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Previous research on sustainability education suggests that for students to change attitudes, beliefs and behaviors, learning needs to be engaged. Through engaged learning activities (e.g. solving real-world problems, or using situations student can relate to), curiosity is stimulated, and complex judgmental skills as well as higher order thinking can be developed (Armstrong & LeHew, 2013; Pappas, Pierrakos, & Nagel, 2013; Zsoka, Szerenyi, Szechy, & Kocsis, 2013). Technology use, such as mobile devices, can increase student engagement and support collaboration when incorporated into learning activities (West 2013). However, no research using mobile technologies for teaching environmental sustainability was reported in the textiles and apparel area. Therefore, in this study we examined the effectiveness of the Making app from Nike, which was used for a hands-on product evaluation and development assignment in an apparel sustainability course offered at a Midwestern University.

Making was developed by Nike in 2013 for Apple devices. It was designed to be a resource for the next generation of decision makers to help them select materials based on comparing their environmental impact. The app uses the Nike Materials Sustainability Index (MSI), a database of the environmental impact of materials scored in four areas: chemical inputs and toxicity; energy use and greenhouse gas intensity; water and land intensity; and physical waste. Materials are ranked from least environmental impact (high scores) to most environmental impact (low scores). Since the intended target group of Making is industry professionals, a learning activity was developed to provide an experience that can be applied to students' future careers.

Upon receiving Human Subject Review Board approval, 22 students in a 300-level sustainability course were given an assignment to evaluate the environmental sustainability levels of apparel products from major sportswear brands, and develop their own hypothetical product. This activity was done in weeks 9 and 10 of a semester-long course after students learned about the product lifecycle and environmental impact of raw materials, finishes, and production processes. Students were instructed to work in randomly assigned pairs to compare and rate the overall environmental impact of six products from three brands (Nike, Patagonia, and Columbia). Four garments (running pants, t-shirt, down filled jacket, fleece jacket), which had different MSI scores, were selected from Nike to compare different product categories. A similar fleece jacket was evaluated from each brand to test Making's usefulness across brands. Students were also instructed to create a hypothetical environmentally friendly garment. First, the activity was done without the use of the app to establish a baseline, and then the instructor demonstrated how to use Making. Students worked with the same partner as in the previous activity and completed all aspects of the assignment again using the app. Additionally, they were given essay questions to evaluate how useful the tool was and if they experienced any frustration in using it. The effectiveness of using the app was

evaluated based on evaluation of students' product rankings, students' hypothetical products, assignment grades (out of 50) and responses for app usefulness.

When completing the assignment *without the app,* students expressed high levels of frustration and indicated that they struggled to identify the most environmentally friendly products to come up with concrete rankings. Only 3 out of 11 pairs correctly identified the product with the highest MSI score. The proposed hypothetical products were made from very basic materials such as organic cotton or recycled polyester. The highest grade was 40 (*M*=27.7, *SD*= 12.4). Using *the app* allowed 9 out of 11 pairs to calculate the environmental impact score correctly; 7 out of 11 pairs identified the product with the highest MSI as the most sustainable product. Hypothetical products went beyond the scope of the first products as this time they were made from materials such as natural rubber, polypropylene, and goose down; or students chose materials ranked in the top 10 by Making. The justifications for using certain materials showed advanced thinking. The highest grade was 50 (*M*=43.3, *SD*=4.6). Students reported that Making was equally useful on products from Nike and other brands.

Even though students were allowed to use the Internet for the first assignment, they were overwhelmed by the abundance of information sources available online and could not decide about how to evaluate materials. Student feedback on the usefulness of the app showed that information was easier to find and understand when using the app compared to searching the Internet, a pair stated as follows: "Making helped more than probably anything else I could have tried to find on the Internet for this project. Instead of having to guess or search for hours…the app was helpful, organized, and efficient…" Fibers were easy to find in the app and the app was perceived to be easy to use. All pairs indicated that the app was useful in completing the assignment; their only comment was it would be more useful if branded fabrics such as Polartec and Dri-FIT were included in the app. Overall, students thought this app was an effective tool that they would recommend to others and use themselves in the future, both personally and professionally. Our findings suggest that the use of specialized apps can better engage students with the course content by allowing students to access an abundance of information quickly and rank environmental impacts of fibers to improve products.

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