Pedagogical Efficacy and Barriers: Analysis of Faculty Perceptions on Augmented Reality Integration in Fashion Education

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ABSTRACT

Fashion pedagogy is predominantly visual and practice-based; Augmented reality (AR) offers enhanced spatial comprehension and iterative design, however it, encounters adoption obstacles, including infrastructure, training, and assessment alignment. This study aimed to assess the faculty perspectives towards the pedagogical efficacy of augmented reality in fashion education. This study used a mixed-methods design. A quantitative questionnaire (UTAUT/TAM constructs), was sent to 92 faculty members who teach patternmaking in fashion courses and SPSS was used to analyze the answers. Based on a semi-structured questionnaire qualitative interviews were conducted with 30 faculty members, who had answered the quantitative questionnaire. The interviews were analyzed using Nvivo software. The findings revealed that the faculty felt that visualization, confidence, and experiential learning provided by AR were helpful, but that high effort expectancy, a lack of discipline-specific AR tools, and weak institutional support make it hard to scale up. Suggestions include co-design, centralized asset support, and ongoing training specific to each discipline. The limitations of this study are that it is based on cross-sectional design and faculty-only sample; future research can incorporate longitudinal design and student-level outcomes. This study uniquely synthesizes Cognitive Load Theory and Experiential Learning Theory with UTAUT constructs to elucidate the interplay of cognitive and institutional factors in influencing AR adoption within creative curricula.

Keywords: Augmented Reality, Fashion education, Patternmaking, Cognitive Load Theory, Experiential Learning Theory.

INTRODUCTION

Augmented Reality (AR) is the incorporation of computer-generated digital components into real-world settings, it has emerged as a significant educational innovation that improves cognitive engagement, spatial reasoning, and conceptual comprehension across various fields (Chang et al., 2022; Li et al., 2025; Radianti et al., 2020). In higher education, AR's pedagogical influence is particularly pronounced in STEM disciplines, where it fosters experiential and interactive learning (Piedade & Batista, 2025). Fashion education includes both theoretical courses, such as fashion history, textile science and fashion studies, and practical courses, such as illustration, patternmaking and garment construction, which focus on developing technical and spatial skills. In recent years, digital technologies have been increasingly integrated into fashion pedagogy to support design development, visualization, technical instruction, and student engagement. Yet, the pedagogical application of AR remains relatively underexplored. AR has significant potential in fashion education because the field relies on visual and hands-on learning. Traditional teaching methods for pattern making, draping, and garment construction can be difficult for students to understand spatially. However, AR allows for 3D visualization, virtual fittings, and real-time prototyping, which cuts down on material waste and makes concepts clearer (Elwan et al., 2023; Sarkis et al., 2025). But for AR to work, faculty members need to be ready, the school needs to support it, and the technology needs to be easy to get to. Despite the recognition of AR's advantages by numerous educators, obstacles such as insufficient infrastructure, inadequate training, and challenges in integrating AR usage with

assessment frameworks impede its extensive implementation (Akçayır & Akçayır, 2017; Bacca et al., 2014; Chen et al., 2025; Piedade & Batista, 2025).

Cognitive Load Theory (CLT) and Experiential Learning Theory (ELT) support the idea that AR is useful in fashion education. CLT posits that learners' working memory may become overloaded during intricate, spatially demanding tasks such as pattern making, and that AR's real time cues and contextual guidance can mitigate extraneous cognitive load, thereby improving comprehension and performance (Herbert et al., 2022; Sweller, 2020; Wenk et al., 2023). ELT enhances this by conceptualizing AR as a tactile, contemplative learning medium that promotes active experimentation and iterative design, which are essential components in creative fields (Abbas Shah et al., 2024; Chen et al., 2025; Kolb, 1984). AR connects theory and practice by allowing people interact with virtual clothes, textures, and shapes in a way that makes them more creative, reflective, and able to solve problems (Sarkis et al., 2025). This study employed a mixed methods design to explore faculty views on the incorporation of AR in undergraduate fashion courses, with particular focus on faculty teaching patternmaking courses. Faculty in this study means the instructor who teaches the students. It examines their opinions on educational benefits, institutional obstacles, and, how these align with the principles of CLT and ELT. The aim was to inform strategic and sustainable AR adoption in fashion education to boost student engagement and improve learning outcomes.

Aim and Objectives of the Study

The aim of this study is to explore the pedagogical effectiveness of AR in fashion education and to examine faculty perceptions regarding its adoption. This study aims to test Cognitive Load and Experiential Learning theory to explore effectiveness as highlighted above.

- To assess faculty perceptions of performance expectancy associated with using AR in fashion education.
- To identify the key barriers that hamper the effective integration of AR in fashion education settings.
- To examine the level of effort expectancy among faculty members when integrating AR into their teaching practices.
- To evaluate the role of institutional support in influencing faculty adoption of AR technology.
- To provide suggestions for improving AR adoption based on faculty insights and the study's findings.

LITERATURE REVIEW

Understanding Augmented Reality in Education

AR integrates virtual components with actual environments to facilitate interactive and immersive educational experiences (Azuma, 1997; Li et al., 2025). In education, AR facilitates experiential and constructivist learning by visualizing abstract and spatial concepts, thereby improving engagement and retention, especially in visual and spatial fields such as fashion design, where comprehension of form and drape is essential (Kazlaris et al., 2025; Sarkis et al., 2025; Zekeik et al., 2025). Research underscores AR's capacity to enhance student motivation, engagement, and spatial cognition when combined with active learning methodologies (Li et al., 2025). AR applications such as ARKit, ARCore, Adobe Aero, and WebAR help students in fashion schools see clothes in a more realistic way and make fewer mistakes when designing (Sarkis et al., 2025). Its use in universities and the fashion industry has encouraged sustainability, iterative learning, and innovation through virtual try-ons and immersive studio simulations (Kazlaris et al., 2025; Li et al., 2025).

But for AR to be effective in the classroom, it needs good instructional design, faculty readiness, and support from the school (Albishri & Blackmore, 2025; Ferati et al., 2025). Even though there is a lot of proof that it works, there are still problems, such as high costs of implementation, limited access, and poor evaluation frameworks (Akinradewo et al., 2025; Li et al., 2025). Best practices stress connecting AR activities to measurable learning outcomes, slowly adopting WebAR, and encouraging collaboration between teachers and developers to esure that AR is used in a thoughtful and long-lasting way (Kazlaris et al., 2025; Sarkis et al., 2025). Nonetheless, substantial research deficiencies persist, notably the scarcity of longitudinal studies evaluating AR's enduring effects on creative competencies and faculty adoption behaviors (Ferati et al., 2025;

Zekeik et al., 2025). To fill these gaps, this study examines faculty members' perspectives on using AR in fashion education, focusing on how well it works as a teaching tool and what institutions can do to facilitate its use.

Faculty Perceptions and Performance Expectancy

Faculty perceptions are critical to the adoption of AR in education. Performance expectancy, which is the belief that AR improves teaching and learning are identified as a significant factor influencing faculty perceptions and adoption of AR within the UTAUT/TAM frameworks (Faqih & Jaradat, 2021; Koutromanos et al., 2024). When teachers think that AR will help students be more engaged, understand space better, or get real-time feedback, they are much more likely to want to use it, even if they are worried about how much work it will take or how difficult it will be to use. In fashion education, AR tools for 3D visualization, drape simulation, and virtual prototyping directly enhance design precision and product visualization, thereby increasing performance expectations and diminishing resistance, especially in studio-based learning contexts (Manocha, 2024; Udiono & Maryani, 2021). However, time constraints, a lack of institutional support, and a lack of fashion-specific AR tools continue to hinder adoption. This is why faculty members are looking for lesson materials that have been shown to work before full integration (Cabero-Almenara et al., 2024).

Furthermore, social influence and enabling conditions significantly impacted adoption intentions. Faculty are more likely to utilize AR when endorsed by peers and institutional leaders for its pedagogical value, and when infrastructure and training are readily available (Koutromanos et al., 2024; Merz et al., 2025). Positive pilot implementations enhance perceived usefulness by demonstrating tangible improvements in learning and efficiency. To enhance comprehension, scholars advocate for mixed method methodologies that integrate quantitative UTAUT/TAM modeling with qualitative insights to elucidate the concept of "usefulness" within creative fields such as fashion, correlating AR's perceived advantages with technical proficiency, aesthetic evaluation, and employment prospects (Koutromanos et al., 2024; Manocha, 2024). This kind of analysis makes sure that faculty perceptions are meaningfully linked to measurable pedagogical impact, which encourages the use of evidence-based AR in fashion education.

Effort Expectancy and Institutional Support

Effort expectancy, or how easy faculty members think it will be to use AR, has significant effect on whether they are willing to use it in higher education. For example, when AR tools require complicated setup, asset conversion, or multi-step authoring. According to research instructors with heavy workloads believe that it will be harder to use and they may use it as much, even though they see the benefits for teaching (Çavuşoğlu et al., 2025; Li et al., 2025; Suhail et al., 2024; Venkatesh et al., 2003). Empirical studies utilizing UTAUT in educational settings indicate that predictable, classroom-compatible AR workflows and diminished technical friction (e.g., simplified authoring, collaborative modes, pre-designed templates) enhance the intention to use AR, whereas technical requirements particularly in visually demanding disciplines, escalate preparation time and classroom management challenges (Chadeea & Prinsloo, 2024; Drakou et al., 2024).

Institutional support targeted training, reliable infrastructure (devices, bandwidth, licenses, helpdesk), and explicit administrative incentives serve as a crucial moderator that diminish effort expectancy and facilitate sustained integration. Continuous, discipline-specific professional development, media-lab services for asset conversion, and policy/incentive signals enhance adoption and long-term usage, whereas one-time training and inadequate infrastructure render innovations reliant on isolated champions (Li et al., 2025; Morales Méndez & Del Cerro Velázquez, 2024; Ronaghi et al., 2024; Suhail et al., 2024). In fashion education, where high resolution textures, drape simulation, and pattern conversion are technical bottlenecks, codesign approaches and centralized content support significantly reduce faculty effort and enhance adoption (Drakou et al., 2024; Perret & Schwientek, 2025).

Barriers to AR Integration in Fashion Education

AR has a lot of potential for fashion education, but not all faculty members are using it because there are many barriers that make it difficult to use in the classroom and measure learning gains (Li et al., 2025). Technical issues are a big problem: high initial costs for devices and software, poor compatibility with institutional systems,

and ongoing problems with reliability and usability (battery, calibration, bugs) make AR lessons risky and difficult to scale. Because of this, teachers often avoid using AR beyond one-time demos (Akinradewo et al., 2025; Li et al., 2025). And many teachers say they don't feel confident or skilled in creating and grading AR activities. Without training in AR-specific instructional design, AR is often used in a shallow way instead of as a tool to help students learn, and there are not many assessment frameworks for AR-mediated learning (Mohamed & Sicklinger, 2022; Nikou et al., 2024).

Contextual and institutional constraints impede integration: the absence of strategic support, a shortage of technical staff, and the lack of shared asset repositories render content creation a burdensome and unsustainable task for individual instructors. Furthermore, concerns regarding equity (device/connectivity disparities) and unresolved privacy and data governance issues deter regular usage (Akinradewo et al., 2025; Giaretta, 2024; UNESCO, 2025).

For fashion-specific applications, AR's need for specialized 3D garments, virtual-fit pipelines, and licensing makes things harder and more expensive. Faculty members who do not have dedicated 3D/design technology support find it difficult to provide authentic AR learning experiences (Batool & Mou, 2024; Mohamed & Sicklinger, 2022). These obstacles diminish teaching efficacy by promoting superficial demonstrations over outcome oriented learning activities, extending preparation and troubleshooting durations, creating inconsistent student access, and complicating the valid evaluation of AR-mediated competencies, thereby constraining the transformative potential of AR within fashion curricula (Li et al., 2025; Nikou et al., 2024).

THEORETICAL FRAMEWORK

This framework connects Cognitive Load Theory (CLT) and Experiential Learning Theory (ELT) to explain what teachers think about (a) why students have trouble with traditional patternmaking lessons and (b) why teachers think AR will help students learn more in fashion school.

Cognitive Load Theory and Challenges in Patternmaking

Traditional patternmaking necessitates significant element interactivity (spatial relations, sequential steps, precise measurements), which strains working memory; when instruction are disjointed (with separate diagrams, text, and demonstrations), extraneous and divided attention loads escalate, often perceived by faculty as student difficulty (Paas & Van Merriënboer, 2020; Sweller, 1988). Empirical studies indicate that effectively designed spatial AR can diminish extraneous cognitive load by offering contiguity and timely cues, whereas inadequately designed interfaces may increase cognitive demand. This phenomenon elucidates the observed variability in student performance with AR, as noted by the faculty (Buchner et al., 2022; Xue et al., 2024).

Experiential Learning Theory and Augmented Reality as Active Pedagogy

Kolb's cycle (concrete experience → reflection → conceptualization → experimentation) presents learning as a repetitive, practice-based process. AR's 3D visualization, adjustable overlays, and re-playable interactions correspond directly to these stages, and are thus anticipated to augment active, embodied learning in practical tasks (Kolb, 1984). Recent studies on educators indicate that AR promotes contextual, practice-based experiences that facilitate swift experimentation and reflection, provided that the instructional design intentionally supports these processes (Piedade & Batista, 2025).

Reconciling CLT and ELT to Address Faculty Perceptions and Obstacles

Faculty support for AR is frequently based on ELT’s potential for enhanced practice; however, apprehensions

stemming from CLT, specifically the risk of cognitive overload due to interface complexity and practical challenges (teacher training, time, infrastructure, assessment alignment), temper enthusiasm. Consequently, perceptions embody both pedagogical optimism and pragmatic limitations in teaching (Kolb, 1984; Piedade & Batista, 2025; Sweller, 1988).

Consequences for the Mixed Methods Investigation

This study utilized Cognitive Load Theory and Experiential Learning Theory as complementary perspectives to explore faculty views on AR-based teaching. Cognitive Load Theory offers a framework for understanding faculty concerns about student mistakes and cognitive demands, addressing issues such as the inherent complexity of tasks, divided attention, and the necessity for instructional support through worked examples. On the other hand, Experiential Learning Theory sheds light on faculty beliefs about the quality of learning, focusing on concrete experiences, reflective practice, and active experimentation. These theories together facilitate a comprehensive analysis of both the educational benefits and perceived challenges, while also considering contextual factors such as technical readiness, time limitations, and curriculum alignment in relation to the intention to adopt and practical feasibility (Paas & Van Merriënboer, 2020; Piedade & Batista, 2025).

Research Gap

Even though there is more and more proof that AR can help students learn, there are still gaps in our knowledge about how to use it in fashion education. Most current research focuses on immediate enhancements in engagement and spatial comprehension, yet it lacks longitudinal data regarding AR's enduring effects on creative skills and educational results. Faculty perceptions have been inadequately examined beyond superficial acceptance models, yielding scant insights into the interplay of performance expectancy, effort expectancy, and institutional factors that shape genuine adoption behavior in creative disciplines. Methodological limitations, including small sample sizes, generic AR tools, and inadequate evaluation frameworks, further hinder comprehension of how AR can be effectively integrated with fashion-specific learning objectives, assessment criteria, and cognitive load considerations. Additionally, there is a lack of research investigating how institutional support, training, and co-design methodologies can reduce adoption barriers and improve faculty's preparedness. To fill these gaps, mixed-method studies are needed to examine how faculty views are related to measurable pedagogical, technical, and institutional outcomes in fashion education.

METHODOLOGY

This study employed a mixed methods design to elucidate both the quantifiable and qualitative aspects of faculty perceptions concerning the integration of AR in fashion education. This method allows for triangulation between quantitative trends and qualitative insights, yielding a thorough comprehension of the pedagogical, technological, and institutional determinants affecting AR adoption.

Sample Population

The study sample was comprised of faculty who teaches the pattern making in higher education programs of fashion and design offered in India. This cohort was chosen due to the fact that the subject of pattern making is a prerequisite in the study of garment construction and the faculty imparting this lesson is critical in deciding on the role of use of AR in learning institutions. Recruitment of participants for the study as not based on previous experience with use of digital technologies or AR for teaching.

Sampling Technique

Snowball sampling was combined with purposive sampling. Purposive sampling was used to make sure that faculty members who were specifically teaching pattern making in the fashion design schools were included. The snowball method was employed to increase the number of people participating through the request for referrals by the first respondents, and this enabled the sample of the faculty in various institutions and different geographical areas.

Sample Size

Quantitative questionnaire was filled by 92 faculty. Out of them, 30 participants were willing to respond to qualitative semi-structured interviews. 30 interviews were carried out till the data saturation was reached. This

was done to ensure that no new codes emerge in the subsequent interviews and to include different perspectives of various educators from different institutions in the study.

Interview Process

Qualitative interviews were carried out face to face, or on the platform of Google Meet, or over the phone based on the availability and geographical location of the participants. The application of various interview modes guaranteed the heterogeneity of the data collection and provided the chance to involve the institutions that are situated in various regions.

Research Instruments

The quantitative questionnaire was shared with the faculty as a Google form. A brief explanation of AR and its relevance to pattern making was provided at the beginning of the form to support participants who were unfamiliar with AR. The quantitative questionnaire consisted of 25 questions. Of these five items were on demographics and the rest of the questions were 5-point Likert scale (from “Strongly Disagree” to “Strongly Agree”). Ten items were on student learning challenges in pattern making, and a QR code which upon scanning displayed an AR experience related to patternmaking. Once they had engaged with the AR, the faculty could respond to the remaining ten items regarding their perspectives concerning the potential application of AR in patternmaking education.

When the QR code was scanned, it triggered a series of three AR layers, as shown in Fig.1. A short catwalk video of a 3D avatar in a digitally created 3D garment, Fig.2. An interactive 3D garment model, which can be rotated, zoomed, and viewed on the screen and Fig.3. The flat patterns that comprise the garment, shown separately and labeled. With this AR experience faculty members were able to learn how garments are made using a complete three-dimensional and spatially oriented presentation before filling the questionnaire. They could zoom in and look at the drape, silhouette, and structural characteristics of the 3D version, and then see how each part of the pattern would be applied to the final garment form. This comprehensive interaction during the pre-survey phase was done to ensure that all the participants could grasp a practical, real-world understanding of how AR is integrated into patternmaking education. No static images were included in the questionnaire. The visual material was distributed only in the augmented reality experience (QR-code based) so that everyone would have had the same, interactive exposure.

Fig.1. Image of catwalk video of 3D Avatar with 3D garment could interact with

Fig.2. 3D garment that participants

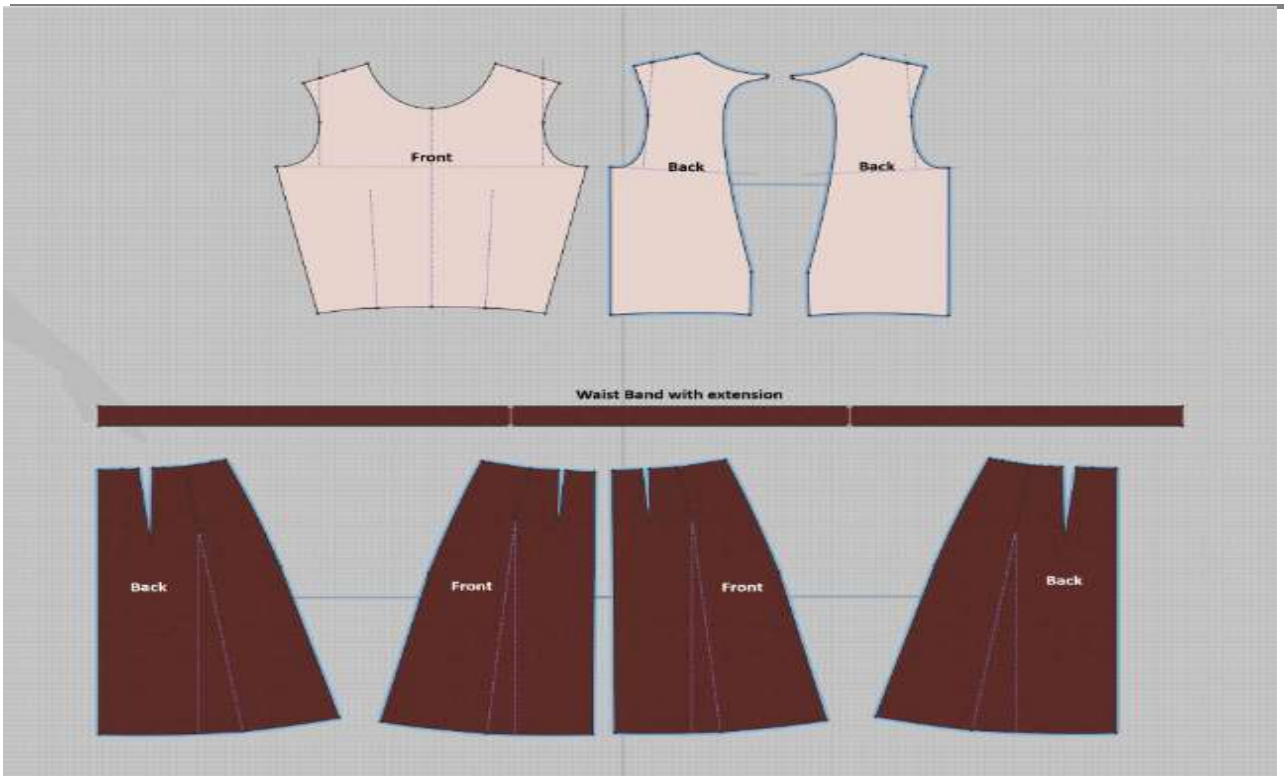

Fig.3. Patterns that make up the 3D garment

The qualitative instrument consisted of a semi-structured interview guide containing 15 open-ended questions. The guide explored teaching experiences, challenges in pattern making instruction, student learning issues, faculty perceptions of technology-enhanced learning, and views on the feasibility of integrating AR into patternmaking pedagogy.

Hypotheses and Data Analysis

The study employed a mixed-methods design, facilitating acquisition of quantitative and qualitative data. The study's quantitative aspect utilized a hypothesis driven method to explore faculty's perspectives on the of AR in fashion education, along with their opinions on the difficulties students face in pattern-making. In line with the study's aims, two hypotheses were developed and tested using inferential statistics. Hypotheses provided a basis for the quantitative analysis, the qualitative data helped to gain a greater understanding of faculty's perspectives.

H_1: Faculty believe that students have difficulty in learning patternmaking.

H_2: Faculty perceive the use of augmented reality in fashion education as pedagogically effective.

Quantitative Data Analysis: Quantitative data was examined using SPSS software. Descriptive statistics (means and standard deviations) were calculated, and the one- sample t-tests were used to test whether the faculty perception was significantly different from the neutral scale midpoint.

Qualitative Data Analysis: Audio recording of the interviews were transcribed by the researcher and then they were analyzed using NVivo software through thematic analysis.

RESULTS AND DISCUSSION

Overview of Findings

The study examined responses from 92 fashion faculty members, comprising 77.2% females and 22.8% males, reflecting significant female representation aligned with the gendered characteristics of the fashion discipline. Most of the respondents had over a decade of teaching experience, suggesting a well-experienced and

pedagogically skilled group capable of evaluating the educational effects of AR. Most of them (60.9%) taught at various fashion schools across India and the rest of them (39.1%) were from various NIFT schools, which provided a wide range of views from different types of schools.

Student Challenges in Patternmaking

The results showed that 26.1% of the faculty members saw that almost half of their students (50%) had trouble understanding and developing patterns. Another 20.7% thought that 40% of students had trouble visualizing patterns and garments. These results confirm that traditional patternmaking instruction is still very difficult, which faculty say is because students have trouble visualizing and processing information in a fragmented way. Descriptive statistics support this trend, with faculty strongly agreeing that "students have difficulty drafting patterns correctly" ($M = 3.90$, $SD = 0.77$) and "struggle to visualize garments while drafting" ($M = 3.90$, $SD = 0.75$).

This finding aligns with the Cognitive Load Theory (Paas & Van Merriënboer, 2020; Sweller, 1988) which asserts that highly interdependent spatial elements elevate intrinsic and extraneous cognitive load during the learning process. In conventional pedagogy, the segregation of 2D diagrams, text, and demonstrations induces split-attention effects, corroborating the claim in (Buchner et al., 2022; Xue et al., 2024) that cognitive overload diminishes learning efficiency. Consequently, the faculty consensus endorses previous research that emphasizes AR's capacity to alleviate extraneous cognitive load through contiguous, interactive, and multimodal representations of garments (Kazlaris et al., 2025; Sarkis et al., 2025).

Moreover, 71.7% of respondents indicated that both male and female students encounter similar challenges in patternmaking, corroborating the findings asserted in (Albishri & Blackmore, 2025) that learning difficulties are predominantly pedagogical rather than gender-specific, stemming from visualization and design abstraction instead of interest or ability.

The one-sample t-test on the “student difficulty” construct ($M = 3.68$, $SD = 0.63$, $t(91) = 10.25$, $p < .001$) statistically corroborates these findings, affirming that the faculty significantly concurred that students encountered learning challenges with conventional methods. One faculty member stated, “some students have this feeling that this is a very difficult subject.” This outcome reinforces the justification for implementing AR-assisted instruction to facilitate intricate visualization and enhance understanding, in alignment with previous studies (Ferati et al., 2025; Li et al., 2025).

Faculty Perceptions Toward AR Effectiveness

The mean scores for items related to motivation, confidence, understanding garment design, and fit/drape simulation were all above 4.0, showing that the faculty had very positive attitudes toward AR. Participants specifically concurred that AR experiences preceding each pattern could bolster student’s confidence ($M = 4.09$), enhance student’s understanding of garment design ($M = 4.09$), and demonstrate realistic fit ($M = 4.07$). The high internal reliability (Cronbach’s $\alpha = 0.897$) shows that people consistently believe that AR has educational value.

The one-sample t-test results ($M = 3.98$, $SD = 0.58$, $t(91) = 16.36$, $p < .001$) indicate that faculty perceptions of AR effectiveness were significantly positive, demonstrating statistically significant support for the hypothesized pedagogical benefits. This statistical validation aligns with Experiential Learning Theory (Kolb, 1984), which underscores the importance of tangible experience and reflective observation for profound learning. This finding was supported by qualitative data, where one faculty member stated, “it would enhance their experience.” and another faculty stated “once students see the 3D garment, they will feel more confident” AR enhances learning by allowing 3D visualization, manipulation, and reflection, thus converting abstract pattern concepts into concrete learning experiences (Piedade & Batista, 2025; Sarkis et al., 2025).

This empirical finding corroborates the assertions in (Kazlaris et al., 2025; Li et al., 2025), which indicated that augmented reality promotes active engagement and conceptual retention via immersive experiences. The

consistency between the present findings and these studies validates that faculty acknowledge AR's contribution to the improvement of experiential learning cycles in studio-based fashion pedagogy.

Cognitive and Motivational Impacts

The robust faculty consensus that AR alleviates fear or anxiety (M = 3.71) corroborates previous research, suggesting that interactive visual feedback can reduce student apprehension (Ferati et al., 2025; Zekeik et al., 2025). This emotional aspect corroborates the Cognitive-Affective Learning Theory, which asserts that alleviating anxiety improves cognitive efficiency and fosters creative exploration (Paas & Van Merriënboer, 2020).

The findings indicate that AR fosters exploratory and self-directed learning, as evidenced by the heightened curiosity (M = 4.03) and motivation (M = 3.95) observed by the faculty. This corresponds with the "active experimentation" phase of ELT, wherein iterative digital trials promote reflection and creative iteration, which is essential for the acquisition of fashion design skills (Kolb, 1984; Piedade & Batista, 2025). This finding was supported by qualitative data, where one faculty member stated,“they will be more interested to learn patternmaking after seeing and interacting with the 3D garment in AR.” The faculty's view that AR is especially helpful for Gen Z learners (M = 3.89) backs up the idea that digital-native students like teaching that is interactive and visually immersive (Kazlaris et al., 2025; Li et al., 2025).

Barriers and Institutional Support

The literature underscores numerous adoption barriers, such as technical expenses, insufficient training, and inadequate institutional infrastructure (Akinradewo et al., 2025; Li et al., 2025; UNESCO, 2025) despite robust pedagogical optimism. The current quantitative results indicate enthusiasm, whereas qualitative analyses imply that enduring adoption necessitates robust institutional support to mitigate perceived effort expectancy. As one faculty member stated “infrastructure and arranging finance for the infrastructure would be challenging.” This is in line with UTAUT findings that training, infrastructure, and incentives are all important factors that affect behavioral intention (Morales Méndez & Del Cerro Velázquez, 2024; Venkatesh et al., 2003).

In it is observed that faculty in resource-constrained environments encounter elevated effort expectancy, potentially obstructing long-term AR integration (Drakou et al., 2024; Li et al., 2025). Consequently, although faculty endorse the advantages of AR, institutional readiness continues to be a pivotal factor for enduring pedagogical transformation.

CONCLUSION AND RECOMMENDATIONS

This study investigated the pedagogical efficacy of AR in fashion education by analyzing faculty perceptions concerning its integration, utility, and institutional viability. The empirical findings indicated that a majority of faculty members recognized the considerable challenges faced by students in traditional patternmaking, primarily attributed to difficulties in spatial visualization and cognitive overload. This is in line with the Cognitive Load Theory and Experiential Learning Theory, which stress the importance of reducing unnecessary mental effort and encouraging active, iterative learning. The findings validated that AR functions as an efficacious pedagogical instrument for enhancing conceptual comprehension and practical skill acquisition in fashion design courses. Based on these findings, it is suggested that organizations should implement organized AR integration frameworks, encompassing faculty training initiatives, the availability of AR development resources, and collaboration between educators and technology experts. Additionally, incorporating AR into the design cycles of fashion curricula, creating AR modules tailored to specific disciplines, and offering institutional incentives and infrastructural support can guarantee sustainable implementation and promote innovative teaching methodologies in fashion education environments.

Theoretical Implications and Managerial Implications

This study contributes to the literature that integrates CLT and ELT within the context of fashion education, offering empirical evidence that AR alleviates cognitive load while enhancing experiential, practice-oriented

learning. The results confirm that UTAUT dimensions, including performance expectancy, effort expectancy, and facilitating conditions, are essential predictors of faculty acceptance of AR, underscoring the interconnected influence of cognitive and institutional factors on technology adoption. From a managerial standpoint, the findings indicate that academic leaders and policymakers should regard AR not merely as a technological advancement but as a vital pedagogical innovation. To effectively incorporate AR into fashion curricula, administrators ought to invest in faculty capacity building, infrastructure compatible with AR, and collaboration across departments. Furthermore, aligning the adoption of AR with institutional sustainability objectives and student employability outcomes can establish educational institutions as pioneers in technology-enhanced creative learning, thereby connecting the divide between academia and the fashion industry's evolving digital ecosystem.

Limitation of the study and Further research directions

This study provides significant inputs; however, it is constrained by its cross-sectional design and faculty-centric sample, which hinders the generalization of findings across various institutional and cultural contexts. The information gathered from self-reported perceptions might be subject to response bias and does not offer longitudinal evidence of the lasting influence of AR on student learning outcomes. Furthermore, the study predominantly examined the pedagogical and institutional aspects of AR, neglecting quantitative evaluations of student performance metrics or cognitive load alleviation in controlled experimental environments. Subsequent research should utilize mixed-method and longitudinal methodologies to assess learning efficacy and behavioral outcomes over time, integrate student-centered viewpoints, and investigate discipline-specific augmented reality tool development specifically designed for fashion design education. Comparative analyses within creative domains, including architecture, interior design, and product design, may enhance the comprehension of how AR reshapes experiential learning frameworks and promotes sustainable digital pedagogy in professional practice-based higher education.

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