature Review: The existing studies suggest an already full application of data science in the fashion industry, covering both creative and merchandising activities such as fashion forecasting, inventory management, marketing research, and product development (Acharya, Singh, Pereira, & Singh, 2018). As fashion companies are increasingly leveraging data science in their daily business operations, even traditional fashion positions more or less start to expect candidates to demonstrate competency in working with data (Luce, 2018). In general, these data-science related skillsets include three major categories: 1) processing and analyzing data (i.e., basic math and statistics knowledge); 2) interpreting data (i.e., quantitative reasoning skills); and 3) using data processing and analyzing software (i.e., Excel skills) (Rawlings-Goss, 2019; Vicario & Coleman, 2019). Meanwhile, undergraduate fashion majors in a U.S. four-year college are typically required to learn basic math or statistics. A few major-core courses, particularly in the merchandising area, also incorporate material that may prepare students' quantitative reasoning skills (Ellington, Hahn, & McLeod, 2017). However, there is a lack of systematic evaluation regarding whether current fashion curriculums across U.S. educational institutions have sufficiently exposed students to the topic of data science and prepared students' career readiness.

Research Method: For the study, we collected the detailed fashion curriculum sheets from colleges on the list of the 2019 top 50 U.S. fashion programs ranked by Fashion Schools, one of the most comprehensive and authentic rankings of its kind (Fashion Schools, 2019). Altogether, 45 four-year

fashion undergraduate programs from 24 institutions that provided detailed curriculum information needed for this study were analyzed. Specifically, we coded these curriculum sheets based on the following scheme:

- *Business:* if the fashion program is under business school =1; otherwise =0
- *Program type:* a merchandising-focused program =1; an apparel design-focused program =0; a merchandising and design dual program=2
- *Math & Stat courses*, *Data courses and Quantitative merchandising courses (*altogether refer to as *MDQ courses* in this study*)*: respectively refer to the total credits of major-required math and statistics courses, data courses (i.e., the course name includes the word "data" or "data analysis") and quantitative merchandising courses (i.e., merchandising courses that address students' quantitative analysis skills as indicated in the course description) as a percentage of the total credits needed to get the degree.
- *Design courses*, *non-quantitative merchandising courses,* and *free electives*: respectively refer to the total credits of major-required apparel design courses, general merchandising courses and free elective courses as a percentage of the total credits needed to get the degree

The MANOVA technique was adopted by using *Business* and *Program type* as the dependent variables and *Math & Stat courses, Data courses and Quantitative merchandising courses, Design courses*, *non-quantitative merchandising courses,* and *free electives* as the six independent variables. The purpose of the MANOVA analysis is to provide a systematic assessment of the exposure to data science courses among different types of fashion programs in U.S.-based educational institutions (Huberty & Olejnik, 2006).

Results and discussions: First, the results suggest that current fashion curriculums in U.S. educational institutions provide students with limited exposure to the topic of data science. For design-focused fashion programs (*Program type =0), MDQ* courses on average only accounted for 5.6% of the total credits needed for graduation, whereas merchandising and dual fashion programs (*Program type =1* or 2) required around 12%. The results of the MANOVA main effect test and between-subject tests further suggest such a difference in credits requirement among different types of fashion program is statistically significant ($p<0.00$), mainly because merchandising majors were required to take relatively more *Data courses* and *Quantitative merchandising courses*. Second, while business schools are relatively more abundant with data science-related academic resources , no statistical evidence suggests that those fashion programs currently housed under business schools need their students to take more *MDQ* courses than otherwise ($p>0.05$). Third, the results also show that current fashion curriculums heavily focus on either traditional apparel design or merchandising courses, but leave little space for students to take additional *MDQ* courses through *free electives.*

Implications and future research agendas: The findings of the study have several important implications. First, the findings call for current fashion curriculums in U.S. educational institutions to provide students with more exposure to data-science related courses and improve their future job readiness and competitiveness. Notably, the conventional mindset that fashion majors, especially design students, do not need to be "good at numbers" may no longer hold as the fashion industry is turning increasingly more data-intensive. Second, the findings reveal a need to strengthen the collaboration between fashion and other academic programs for data-science related education. Particularly, fashion programs currently housed under business schools could consider taking more advantage of the academic resources accessible to them to broaden the offers of data science and quantitative merchandising courses to fashion majors. Additional studies can be conducted further to understand the state of data science education in fashion curriculums from educators or administrators' perspective.

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