

# The Impact of Augmented Reality Application Development on University Teaching Curricula

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## **Abstract**

The rapidly developing field of augmented reality (AR), which has the potential to completely transform the educational system, is called "augmented reality." AR applications may be utilized to build learning environments that are immersive and engaging, which can help students better absorb and remember the content they are being taught. In this article, we examine the research that has been conducted about the influence that AR has had on the growth of educational curricula in higher education institutions. We highlight the benefits of employing AR in education, such as higher learning outcomes, greater problem-solving abilities, and increased student engagement. We also go through some of the difficulties associated with implementing augmented reality in educational settings, such as the high cost of AR hardware and the prerequisite of specialized instruction. In conclusion, we provide some suggestions as to how universities may benefit from incorporating augmented reality into their existing instructional programs.

**Keywords:** augmented reality, educational curricula, learning, student, developing.

## **Introduction**

Augmented Reality (AR) technology is growing and developing rapidly, and its potential to develop and improve teachers' experiences has received a lot of attention in recent years. Augmented reality applications have been increasingly used in various fields, including education, as they can improve student engagement and understanding of complex ideas and concepts associated with undergraduate educational curricula, (Chiang et al., 2022) augmented reality technology can change traditional classroom learning environments by providing an interactive and immersive learning experience. (Lampropoulos et al., 2022) The impact of the application of Augmented Reality in university (Manuri & Sanna, 2016) educational curricula plans is a topic of extraordinary interest and importance for teachers,

students, and researchers. This technology has been shown to improve knowledge retention and retrieval, as well as problem-solving and critical thinking skills.

However, there are some challenges to integrating AR technology into school curricula, such as the need for specialized software development skills, and access to appropriate hardware. Augmented Reality technology is becoming more accessible with the rise of smartphones and tablets equipped with AR capabilities, such as Apple's ARKit and Google's AR-Core. (Yuliono & Rintayati, 2018) This technology allows users to experience a blend of the physical and digital worlds by overlaying virtual objects onto the real world in real time.

This presents unique opportunities for educators to create immersive and engaging learning experiences that can increase student motivation and interest in the subject matter.(Chen et al., 2022) One potential application of AR in university education is in the teaching of STEM (Science, Technology, Engineering, and Mathematics) subjects. AR can be used to visualize complex concepts such as molecular structures or engineering designs, allowing students to interact with virtual objects in a way that was not possible before(Duan et al., 2022). AR can also provide opportunities for hands-on experimentation without the need for expensive equipment or facilities.

AR can also be used to enhance language learning by providing students with immersive language experiences. For example, students can use AR to practice language skills by interacting with virtual objects and characters in a simulated real-world environment. However, there are challenges associated with integrating AR technology into university curricula. One difficulty is the need for specialized software development skills, as creating augmented reality applications requires knowledge of programming languages and software development tools, which not all educators have access to.

Teachers may need to invest in equipment such as smartphones or tablets. Despite these challenges, the potential benefits of AR in education make it an area of growing interest and research. Incorporating AR technology into university curricula has the potential to improve student engagement and understanding of complex concepts, leading to better learning outcomes increased and retention of knowledge. (Arulanand et al., 2020)His paper aims to explore the potential impact of AR application development in university educational curricula. It will examine the benefits and challenges associated with the use of AR technology in education and provide examples of how AR has been successfully integrated into university courses.

The paper will also explore the skills and knowledge required to develop AR applications(Tang et al., 2020) and the role of educators in guiding students through

the development process. Ultimately, this paper will argue that the integration of AR technology in university curricula has the potential to improve student learning outcomes and enhance the overall quality of the educational experience. The research topic arises from answering the following key question: What is the Role of Augmented Reality Application Development in Teaching Undergraduate Courses?

The following are the study hypotheses: Augmented reality is quite useful in a variety of educational settings? One of the most essential educational digital applications is augmented reality. Using augmented reality applications in teaching has a major positive influence? Maintaining a widespread culture of digital education apps that use augmented reality? There have been several earlier experiences using augmented reality in teaching? Augmented reality makes a vital contribution to educational applications?

Science, engineering, and medicine are the most common AR uses for education. The usage of augmented reality (AR) is being utilized to increase student engagement, motivation, and learning results. According to these Figures, augmented reality is quickly becoming a mainstream technology in education. As AR technology advances, we should expect to see much more widespread use of AR in university education.

### **Augmented Reality**

Augmented Reality is a technology based on projecting virtual objects and information into the user's real environment to provide additional information or act as a guide for him, in contrast to virtual reality based on projecting real objects into a virtual environment (Arulanand et al., 2020). All can deal with information and virtual objects in augmented reality through several devices, whether they are portable such as a smartphone or through devices that are worn such as glasses and contact lenses. (Karagozlu, 2018) All of these devices use a tracking system that provides accurate projection, displaying information in the appropriate place such as the global positioning system (Global Positioning System), camera, and compass as inputs that are interacted with through applications.

Augmented reality is an enhanced, interactive version of a real-world environment that is achieved through digital visuals, sounds, and other sensory stimuli via holographic technology. Augmented reality includes three features: a combination of the digital and physical worlds, real-time interactions, and precise 3D identification of real and virtual objects.

Augmented reality provides a better way to design, organize, and deliver consumables by overlaying digital content in real-world work environments (Mota et

al., 2018). When a business understands augmented reality and how to use it successfully, everyone can work remotely while collaborating efficiently.

### **Types of augmented reality**

When deciding what kind of augmented reality technology you'll need for your business, you'll first have to decide what kind of augmented reality you want to use. There are two types of augmented reality: tag-based and taggles.(Edwards-Stewart et al., 2016) Choosing one of these types of augmented reality will determine how you will be able to view your images and information.

Tag-based AR is created using image recognition to identify objects already programmed into your AR device or app.(Peddie & Peddie, 2017) By placing objects as reference points, they can help the augmented reality device determine the camera's position and orientation. This is generally achieved by switching the camera to grayscale and detecting a tag to compare that tag with all the other tags in its databank. (Jasche et al., 2021)Once your device finds a match, it uses that data to mathematically determine the position and place the AR image in the right place.

Marker-less augmented reality is the most complex as there is no point for your device to focus on. For this reason,(Jasche et al., 2021) your device must recognize the items as they appear in the display. Using a recognition algorithm, the device will look for colors, patterns, and similar features to determine what that object is and then, using time, accelerometer, GPS, and compass information, will orient itself and use the camera to overlay an image of whatever you want in your real-world surroundings.

### **The future of augmented reality in education**

There is no doubt that learning through practice is more effective than different teaching methods such as reading and writing.(Özeren & Top, 2023) Thus, augmented reality can participate strongly in this field, and enter the classroom, which would be a stimulus for learning and increase concentration (Ozdemir et al., 2018). The nature of augmented reality by displaying virtual objects in the real environment for students would be beneficial in improving student performance and increasing their interaction. Moreover, it provides them with the opportunity to see, move, and interact with three-dimensional images through books designed for that.

Augmented reality contributes to much scientific research, especially those that cannot be dealt with in a traditional way, for example, to do chemical reactions for the course of chemistry; Augmented reality provides the possibility to use virtual materials, mix them and see the results in the classroom without the need for these

materials or laboratories.(Yuliono & Rintayati, 2018) Space science is one of the most important areas in which augmented reality can be applied due to the ambiguity it contains and the lack of infrastructure for monitoring from astronomical observatories, especially in the Arab world, so that augmented reality applications are used to display planets and galaxies on mobile devices such as smart phones that have (GPS) to determine the user's location (longitude and latitude) and the compass and to determine the user's direction and the accelerator to determine the height, the global system for determining time (universal time) all of these four elements work together through a series of operations and calculations to determine the destination (Shirazi & Behzadan, 2015)The user is then shown galaxies, planets...etc. Perhaps the most notable application in this field is observing the "Gazing star" sky.

The application of augmented reality in education still faces several challenges, which is that displaying educational content requires technical experts,(Kurt & Öztürk, 2021; Sari et al., 2017) and investment in this field is costly and requires advanced devices such as cameras and projectors, and experts are needed to repair any malfunctions. In addition, augmented reality is still not accurate in displaying objects in the right place and time.

### **The importance of augmented reality in education**

Augmented reality holds great importance in the field of education and can have a positive impact on the learning process.(Han et al., 2022) Here are some reasons why augmented reality is important in education:

**Exciting Learning Experience:** Augmented Reality provides an exciting and interesting learning experience for students.(Pasaréti et al., 2011) By integrating digital elements with the real world, learning becomes an interactive and innovative experience that engages students and motivates them to explore the subjects.

**Enhancing interaction and participation:** Augmented reality can contribute to enhancing interaction and participation among students. (Wu et al., 2013)It gives them the opportunity to interact with and interact with digital objects in a real-world context, which promotes collaboration and engagement among students.

**Provide real-world experiences:** Augmented reality allows learning elements to be experienced in real-world contexts.(Elmqaddem, 2019) Students can explore educational places, objects and phenomena in a more realistic and detailed manner, which contributes to a better understanding and practical application of academic concepts.

Enhancing critical thinking: Augmented reality can contribute to enhancing students' critical thinking. When students interact with digital elements and explore concepts first-hand, critical and analytical thinking and creativity speak (P. Chen et al., 2017).

Developing practical skills: Augmented reality provides an opportunity to develop a range of practical skills in students. Students can collaborate on learning projects that use augmented technology, enhancing communication, collaboration, and problem-solving skills.

Expanding access and communication: Augmented reality can expand students' access to learning materials and resources. Students in remote or inaccessible areas can access exciting learning experiences through augmented reality technology.

Augmented reality can improve the learning experience and contribute to students' skills, interaction, and participation in the learning process. Thus, augmented reality plays an important role in developing education and improving learning outcomes.

### **Augmented reality applications in education**

Augmented reality technology has multiple applications in the field of education. Here are some examples of how augmented reality can be used in education:

Enhanced Science Experiments: Augmented reality can be used to enhance science, chemistry, and physics experiments. Students can explore scientific processes first-hand and watch and interact with 3D experiments for a better understanding of scientific concepts (Tzima et al., 2019).

Virtual educational tours: Augmented reality can be used to organize virtual educational tours of museums and historical and cultural sites. Students can visit remote or hard-to-reach locations and explore them realistically and interactively (Tekedere & Göke, 2016).

Teaching foreign languages: Augmented reality can be used in learning foreign languages by creating interactive virtual environments to interact with the target language. Students can practice conversations and learn vocabulary and grammar through interactive experiences (Crandall et al., 2015).

Learn practical skills: Augmented reality can be used to develop practical skills such as engineering, design, and architecture. Students can create and interact with 3D models to develop hands-on skills and experience practical operations more realistically (Iqbal et al., 2022).

Develop stories and narratives: Augmented reality can be used to transform stories and narratives into exciting visual experiences. Students can see and interact with the characters and events in the novel in 3D, which enhances understanding and imagination of the story.

Teaching motor skills: Augmented reality can be used to teach motor skills such as dance and sports. Students can watch motion models and simulate movements to improve their technique and performance (Bacca Acosta et al., 2014).

These are some examples of how augmented reality can be used in education. Applications and uses are constantly evolving, enhancing the learning experience, and enhancing student engagement and interaction in the educational process.

### **Materials and methods**

Augmented reality (AR) is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. AR has the potential to revolutionize education by creating immersive and interactive learning experiences that can help students to better understand and retain information. In this research, we follow the most important methods to answer the research hypotheses.

#### **1-Development of educational applications commensurate with the requirements of modern technological technology.**

Several major elements must be considered while developing educational applications that fulfil the criteria of contemporary technological technologies. The utilization of interactive and immersive technology such as augmented reality (AR) and virtual reality (VR) is one of the most essential components. These technologies can provide a more interesting and immersive learning experience, which can allow students' attention to be captured and maintained. Another critical factor to consider is the use of personalized learning strategies that address individual student demands and learning styles. Furthermore, the development of educational applications should focus on improving students' critical thinking, problem-solving, and teamwork abilities, as they are necessary for success in the modern workforce. Finally, educational apps must be accessible and inclusive for all students, including those with disabilities or special needs, to benefit from them. Taking these elements into consideration, educational apps that are consistent with the requirements of contemporary technological technology and that may assist to improve the quality of education for all students can be produced.

## **2- The urgent need to develop modern training and education methods.**

The rapid rate of technological progress, globalization, and evolving worker expectations have produced an urgent need for contemporary training and education approaches to be developed. Traditional education and training systems are no longer adequate to fulfil the demands of the modern workforce, which expects employees to be adaptive, inventive, and adept in developing technology. Furthermore, the current COVID-19 epidemic has emphasized the need for creative and adaptable training approaches that may be taught remotely or via hybrid learning models. To meet these difficulties, current training and education techniques must emphasize critical thinking, problem-solving, and teamwork abilities, as well as the incorporation of emerging technologies like augmented reality, virtual reality, and artificial intelligence. Furthermore, current training and education techniques should be accessible, adaptable, and personalized in order to suit to learners' specific requirements and learning styles. We can help to guarantee that individuals are prepared with the skills and information required to thrive in the contemporary workforce and to adapt to the continuous changes and challenges of the twenty-first century by establishing new training and education approaches.

## **3- keeping pace with the rapid developments of Augmented Reality applications in education.**

Augmented Reality (AR) is a fast-expanding discipline, with new technology and applications emerging at a rapid rate. As a result, educators and educational institutions have huge difficulty in keeping up with the newest innovations in AR applications in education. However, staying current on these advances is critical to guarantee that educational programs are relevant, interesting, and successful in preparing students for the needs of the modern workforce. Furthermore, by staying up to date on the newest AR apps and tools, educators may remain ahead of the curve in terms of adopting cutting-edge technology into their teaching practices, which can help attract and retain students while also improving overall educational quality. Educators and institutions may keep up with the newest advances in AR applications in education by attending conferences, seminars, and other professional development opportunities, as well as reviewing relevant material and engaging with the AR community on a regular basis. Furthermore, it is critical to interact with industry partners and other stakeholders to ensure that the educational curriculum corresponds with the most recent workforce demands and trends.



## **Results and discussions**

### **Manifesting the role of augmented reality in various fields of education.**

Augmented Reality (AR) has a function in education that goes beyond the usual STEM professions. AR may be used in a variety of disciplines and fields, such as art, history, literature, and language acquisition. AR may be utilized in the realm of art to bring paintings and sculptures to life, allowing students to understand the artistic styles and techniques of many eras and artists. AR in history may give students a more immersive and interactive experience, allowing them to examine historical locations and events in a more engaging and memorable manner. AR can give a more dynamic and engaging experience for students in language learning, allowing them to practice their language abilities in a realistic and immersive setting. Furthermore, augmented reality (AR) can assist to bridge the gap between theory and practice by allowing students to apply their knowledge in real-world settings and build practical abilities that employers greatly value. As a result, the function of augmented reality in education is broad and multidimensional, having the potential to alter how students engage with instructional information across a wide range of courses and areas.

### **Emphasize the importance of employing augmented reality applications as an integrated educational medium.**

In today's digital world, using Augmented Reality (AR) applications as an integrated instructional medium is critical. AR may make learning more interesting and interactive for students by allowing them to actively engage in the learning process and explore instructional information in a more immersive manner. By incorporating AR into the curriculum, educational institutions may offer a more dynamic and personalized learning experience that responds to individual learners' different requirements and preferences. Furthermore, AR may assist students bridge the gap between theory and practice by allowing them to apply their knowledge in real-world circumstances and build practical abilities that employers greatly value. Furthermore, incorporating AR can aid in the promotion of digital literacy and 21st-century skills among students, preparing them for the needs of modern jobs. As a result, the significance of using augmented reality as an integrated educational media cannot be emphasized, as it has the potential to alter the way students engage with educational information and prepare them for success in their future employment.

### **Develop applications for bachelor's education using augmented reality technology.**

The development of bachelor's education applications employing augmented reality technology has the potential to improve the quality and efficacy of educational delivery. Students may experience a more immersive and engaging learning environment by incorporating AR into the curriculum, which allows them to engage with digital information in a way that closely matches real-life settings. AR, for example, may be used to imitate laboratory activities, giving students the opportunity to practice scientific ideas in a safe and controlled environment. AR may also be utilized to provide students with virtual tours of historical monuments and landmarks, letting them experience the world's cultural legacy in a more participatory and memorable way. Furthermore, because AR provides a new and interesting manner of providing instructional information, it may be utilized to improve student engagement and motivation. As a result, the creation of bachelor's education apps employing AR technology is a significant step towards fostering creative and effective teaching practices and improving the quality of education provided to students.

## Conclusion

AR is a promising technology with the potential to transform education. Educators may utilize AR to create immersive and engaging learning experiences that help students better absorb and remember material by overcoming the hurdles of adopting AR in education. There has been a surge of interest in the use of Augmented Reality (AR) technology in educational settings in recent years, with a particular emphasis on its potential to improve student engagement, motivation, and learning results. AR is a technology that superimposes digital information on top of the actual environment, allowing users to engage with digital content in a more immersive and engaging manner.

AR has the potential to alter the way students engage with educational information in higher education by providing a more dynamic and personalized learning experience. The incorporation of augmented reality apps into university courses can have a major influence on student learning results. AR technology has been proved in studies to improve student engagement and motivation by providing a new and entertaining manner of presenting instructional information. AR may bring abstract concepts to life and help students grasp difficult topics in a more realistic and concrete way by superimposing digital information over the actual environment. AR, for example, may be used to imitate scientific investigations, giving pupils the opportunity to practice scientific ideas in a safe and controlled setting. This can assist to improve student learning outcomes by making learning more interactive and interesting for pupils. AR technology can also be utilized to improve pupil

information retention. AR can assist in boosting the efficacy of educational material delivery and promote long-term retention of information by presenting students with a more dynamic and immersive learning experience.

This is especially true in higher education, where students are frequently asked to study complicated and abstract topics that can be difficult to understand without the assistance of interactive and engaging instructional tools. AR technology can assist bridge the gap between theory and practice, in addition to increasing student engagement and knowledge retention. AR can help students build practical abilities that employers appreciate by giving them access to simulated real-world events. For example, in professions like engineering, architecture, and medicine, AR may be used to recreate work-related settings, allowing students to gain practical abilities that are extremely relevant to their future employment. Despite the potential benefits of AR technology in educational contexts, several difficulties must be overcome before its full potential can be realized.

One of the most significant hurdles is the requirement for specialized technical skills and experience to build AR applications. For educational institutions that do not have access to specialized technological competence, this might be a substantial impediment. Another issue is the lack of necessary infrastructure to enable the usage of AR technology, such as high-quality hardware and software, dependable network access, and acceptable bandwidth. Finally, the incorporation of augmented reality apps into university courses has the potential to improve student engagement, motivation, and learning results. AR can assist bridge the gap between theory and practice by giving students with an innovative and dynamic learning experience, as well as build practical abilities that employers greatly value. However, to fully realize the promise of AR technology in educational settings, specialized technical skills, and expertise, as well as suitable infrastructure to enable AR technology use, are required.

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