

Increasing student understanding of cotton and polyester's environmental impact: Assessment of objective and subjective knowledge

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Background. The negative environmental impacts of the textile and apparel industries across the entire product lifecycle are well-recognized and documented (Kozlowski et al., 2012; Marcketti & Karpova, 2020). One strategy to help reduce the industry's ecological footprint is to prepare competent and knowledgeable professionals who can make informed and responsible decisions when designing, sourcing, and marketing products to consumers (Sadachar et al., 2016). Decisions made early in the supply chain, such as choosing fiber for making yarn and fabric, have critical repercussions for product sustainability. Polyester and cotton are the two primary textile fibers used in apparel and account for roughly one half and one quarter of the total fiber market, respectively (Preferred Fiber and Materials, 2021). Therefore, it is essential for industry professionals to understand the ecological advantages and disadvantages of both fibers throughout the product lifecycle. To address this need, the **first objective** of this research was to design an effective learning experience to increase student knowledge on the environmental impact of cotton and polyester from fiber production to garment disposal. The **second objective** was to assess student knowledge on the subject before and after the learning experience.

When evaluating an individual's knowledge on a topic, it is important to consider both *subjective* and *objective* knowledge (Raju et al., 1995). The former is the feeling of knowing, or one's self-reported perception of how much they know about an issue (Eija et al., 2017). The latter refers to the actual amount and type of facts stored in one's memory (Pieniak et al., 2010; Raju et al., 1995). In the context of fashion, few studies have examined either consumers' or professionals' knowledge of the industry's environmental impact (Arachchi & Managi, 2021; Effeney & Davis, 2013; Kim & Damhorst, 1998; Sadachar et al., 2016). Further, existing studies have measured participants' self-reported subjective knowledge. Only one unpublished study measured consumers' objective knowledge about environmentally sustainable apparel (Albloushy, 2016). While objective knowledge is helpful for professionals to make products with the smallest ecological footprint, subjective knowledge is also important to this goal, as it contributes to self-confidence and problem solving (Raju et al., 1995). Thus, in this study, both

objective and subjective knowledge of the environmental impact of cotton and polyester fibers were examined before and after the learning experience.

Project Description. To design an effective learning experience for increasing student knowledge, a project consisting of four parts was developed. Constructive controversy, an instructional strategy by which students argue for and against a controversial topic and try to reach an agreement, was used in this project (Johnson & Johnson, 2007). Constructive controversy has been found beneficial in terms of cognitive and moral reasoning, as well as perspective-taking while staying open-minded, which can lead to innovativeness, attitude change, and increased engagement and self-esteem (Tjosvold, 2008). Students were asked to:

- a) *Write a Research Report* by collecting science-based facts on the environmental impact of cotton and polyester from fiber, yarn, and fabric manufacturing to the use and disposal of garments; completed in teams.
- b) *Debate*. Each team was assigned a fiber (cotton or polyester) and a position (environmentally friendly or not) to defend. Using research evidence and logical reasoning, each team prepared a strong and convincing message to argue their position.
- c) *Make a Sourcing Decision*. Following the debate, each team deliberated to make a sourcing decision to use cotton or polyester fiber to produce an apparel line with minimal environmental impact. Students were asked to synthesize and integrate complex information to make a judgment.
- d) *Reflection* was completed by each student to explain the team's sourcing decision and reflect on the project and their learning experience.

Method. Apparel students enrolled in a sourcing course offered at a US university participated in the study, which was approved by the university's Institutional Review Board. To measure how student knowledge may change as a result of completing the project, an online survey was administered before (pre-test) and after (post-test) the learning experience. The survey assessed students' objective and subjective knowledge about the environmental impact of manufacturing, use, and disposal of cotton and polyester apparel.

To measure *objective knowledge*, a scale consisting of 14 factual items was developed based on Albloushy's (2016). The scale evaluated student knowledge about cotton and polyester environmental impact. The items were in the form of multiple-choice questions, and each had one correct response as well as a "don't know" option. The responses were scored as follows: 1 = correct response; 0 = don't know; and -1 = incorrect response. To measure *subjective knowledge*, ten items were developed to mirror the content of the objective knowledge scale, as no existing scale was available. The ten items were measured with a 4-point Likert scale, ranging from 1 = I have no knowledge to 4 = I am very knowledgeable (Arachchi & Managi, 2021). In addition, the

survey included questions regarding participants' background information such as age, gender, ethnicity, etc.

Results. The final sample consisted of 39 apparel students who completed both pre- and post-test surveys. Participants' average age was 20.6 years, and 82% were women. Most students had a retail concentration (68%), with the rest specializing in design. Most participants were African American (38%), followed by Caucasian (32%), and Hispanic (17%).

After removing one item from the subjective knowledge scale, the remaining nine items loaded on one factor (reliability $\alpha=.89$). Paired sample *t*-tests were used to compare students' performance on pre- and post-tests for: (a) subjective knowledge means, and (b) objective knowledge scores. Both tests were significant, indicating an increase in student subjective and objective knowledge on the environmental impact of cotton and polyester fibers (Table).

Table. Student knowledge before and after the project.

Type of knowledge	Pre-test (SD)	Post-test (SD)	Paired <i>t</i> -test	<i>p</i> value
Subjective	1.97 (0.51)	3.41 (0.47)	15.21	< .001
Objective	3.23 (2.76)	6.41 (3.16)	5.09	< .001

Conclusion and Implications. To our knowledge, this study is the first to measure both subjective and objective knowledge of the environmental impact of cotton and polyester apparel. As future professionals, the project allowed students to not only gain knowledge about the two major fibers used in apparel, but to evaluate this information critically and then apply it to make a business decision with the goal of minimizing the product's environmental impact. The research results demonstrate that both subjective and objective knowledge can be significantly increased through learning experiences that are designed to reflect real-world business decision-making, as well as highlight the importance of including sustainability-related topics in the curriculum. The results of the study have practical implications for educators who want to increase student understanding of cotton and polyester apparel's environmental impact. Moreover, the subjective and objective knowledge scales that were developed in this study can be used in future research on the topic.

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