Implementing the Ditto Pattern Projector into Patternmaking Curriculum

Robert Pettys-Baker, Lynda Xepoleas, & Laura McAndrews
Kent State University, USA

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Higher education plays a crucial role in developing human resources by fostering knowledge creation and its application, while also contributing significantly to technological and industrial transformation (Wu and Liu, 2021). Integrating digital technologies into the classroom involves collaboration among key stakeholders within the organization (such as educators, learners, IT, business management, and facilities) placing the individual at the heart of the process of growth, change, and its impact on the organization and culture (Alenezi, 2023). To prepare future fashion industry leaders, textile/apparel educators have continuously introduced new technologies into the classroom as the traditional fashion development process has been recontextualized in the age of digital technologies (Jacobs and Karpova, 2023). This shift in technology requires academic institutions and units to be open to testing new trends and technologies relevant to instructional and/or industry demands. This study examined student perceptions of the Ditto pattern projector, a stationary projector that was introduced within a sophomore level patternmaking course.

The Ditto system displays patterns using a stationary projector placed above a table; a cutting mat acts as a calibration tool for the system while also serving as a workspace. Ditto eliminates the need to print patterns when digitally patternmaking, reducing the use of paper and ink, minimizing waste and providing cost savings to students and academic departments. However, resistance to change poses a significant obstacle when integrating new technologies, specifically industry specific technologies for students (Ayodele Ajani, Gamede, Bansal, 2024). Using digital tools in the classroom requires both educator and learner to be open and flexible to new responsibilities (Elena, 2017). Assessing instructional tools, like Ditto, requires understanding the format of use and implementation. The Ditto requires a mixture of digital and physical labor as users input their patterns into the system and interact with the projected patterns to position and cut their fabric. This study's objectives were to measure (a) the workload of using the traditional method of printing patterns, (b) the workload of using Ditto, and (c) student perceptions of the integration of these technologies into the course.

The Ditto was integrated in an introductory patternmaking course where 90% of the assignments are patterned digitally using Browzwear, which requires some method to take the patterns from a computer to a cutting surface. Students chose between using the Ditto to cut out their patterns, printing patterns using a plotter, or a combination of these methods. Students then completed a survey with an adapted NASA Task Load Index (Hart and Staveland, 1988) scale for assessing workload on a Likert 5-point scale. An example is "How mentally demanding was using the plotter to print your patterns". Students also provided open-ended feedback about their experiences printing and/or projecting patterns. Students received extra credit for completing the survey. After receiving university IRB approval, the survey was administered using Qualtrics and

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quantitative data were analyzed in Microsoft Excel. Qualitative data was thematically analyzed (McCraken, 1988) between two researchers.

In fall 2024, a total of 108 students enrolled in an introductory patternmaking class and 49 of these students completed the survey. The results showed 10 students used only Ditto, eight only printed, seven used both methods successfully, and 24 attempted to use Ditto but switched to printing. All students had prior experience with printing patterns and were provided written and verbal instructions on how to perform both pattern transfer methods. Overall, four students preferred Ditto, 42 preferred printing, and one was interested in using both. Students mentioned generally liking the conceptual idea of Ditto but found the current implementation non-conducive to their workload. This aligns with the quantitative data, which showed that the Ditto system performed worse overall compared to printing, albeit with high variance in responses (Table 1). This is further supported by open-ended student responses.

Table 1: NASA Task Load Index Likert Scale Ratings

	Physical Demand	Mental Demand	Temporal Demand	Success in Using	Effort Required	Emotional Valence
Ditto Ratings	3.54±0.91	2.88±1.02	3.78±0.98	2.17±1.08	3.56±0.8	3.71±0.83
Print Ratings	2.55±1.01	2.16±0.91	2.63±1.02	4.12±1.06	2.69±1.03	2.14±1.14

Qualitative data analysis revealed the strengths and challenges of implementing this technology within an introductory patternmaking course. Students responded positively to the sustainable aspect with one student pointing out, “Ditto is a very good idea, as it is environmentally friendly and saves a lot of paper waste that happens in the fashion industry...”. Projecting digital patterns eliminates the need to restock paper and ink, but it should be noted that costs associated with printing were covered by course fees for this class. Therefore, student responses were more concerned with accessing and connecting to the Ditto than they were with the cost of printing paper patterns. 44% of student responses described issues connecting with and using the Ditto projector, whereas only 4% addressed financial constraints that impeded them from using the equipment

The biggest challenge students faced was consistently connecting to the projector. The Ditto system requires that the projector and control device (phone/tablet) be on the same Wi-Fi network. The Ditto could not connect to university Wi-Fi because it is incompatible with enterprise grade wireless authentication. Instead, students needed to use a mobile hotspot to connect both devices, which presented logistical and financial issues for successfully using the system. One student pointed out that relying on hot spots meant “students of different financial statuses cannot use the equipment.” Others described their frustration in “needing to use multiple devices” to connect to the Ditto. Students also experienced connectivity issues when multiple projectors were used simultaneously, causing patterns to connect to the wrong projector. To address this issue students “determined that only one person could use [the projectors] at a time” despite multiple being available to use. 21% of student responses also addressed physical, the

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height of the cutting tables, and the limited visibility of the projected pattern outlines and labels. The physical constraints of tracing patterns using a stationary surface led the students to question the accuracy of the Ditto projector: “I dislike that I had to splice and move my fabric to get my whole pant leg patterns. I had to move it right and left and up and down and I think many of my pattern pieces shifted so it wasn't as accurate [as printing]”. Peer effects also influenced student perceptions, as negative feedback about Ditto spread amongst them: “I heard the ditto process from others was extremely confusing and had lots of steps”. In fact, 21% of student responses stated that time constraints led them to forgo using the Ditto projector.

In conclusion, while Ditto pattern projector may serve as an environmental alternative to traditional pattern printing, student feedback indicates several challenges with its implementation, particularly regarding connectivity issues and physical limitations. As one student summarized: “Ditto is a lot easier and quicker after the fight of getting your stuff connected to the projector.” The findings suggest that technological integration requires careful consideration of user accessibility and system reliability (Alenezi, 2023), especially for diverse student populations. Ultimately, systems like the Ditto pattern projector present an intriguing alternative to traditional manual drafting and pattern printing, and act as a soft introduction to augmented reality learning. Limitations of this study include the small sample size and the lack of control over external factors, such as varying student technological proficiency and available resources.

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