

Enhancing Immersive Learning Experiences through Augmented Reality: A Paradigm Shift in Design and Fashion Education

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INTRODUCTION

Using cutting-edge technologies into design and fashion education is essential to improving the student experience in this dynamic field. Students' creativity is greatly enhanced by Augmented Reality (AR), which is emerging as a revolutionary technology. By superimposing digital content over the real world, augmented reality (AR) enhances traditional lectures and demonstrations. Teachers can utilise augmented reality (AR) to give students virtual demonstrations of design principles so they can see ideas in action. By bridging the gap between theory and practice, this immersive approach helps increase the retention and engagement of instructional content.

Students may see their design thoughts in three dimensions with AR's dynamic platform. With AR, students may engage with their ideas in real time and gain a deeper grasp of spatial connections and proportions by superimposing digital information onto the real environment. By providing students with a more tangible means of exploring and honing their ideas, this immersive experience fosters creativity. With the use of augmented reality (AR), interactive learning modules that let students actively investigate design ideas can be created. Through hands-on interaction, augmented reality (AR) enables students to interact with virtual aspects and gain a deeper knowledge of theoretical concepts, whether they are breaking down complicated design structures or examining historical fashion trends.

AR allows numerous people to engage with the same augmented area at once, which promotes collaborative design processes. Students can work together in real time on projects, exchanging ideas and improving designs as a group. The collaborative nature of augmented reality fosters creativity by

extending the boundaries of traditional design thinking and inspiring students to take inspiration from a variety of viewpoints.

As AR enables students to examine and evaluate their work in real-world environments, it facilitates quick feedback on designs. Students are able to quickly iterate on their creations thanks to this immediate feedback loop, which helps them develop their creative talents by teaching them from both failures and achievements. Having the flexibility to quickly modify plans in response to immediate feedback promotes experimentation and adaptation.

Beyond only being a cutting-edge technology advancement, augmented reality integration in design and fashion education fosters innovation. By offering a collaborative, dynamic, and immersive learning environment, augmented reality (AR) enables students to fully realise their creative potential and equips them for the ever-changing demands of the fashion and design sectors.

With its ability to provide access to an immersive learning environment, augmented reality is emerging as a revolutionary force in the field of design and fashion education. Teachers can improve the educational experience for students and better equip them for the rapidly changing and technologically sophisticated world of the fashion and design industries by incorporating augmented reality (AR) into interactive modules, design studios, and lectures. Not only does the application of AR improve learning, but it also helps to mould the next wave of innovative and adaptable designers.

Augmented Reality (AR) emerges as a powerful tool, transforming the traditional teaching landscape into an interactive and dynamic experience.

This paper attempts to explore

1. Using AR as a tool to enhance the design and fashion education learning process.

Assess the keenness of students in adapting the new Tech enabled Design and Fashion Education. (Skill based)

Effectiveness of AR as aid for enhancing the immersive teaching experience for Faculty.

LITERATURE REVIEW

Augmented Reality (AR)

Gallayanee Yaoyuneyong, Erik Johnson in their paper titled: "Augmented Reality: An Overview and Five Directions for AR in Education" defines AR as a tool of enhancement of the real world with the intervention of computer-generated execution with the markings of specific locations. These markings can be of specific location or place in order to render it on screen with a realistic seeming object or imagery.

Danakorn Nincareana, Mohamad Bilal Alia, Noor Dayana Abdul Halima, Mohd Hishamuddin Abdul Rahmana in their paper: titled: "Mobile Augmented Reality: the potential for education", mentioned two ways of addressing AR i.e broad and restricted approach. The broad sense of AR is that it enhances natural feedback for users through simulated cues, but a more restricted definition is that it is a kind of virtual reality in which the participant's head-mounted display is transparent, enabling an unobstructed view of the real world. The paper describes Augmented Reality as a system that meets three fundamental criteria: (1) merging real and virtual elements, (2) enabling real-time interaction, and (3) aligning virtual and real objects three-dimensionally.

Jule M. Kruger, Alexander Buchholz & Daniel Bodemer in their paper titled: "Augmented Reality in Education: Three Unique Characteristics from a User's Perspective" elaborates this further by highlighting the technological characteristics of augmented reality (AR) from a user's perspective and how it can be utilized in education. Using a user's perspective, there are three main characteristics: contextuality, interactivity, and spatiality. Putting learning into a context that is relevant enhances learning by combining real-world and virtual elements. This means the application or device in use must be aware of its location to adapt to the given location. With interactive properties, users can manipulate both real and virtual properties, creating new possibilities for interaction. Spatiality refers to the placement of virtual objects in the real world, providing a more realistic and immersive experience.

AR in Education

Walter J. Rezende, Eduardo S. Albuquerque and Ana Paula Ambrosio in their paper titled: "Use of Augmented Reality to Support Education Creating a Mobile E-learning Tool and using it with an Inquiry-based Approach", emphasis on how traditional teaching methods will turn obsolete in a world wherein the collision of modern technology and the curiosity is fuelled together to create something better and new

everyday. It proposes how AR can utilize inquiry-based models and bridge the gap between theoretical concepts and its practical application in a student's life. Mentioning the efficiency of including games in AR for the purpose of education, the paper elucidates with an example of Jigsaw Puzzle. In an experiment, two groups initially with similar quiz scores were used to demonstrate the effectiveness of Jigsaw. A traditional teaching method was used in one group, while a Jigsaw approach was used in the other. After the lesson, both groups were tested again in a new quiz. The findings revealed a notable difference in scores, with the Jigsaw method group achieving an average score of 92.25 out of 100.00, while the group exposed to traditional methods scored 75.5. Jigsaw is one method that can be adapted to enhance traditional methods of teaching in AR.

György Molnár, Zoltán Szűts, Kinga Biró Use of Augmented Reality in Learning in their paper titled: Use of Augmented Reality in Learning shows augmented reality is being used in field of biology, and physics wherein animated model of organs can be created to understand its functioning or even conduct experiments that are deemed dangerous virtually. The paper mentions how students can have a more involved experience in learning by creating their own content crediting the innovative nature of this technology.

Intervention of AR in Design & Education

Augmented Reality (AR) has significantly impacted both the fields of design and Fashion education, offering innovative and creative ways to enhance user experiences, improve learning outcomes, and streamline creative processes.

Few of the classroom projects include Interactive User Experiences and Augmented Retail Experiences by creating virtual retail store merchandise, displaying detailed information about the products enhancing the immersive experiences with multi sensorial approach. there by getting to know which layout, planning and other details better suits the objective and requirement of stores.

Virtual Try-Ons and Product Customization: Augmenting furniture in the living spaces, trying virtual beauty products and garments are also few areas where research and learning is a great opportunity.

Virtual Field Trips: Traveling to new environments allows them to explore historical sites, scientific phenomena, or geographical locations without leaving the classroom.

The intervention of AR in design and education continues to evolve, offering new possibilities for creativity, learning, and collaboration. As technology advances, we can expect even more sophisticated applications in these fields.

Scope of AR in Design & Education

The scope of Augmented Reality (AR) in design and fashion education is expanding with technology advancement. AR enhances the learning experience, provides practical applications for design students, and offers innovative tools

for the fashion industry in the form of Enhanced Visualization by creating 3D models to overlay on real spaces in many areas for a more immersive design experience. creating prototypes that are interactive to interact with the design in a virtual or augmented area by speeding up the testing process to make changes and improvements. Creating interactive and engaging marketing campaigns. with the help of Interactive AR advertisements and product placements. Augmented reality's potential in the design and fashion industries is vast, with many potential uses ranging from improving the quality of instruction to giving students hands-on experience with real-world problems.

METHODOLOGY

This study used primary & secondary data from journals, scholarly articles, research papers, and books to decode the elements of design education. The purpose of the study is fulfilled with quantitative tools using surveys in the form of a structured questionnaire. To decode the components of future fashion and design education for Immersive learning, we adopt an integrated TCM (Theories, Contexts, and Methods)-ADO (Antecedents, Decisions, and Outcomes) framework to systematically review structured questionnaires and secondary data from journals, scholarly articles, research papers, and books. The findings from this analysis present implications for future research, theory, and practice. This paper used a purposeful sampling technique to collect data from young adults (19-25 years old) studying design. To understand the adaptations of Augmented Reality in a learning environment, a structured questionnaire was conducted with a few educationalists teaching design.

ANALYSIS

Students with a background of design and fashion who are currently pursuing their graduation and masters were surveyed to gather insights about the integration of AR in design and fashion education.

AR applications have not been used by most respondents for fashion and design learning. As a result, AR technology has not yet become mainstream or widely integrated into design and fashion educational practices.

It is evident from the data that education providers, app developers, and educators have an opportunity to increase awareness of, accessibility to, and integration of AR applications into design and fashion education. It is possible to improve engagement, creativity, and practical skills development within these fields by leveraging AR technology.

These findings suggest a strong positive perception of the contribution AR technology can make to the educational experience within the field of design and fashion. There is a small percentage of respondents who do not share the optimism of the majority regarding AR's potential. This could

be attributed to the challenges posed by AR like technical complexity, lack of training or even, security concerns with technology. The openness of the respondents reflects an interest towards receiving education in a way that transcends traditional mode of teaching & dives into a more immersive experience.

Although AR can be applied to many subjects in design and fashion, respondents chose fashion illustration and 3D modeling as well as digital fashion showcases and interactive design prototypes as their preferred subjects. It can be noted that there is a significant inclination towards creating and rendering fashion concepts reflecting through these choices of subjects. Furthermore, AR app developers can also look into combining these aspects to deliver a packaged experience for fashion and product designers. The preference for areas such as Fashion Illustration and 3D Modeling suggests a recognition of AR's potential for practical application and real-world simulation in design and fashion education. AR can allow students to digitally sketch and manipulate fashion designs in real-time, as well as create virtual prototypes that closely resemble real garments or products.

When asked about the benefits of learning design and fashion through AR, improved understanding of materials, draping, fits and fabrics emerged as one of the most ticked options followed by increased engagement and interactivity in learning & opportunity for experimentation and creative exploration. Navigating through complex concepts can be made easier which further lets students try out different possibilities for design and fashion making a pathway for new ideas and innovation. This in turn would lead to a rise in participation and promote the interplay of traditional teaching in classrooms with the intervention of AR. This preference for fashion illustration and 3D modeling suggests that AR has potential for real-world simulation and practical application in design and fashion education. Using AR, students can sketch and manipulate fashion designs in real-time, and even create virtual prototypes that closely mimic real garments and products.

Respondents cited a lack of training and resources as one of the major challenges. It therefore follows that implementing AR technology for students would require a training module along with valuable online or offline resources to facilitate their understanding of AR. The second most common challenge was technical complexity and implementation challenges. It would be crucial, apart from training, to teach students how AR works in applications in order for them to use it in their education. Among these could be concerns about data privacy, cybersecurity threats, and potential misuse of AR technology, particularly in where sensitive information or intellectual property is involved.

A large number of respondents preferred workshops or tutorials to learn AR in the context of design and fashion education, showing an interest in a more hands-on approach and interactive learning method. This was followed by the

choice of classroom lectures or discussions selected by students, suggesting a desire for open discussion while learning. The small number of respondents who agreed with online courses or webinars suggests the need for more engaging ways to receive knowledge than online tutorials.

Another survey was conducted with professors to test how effective AR can be to enhance the teaching experience for the educators. Alongside students, it was important to understand the lens of professors in the field of fashion and design as this is one of the tools that could help in the translation of their subject matters.

When asked about their usage of design and fashion-based AR applications, "the ability to interact with virtual objects in the real world" was the most picked option after "enhanced visualization of complex subjects". Professors may find the practical application of interacting with virtual objects particularly beneficial when teaching complex or abstract concepts. In addition, they see AR applications as a way to make difficult subjects more tangible and accessible to students.

The preference for interaction suggests that professors endorse active learning strategies in their teaching approach. By providing students with opportunities to actively engage with virtual content, they may believe that students can develop deeper levels of learning and critical thinking skills.

Many educators answered "yes" when asked about AR's potential to enhance the learning experience for students, clearly showing their interest in and acceptance of technology. With the willingness to adopt a learning strategy using AR as the medium, along with the students' approval, it shows that this field has a lot of potential.

Both students & professors were asked the area of design and fashion they would prefer to integrate augmented reality. However one subject which got the most responses was Fashion Illustration and 3D modeling.

The response shows that they are not only interested in using technology to simplify education but are also interested in using it to digitalise student designs as reflected in their response of 'digital fashion showcases'. This was followed with the option of fashion illustration and 3d modeling techniques. This could potentially mean exploring sketching tools and interactive modeling platforms.

RESULTS AND DISCUSSION

With the results of the survey, it can be inferred that the integration of AR can be explored in the field of fashion and design particularly aiming at offering fashion illustration and 3D modeling, digital fashion showcases and interactive design prototypes.

In summation AR applications can be developed for classroom learning adopting a hybrid strategy of traditional learning backed with immersive technology.

The following ideas can be explored basis the results:

- **AR Fashion Illustration app:** It can be made keeping in mind the proportions, anatomy, and fabric details suited for the Indian market. Using the knowledge base of the app, real-time feedback can also be provided if there is a technical error. Students could also use this for fabric or garment swatching, using the camera on top of their drawings to analyze whether the print or color is working.
- **3D Modelling for product and fashion designers:** There are a lot of 3D models which are available online however, they may not always provide room for innovation. Students might be encouraged to experiment more if drawings can be manipulated and customized.
- **Virtual Fashion Showcases:** Students can use augmented reality to design their collections and display them in the classroom, preparing them for a more realistic approach required by the fashion and design industry.

CONCLUSION

The results of case studies, empirical data, and the literature review add to the rich conversation about AR's usefulness in augmenting immersive teaching and learning environments. The procedures of developing new products and producing them can be considerably improved by using augmented reality (AR) as a platform. Throughout the product development and manufacturing lifecycle, designers, manufacturers, and other stakeholders can increase overall efficiency, optimise workflows, and cut costs by utilising augmented reality (AR) as a collaborative platform.

The report ends with recommendations for further research to determine the plugin requirement to include specialised inputs that are by their very nature created for subjects to deliver a hybrid module form. This knowledge will be helpful for educators and designers.

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