

## Transforming Activewear and Intimate Design Education through AI-Driven Flipped Learning

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### Abstract

**Background:** Traditional teacher-centered approaches in fashion design often restrict engagement, creativity, and interaction, while heavy curriculum loads and academic pressure contribute to stress and low motivation. To address these challenges, this study implemented an AI-powered flipped learning model in intimate and activewear design education, shifting the focus to student-centered, active exploration. It is aimed at boosting engagement and creative competencies.

**Methodology:** Sixty senior university students were invited to participate in the study for three months. AI tools such as LMArena and Grok, together with the 3D design software CLO 3D, were integrated into the flipped learning model alongside gamified quizzes (e.g., Kahoot!) and factory visits to enrich the learning experience. An intimate and activewear design project served as the primary measure of students' creative performance. Additionally, pre/post tests, Attention, Relevance, Confidence, and Satisfaction (ARCS) questionnaires, and interviews were used to evaluate knowledge retention, improvements in study motivation, and overall learning experience, respectively.

**Results:** Student projects demonstrated the effective application of tutorial knowledge, enhanced creativity, and the development of industry-ready competencies. Pre- and post-test results revealed stronger knowledge retention and improved learning outcomes. Furthermore, both ARCS questionnaires and interviews indicated that students strongly favored this technology-enhanced, student-centered approach, emphasizing its capacity to foster higher engagement, practical relevance, and overall enjoyment. Thus, students showed increased motivation to engage with study content and a greater inclination toward self-directed learning.

**Conclusions:** This study demonstrates that AI-powered flipped learning enhances engagement and creativity while fostering self-directed learning. By integrating advanced technologies with gamified and practical experiences, the approach improves academic performance and cultivates creative competencies. These findings highlight the potential of AI-driven, student-centered pedagogy to transform fashion design education and provide a sustainable model for future curriculum innovation.

