Innovative Teaching for Real-World Capstone Experience in Apparel Production

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Introduction: The textiles and apparel industry is one of the most globalized, dynamic, and labor intensive businesses with various sectors of production providing jobs for millions of people worldwide (Dickerson, 1999; Kunz & Garner, 2009). Due to these reasons, it is important to understand the industry demands and prepare students for these industry needs. There have been profound concerns regarding the gap in education and real-world capabilities to be used in the industry as the course contents may not fully cover all industry needs due to limited time and resources (Wang & Cole, 2018). Institutions need to consider curriculum development according to the professions involved primarily in the product development process, the production process, and the distribution process (Lee & Steen, 2014). The purpose of this paper is to provide insights to instructors who teach the main two areas; apparel product development and production, especially as capstone series, in their curriculum development.

Method: 1) *Course Setting.* The senior capstone course series addressed in this paper covers both apparel product development and apparel production in depth where students operate as a wholesale apparel manufacturer. The goal of the capstone course series is to develop an apparel line in a real-world setting to be sold at the campus bookstore. Both courses are organized as operating a company. In the first course, Apparel Product Development Simulation, students are placed into teams of five to six, where each student selects the role of their choice that is given by the instructor within the product development process to be held for their responsibilities. The coordinators in each style team include: 1) Team representative/Marketing, 2) Pattern making/Sewing, 3) Technical flats/Tech pack, 4) Artworks/Labels/Embellishment, 5) Sourcing/Fabric testing, and 6) 3D virtual fitting. These roles represent highly demanded professions in the apparel industry (Lee & Steen, 2014). The second course, Apparel Production Simulation, keeps some of these roles from the development stage with a few additional job descriptions to satisfy the needs of the production area in the industry. Simulating a company, this course has a hierarchy of student leaders in the management team including Team Leader, Production Coordinator, and Inventory/Quality Coordinator representing General Manager, Production Manager and Quality/Inventory Manager consecutively and style teams including coordinators of 1) Team representative/Marketing, 2) Pattern grading/Sewing, 3) Marker making/Cutting, 4) Tech pack/Post production, and 5) Sourcing/Inventory/Quality Assurance. All these positions work together, in their respective teams and with other teams, to verify that the garments are developed and produced with the expected acceptable quality level and are delivered to the buyer on agreed time. This setting allows students to demonstrate expertise and leadership skills in product, process, and technology related to the apparel industry.

2) *Course Contents.* In the first capstone course, students conduct a market research by collecting and analyzing consumer target market data. Based on the results, several styles are selected for further development. The development process includes: 1) Ideation, 2) Tech pack development, 3) Fabric sourcing & testing, 4) 3D virtual fitting, 5) Prototype development, and 6) Marketing. There are constant line reviews and revisions to make sure that the line looks cohesive and improved. In the assessment process, students present their work to the public during the Open House as well as to the Bookstore buyer. Their outputs in each project, design notebook, final prototype, and professional skills are evaluated throughout the semester. Once the buyer confirms the styles to be produced, students move forward to the next senior capstone experience: Apparel

Production Simulation. This course has a total of seven projects and in each project, students face a multitude of challenges that goes into production phase. To manage projects, active progress review meetings are held by management team every week to discuss issues and solve the problems. Also, there are expected project reports, including project goals, complete/incomplete tasks, problems encountered, and solutions, written by the management team and each style team. Through these reports, each team member is able to understand the project progress and issues and can communicate with instructors. Throughout production, all processes are monitored and quality controlled to ensure the products meet the required specifications. Once all objectives are met and finished products are ready, the garments are delivered to the buyer and the apparel line is launched. In the assessment process, the accuracy and precision of their project assignments, production notebook, and professional skills are assessed to understand how well the students have achieved the course objectives. Figure 1 shows a flow chart of the project stages in both capstone courses.
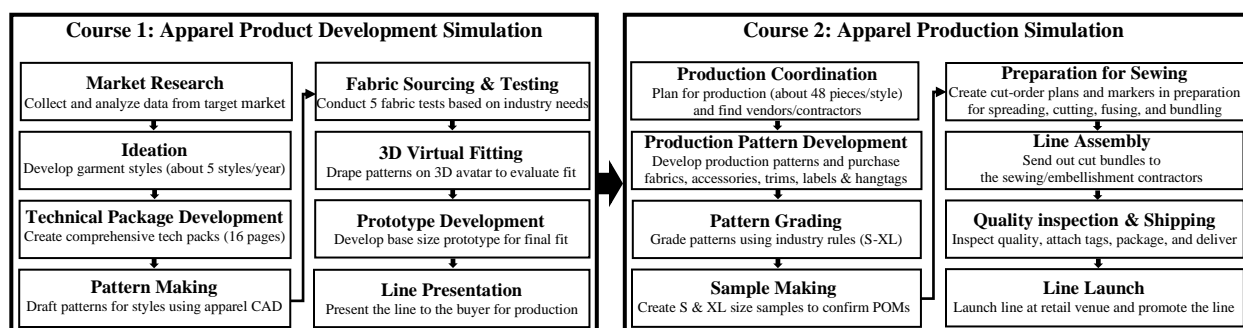
Course 1: Apparel Product Development Simulation		**Course 2: Apparel Production Simulation**	
Market Research Collect and analyze data from target market	**Fabric Sourcing & Testing** Conduct 5 fabric tests based on industry needs	**Production Coordination** Plan for production (about 48 pieces/style) and find vendors/contractors	**Preparation for Sewing** Create cut-order plans and markers in preparation for spreading, cutting, fusing, and bundling
Ideation Develop garment styles (about 5 styles/year)	**3D Virtual Fitting** Drape patterns on 3D avatar to evaluate fit	**Production Pattern Development** Develop production patterns and purchase fabrics, accessories, trims, labels & hangtags	**Line Assembly** Send out cut bundles to the sewing/embellishment contractors
Technical Package Development Create comprehensive tech packs (16 pages)	**Prototype Development** Develop base size prototype for final fit	**Pattern Grading** Grade patterns using industry rules (S-XL)	**Quality inspection & Shipping** Inspect quality, attach tags, package, and deliver
Pattern Making Draft patterns for styles using apparel CAD	**Line Presentation** Present the line to the buyer for production	**Sample Making** Create S & XL size samples to confirm POMs	**Line Launch** Launch line at retail venue and promote the line

Figure 1. Flow chart of project stages

To meet the industry's human resource needs, some critical industry technologies are used for the courses such as Adobe Creative Suite for graphic design, 2D and 3D Computer Aided Design for pattern making/grading and virtual garment fitting, Computer Integrated Manufacturing for marker making, and Enterprise Resource Planning for overall mass production process following through costing, inventory management, picking, shipping, invoicing, and accounting. All skills and experiences they gain from this course support the expected student learning outcomes.

Results & Conclusion: The Apparel Production senior capstone series is dynamic and allows students to strengthen their skills on problem-solving, critical thinking, and attention-to-detail, while developing self-motivation. Valuable comments and positive feedback regarding students' industry knowledge were provided from the recent internship employers. It is hypothesized that these comments stem from the students' participation in the Apparel Production senior capstone series as the main internship responsibilities are similar to the activities done in the courses. Their positive comments reflect the program learning outcomes that graduates will be able to demonstrate expertise and leadership skills in product, process, and technology knowledge related to the apparel industry and propose meaningful solutions to apparel/textile business problems. This is indirectly supported by student course evaluations, where students agree that the course content related to real-world applications (1.39 ± 0.57, $n=28$) and the course supported development of critical-thinking and problem-solving skills (1.43 ± 0.69, $n=28$). The results were based on the last year's student course evaluation with rating 1 for strongly agree and 5 for strongly disagree. Further research is suggested to evaluate the data which may directly support the program learning outcomes.

References

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