Field to Virtual Fashion: Development and Initial Testing of a Virtual Textile Foundations SIMLab

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Introduction. The global pandemic is clearly illuminating the value and even necessity of online education and remote learning for students around the world (IIIE, 2020.) Common in the sciences, the novel concept of the virtual simulation lab embeds state-of-the-art learning into the textile and apparel curriculum. In the virtual lab, students are able to work together, applying course concepts to new situations and contexts, as well as develop data analysis skills. The **purpose** of this study is to develop and launch a virtual textile simulation lab focused on cotton fiber and fabric. Virtual simulation labs enable students the opportunity to experiment with cutting-edge technology in an accessible learning environment and carry out experiments otherwise not possible without being in-person.

Teaching Strategy and Implementation. From previous studies the main components for an effective online learning environment were presence, functionality or ease of use, and appealing aesthetics (Buhu & Buhu, 2017, Lehman et. al, 2010, pg. 127 & Sung et .al, 2012). A soft systems framework was an approach for developing the virtual space utilizing the systems flexible nature, a method of tackling problems in social situations and creating more than one way of thinking (Checkland, 1989). For an educational context, the system allows for teaching a textile lab in unconventional ways with the goal of evaluating the effectiveness of the course compared to traditional means. The virtual simulation lab can be a supplement for in person textile labs for apparel students for times when they cannot be together in-person.

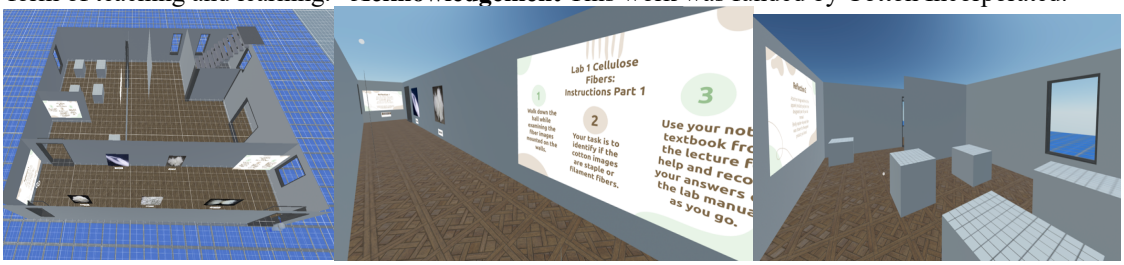
Method. A pre-pilot was conducted as a first iteration virtual textile simulation lab in virtual reality platform Mozilla Hubs. Responses from this pre-pilot guided development of a second iteration virtual lab environment in Mozilla Hubs. A virtual lab architecture as well as a lab activity were created. A survey was developed to capture the students' experiences with both lab settings and questions were asked on a five-point Likert scale with one being strongly disagree and five being strongly agreeing. Upon IRB approval, to assess learning textiles in a virtual environment, students were split into two groups with one completing the virtual lab and a control group completing the same lab in-person. After analyzing data from the first test, the virtual architecture was revised utilizing the virtual reality platform Spatial. To assess the revised Spatial lab the same survey was given to evaluate students' experiences completing the lab in the new space.

Results. Table 1(below) visualizes the results of testing platforms and formats through two iterations of Simulation lab, with students learning face-to-face as well as in a virtual lab both conducting the same task. To test the effectiveness of the virtual lab, variables used were student engagement, functionality, and aesthetic appeal.

Table 1.		Engagement	Engagement	Engagement	Functionality	Functionality	Aesthetics	Aesthetics
Test platform/format	**Respondent**	didn't zone out while moving through out the virtual lab or in-person	information was presented in an interesting way	lab environment itself was interesting	could ask for help if there was an issue	could easily navigate the virtual lab space or had no issues completing in-person lab	videos, images, and 3D models were clear and easy to identify or the physical swatches/fibers	lab space was appealing.
Mozilla-in person	**20**	**75%**	**66.67%**	**60%**	**80%**	**80%**	**75%**	**80%**
Mozilla-virtual	**12**	**88.30%**	**66.67%**	**58.33%**	**66.67%**	**91.67%**	**58.33%**	**81.67%**
Spatial-in person	**40**	**40%**	**50%**	**47.5%**	**47.5%**	**25%**	**47.5%**	**82.5%**
Spatial-virtual	**11**	**63.64%**	**54.55%**	**54.55%**	**72.73%**	**72.73%**	**72.73%**	**45.45%**

Effectiveness of Strategy. Overall, there is a positive trend of student responses toward both types of virtual labs. Engagement during the virtual labs was high with Mozilla Hubs's 80% of students remaining attentive with the labs content. This can also be seen with Spatial's engagement of students at 40% not zoning out/remaining attentive. However, Spatial's sample pool is larger and could be the reasons why the number of strongly agreed is lower. Compared to the both in-person labs, the virtual labs had higher percentages of students attention indicating that the virtual labs can also capture students attention at the same level as in-person and in instances even better. Regarding functionality, the virtual labs followed a similar concept of creating a maze-like structure for students to follow without getting lost between rooms. However, the Mozilla Hubs flow was easier for students to navigate. Whereas the Spatial flow was more difficult for students to navigate. The maze-like structure is good for students to follow, but it should be noted the flow should be one directional so students do not confuse rooms. The images, videos, and 3D models in the virtual labs were considered to be relatively easy to observe, with Spatial having better quality. Both platforms have constraints on their ability to import assets and so this can lead to pixelation or lag in images, models or videos. This can also be a contributing factor to the students having any difficulty identifying items in the virtual space. **Recommendations and Future Plans.** This study is a base for future researchers to develop higher level virtual environments for teaching and learning. Covid was the catalyst to push forward with more online learning, but the ideas for virtual labs already existed. It is recommended that future researchers have consistent sample pools to ensure reliability with survey responses. Also, for the testing to be performed remotely rather than as split into groups put in separate rooms. This would then give a more accurate representation of remote online learning and the

virtual labs engagement, communication, and functionality capabilities. Ultimately, with new versions of virtual textile simulation labs, it is hoped it will eventually be embedded into apparel students curriculum and serve as a staple form of teaching and learning. **Acknowledgement** This work was funded by Cotton Incorporated.



A. B. C.

Figure 1: Beta Virtual Textile Lab Space; (A) Area view of whole space (B) Entrance/first task (C) Second room with task.

A. B. C

Figure 2: Mozilla Hubs Virtual Textile Simulation Lab; (A) Spawn and first set of directions (B) Fiber Lab (C) Fabric Lab.

A. B. C.

Figure 3: Spatial FASHSIM Lab; (A) Fiber Lab with 3D models of cellulose plants (B) Fabric lab with 3D models of draped fabrics and activity (C) Mock store room with activity.

References

Buhu, A., & Buhu, L. (2017). Developing interactive elearning courses based on HTML5 for students in textile engineering. In 9th International Conference on Education and New Learning Technologies, Barcelona, Spain.

Checkland, P. B. (1989). Soft systems methodology. Human systems management, 8(4), 191-242.

IEEE. (2020). Paving the Way for Transformative Learning Technologies.

Lehman, R. M., & Conceição, S. C. (2010). Creating a sense of presence in online teaching: How to" be there" for distance learners (Vol. 18). John Wiley & Sons.

Sung, E., & Mayer, R. E. (2012). Five facets of social presence in online distance education. Computers in human behavior, 28(5), 1738-1747.