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AR Education Revolution: Augmenting Learning with Interactive Augmented Reality Experiences

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ABSTRACT: The use of Augmented Reality (AR) in education is a major step forward in teaching and learning practices, revolutionizing the way education has been done traditionally. AR superimposes digital information, including images, videos, and interactive models, on the real world, providing engaging and interactive learning experiences. This paper delves into the possible capacity of AR to transform education through higher engagement levels of students, better retention of knowledge, and offering experiential learning opportunities that have not been easy to attain using traditional teaching resources. Through AR, students can engage with abstract ideas using 3D visualizations, simulations, and immediate feedback, thus making learning more engaging, tailored, and efficient. The research also underscores the ability of AR to accommodate various learning types, such as auditory, visual, and kinesthetic learners, hence promoting inclusivity in the classroom. Notwithstanding its potential, the use of AR in education has several challenges, including high development costs, technical constraints, and the necessity for expertise teacher training. Yet, with the advantages of AR in enabling experiential learning and closing theory-practice divide, it is a force to be reckoned with for education in the future.

KEYWORDS: Augmented Reality, education, interactive learning, immersive experiences, student engagement, knowledge retention, 3D visualizations, learning styles.

I. INTRODUCTION

In the dynamic world of education, conventional approaches to teaching and learning are constantly being redefined by the accelerating development of technology. Among the most revolutionary technological developments that are revolutionizing the face of education is the emergence of Augmented Reality (AR). Augmented Reality is a revolutionary technology that overlays digital information—such as images, audio, and text—on the real world, producing a combined, immersive experience for the user. Within an educational setting, AR has the potential to transform student experience with learning materials entirely, providing interactive and highly immersive experiences that are far beyond what can be achieved with traditional textbooks, lectures, or even video. By augmenting the real world with contextual, virtual information, AR allows learners to experience and interact with information in a much more dynamic, meaningful manner. This union of the physical and virtual world presents new learning opportunities, making learning more interactive, immersive, and efficient.

The sheer pace of growth of AR technologies has created various uses across industries, but their effects on education are especially significant. The implementation of AR in education creates unlimited learning opportunities for students to engage in intricate ideas through experiential, interactive means. It facilitates the exploration of otherwise inaccessible subjects by placing students in richer, visual environments that bring learning alive. As technology advances, educators are increasingly turning to AR to integrate into their teaching methodology so that they can get their students involved in a manner that encourages creativity, critical thinking, and problem-solving. By marrying interactive 3D models, immersive simulations, and real-time data overlays, AR closes the gap between abstract theoretical knowledge and experiential, practical learning. As such, it holds the promise to not only revolutionize how students learn but also how teachers teach. Perhaps the most persuasive argument for why AR is becoming popular in education is that it is capable of stimulating multiple senses at once. The old ways of learning usually depend on auditory or visual data alone, which might not be engaging to all students or enable effective learning for everyone. AR can, however, address auditory, visual, and kinesthetic learners through experiences that cater to various learning styles. For example, they can be worked with 3D molecules in a chemistry lesson or converse with historical characters in a computerized reconstruction of the ancient world. Through such activities, students can engage with the content in

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a more physical and memorable fashion, which assists in furthering understanding and memory retention of the material. Additionally, AR can offer real-time feedback, allowing students to check errors, respond to questions, and review challenging concepts, further improving their learning experience.

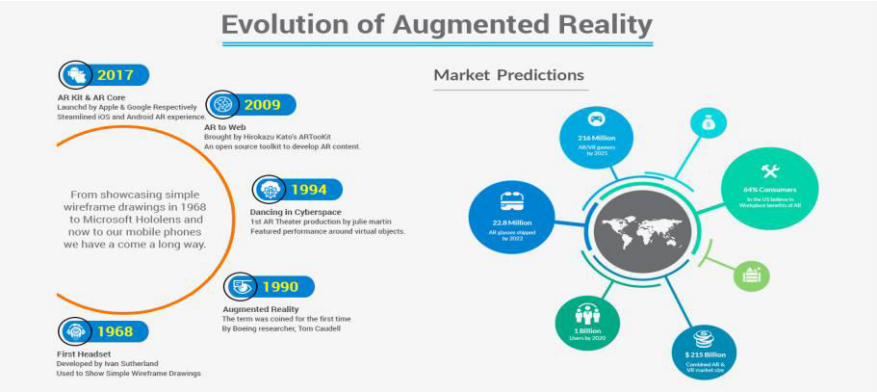

Fig 1 Historical evolution of AR

The use of AR in learning spaces also accommodates central pedagogical ideals, such as active learning and constructivist models. Following educational theorists such as Jean Piaget and Lev Vygotsky, it is best that students are engaged actively during the learning process, building knowledge by living experiences and interacting with their environment. AR fulfills this concept through providing interactive material that makes students experience and explore, enabling them to construct meaning through active engagement. For instance, in a science class, students may do virtual experiments or study ecosystems in a manner that would be impossible or impractical outside the computer. Such active participation leads to critical thinking, teamwork, and problem-solving, which are key ingredients of success in today's rapid-paced, information-driven world. In addition, the use of AR has the effect of making students feel a sense of responsibility towards learning, which enhances intrinsic motivation and engagement with the subject matter.

AR's capacity to convert abstract ideas into three-dimensional, interactive experiences also holds out hope for assisting students who have varying learning needs. In conventional classrooms, students with learning disabilities or those who are not able to understand some concepts might find it hard to comprehend intricate information in the form of text or static images. AR can overcome these issues by offering interactive, experiential learning that is tailored to individual learning requirements. For example, students with visual impairments will find it easier to use AR applications that present auditory or haptic feedback, while attentionally challenged students can benefit from the stimulating, interactive characteristics of AR, which encourage them to stay attentive and motivated. This inclusivity is one of the key strengths of AR, as it allows teachers to develop personalized learning opportunities which are able to accommodate a broad array of learners and help them realize their optimum levels of performance.

Augmented revolution in education

The way that information is taught, learnt, and used has changed significantly with the introduction of Augmented Reality (AR) into the classroom. Textbooks, lectures, and two-dimensional media are often the mainstays of traditional teaching techniques, which may sometimes restrict students' interest and understanding, particularly when it comes to difficult subjects. By fusing the real and virtual worlds, the augmented revolution in education seeks to address these issues and provide immersive learning opportunities that improve comprehension, creativity, and engagement. Students may now visualize complex or challenging subjects in ways that were previously unthinkable thanks to AR. For instance, students may use AR devices to engage with 3D simulations of solar systems or internal body structures in place of reading about human anatomy or planetary motions. By converting passive intake into active inquiry, this experiential learning method helps students better understand challenging material and stimulates their curiosity. Because AR information is so dynamic, it can accommodate many learning preferences, which is advantageous for kinesthetic, visual, and auditory learners.

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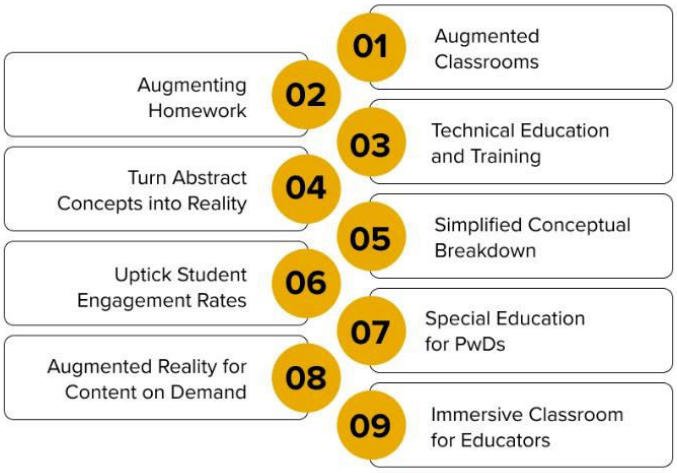

Fig 2 AR in Education

The development of virtual simulations that provide chances for experiential learning is another important advantage of augmented reality in education. Without being constrained by time, location, or danger, students may do experiments, investigate virtual laboratories, or practice real-world skills. This is particularly helpful in fields where safety or equipment availability may be a concern, such as physics, chemistry, medicine, and engineering. Prior to using their abilities in real-world situations, students' confidence and competency are strengthened by the opportunity to practice often in a virtual setting. By enabling several users to interact with the same AR information at once, whether they are in the same room or connected remotely, the augmented revolution also raises the bar for collaborative learning. As students collaborate on AR-based assignments, projects, or challenges, this develops their communication, problem-solving, and cooperation abilities.

II. RELATED WORK

Evolution of AR Technology in Education

Augmented Reality (AR) and Virtual Reality (VR) technologies have gained significant traction in the education sector, offering immersive digital experiences and interactive learning environments. A study by **Al-Ansi et al. (2023)** analyzed over 1500 research articles from the Scopus database to explore the development and applications of AR and VR in education over the past twelve years. The results highlighted exponential growth in the adoption of AR and VR, particularly with wearable devices. The review identifies key challenges in quickly implementing and customizing these technologies within educational institutions, while also emphasizing the need for further research to enhance adaptability and maximize benefits. **Kamińska et al. (2023)** highlighted the potential of AR in improving student engagement and interaction in life sciences, engineering, and health education. The use of AR tools has proven effective in simplifying complex concepts, such as anatomy and molecular biology, by providing interactive 3D models. Similarly, the application of AR in educational settings has increased significantly, with growing interest in its ability to enhance teaching methods, making learning more engaging and effective. AR solutions are particularly beneficial in remote learning environments, offering real-time simulations that are both cost-effective and scalable. Despite its benefits, challenges remain, including the high costs of development and the need for specialized skills to implement AR tools effectively in educational curricula.

https://www.researchgate.net/publication/371869065_Augmented_Reality_Current_and_New_Trends_in_Education/fulltext/649a2e4dc41fb852dd348a5d/Augmented-Reality-Current-and-New-Trends-in-Education.pdf?origin=publication_detail&_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uRG93bmxvYWQiLCJwcmV2aW91c1BhZ2UiOiJwdWJsaWNhdGlvbiJ9fQ&__cf_chl_tk=kt69.MAZFEc6vQoJGXjlkj6bKw74nhNEMYpaKjmbUWA-1742901357-1.0.1.1-0cJnSJm.WyTD6Z8XSEyVXHPPEFR75f9LBwPbTMTeqgw

Garzón (2021) provides an extensive overview of twenty-five years of augmented reality (AR) in education, tracing its evolution from the first educational AR application to current innovations. The study highlights AR's ability to create interactive experiences by integrating real-world objects with computer-generated perceptual information.

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https://www.mdpi.com/2414-4088/5/7/37 According to AlGerafi et al. (2023), AR overlays digital elements onto the physical world, providing an interactive and engaging learning environment, while VR immerses users in entirely digital environments, offering rich, simulated experiences. Both technologies promote active learning and have been shown to improve student motivation, engagement, and knowledge retention across various educational settings, from K-12 schools to professional training programs. https://www.mdpi.com/2079-9292/12/18/3953

Table: Related works to AR in Education in recent years.

Reference	Subject	Method	Findings
Zwolnilski et al. (2022) http://refhub.elsevier.com/S2590-2911(23)00137-7/sref81	Extended reality in management skills	Case Studies	Creating a modal for XR-based educational environment by utilizing different XR technologies.
Scavarelli et al. (2021) http://refhub.elsevier.com/S2590-2911(23)00137-7/sref66	AR in Social Learning	Literature Review	Exploring the recent developments of VR & AR in social space and several learning theories.
Patel et al. (2020) http://refhub.elsevier.com/S2590-2911(23)00137-7/sref58	VR, AR & mixed Reality in Education	Survey	Overview of VR, AR, and Mixed Reality in education and the ability of people's adaptation to these technologies.
Boyles (2017) http://refhub.elsevier.com/S2590-2911(23)00137-7/sref16	AR in Education	Review	Describing usage of AR & VR in enhancing learning and reviewing advantages and disadvantages.
Olbina and Glick (2022) http://refhub.elsevier.com/S2590-2911(23)00137-7/sref56	Integration of AR & VR in Construction	Physical model	Improving visualization, enhancements in construction-related work, and student communications skills.
Sirohi et al. (2020) http://refhub.elsevier.com/S2590-2911(23)00137-7/sref70	Augmented & Virtual Reality applications	Survey	An interdisciplinary review of VR & AR in different areas of education and directions.

AR and its Role in Enhancing Learning Experiences

Bahroun, and Ahmed (2023) explore the potential of augmented reality (AR) in transforming engineering education. They systematically review 67 peer-reviewed papers using the PRISMA framework to assess AR's effectiveness in enhancing visualization, interaction, and student engagement across various engineering disciplines. The study identifies that AR has been widely applied in civil and mechanical engineering, using tools like Unity 3D to significantly improve student comprehension and motivation, especially in complex areas such as construction design. However, the authors note that AR adoption remains limited in other engineering disciplines. Despite facing challenges such as technical limitations and the need for better educator training, AR's positive impact on learning outcomes is evident.

https://www.frontiersin.org/journals/virtualreality/articles/10.3389/frvir.2024.1461145/full#:~:text=AR%20has%20been%20shown%20to%20enhance%20student%20engagement%20and%20understanding,and%20hands%2Don%20learning%20experiences. **Kraut and Jeknić (2021)** discuss the transformative impact of AR on education, emphasizing its ability to upgrade conventional textbooks with interactive and immersive elements, offering students a more engaging and effective learning environment. Their research suggests that AR can speed up memorization, enhance understanding, and offer a multisensory experience that improves learning outcomes. Furthermore, their ARAVET project revealed that a significant portion of students (71%) could comprehend the concept of AR, with 64% finding AR software easy to use. Although students were divided on whether AR should replace physical devices, such as sewing machines, 62% felt it could help them understand certain concepts better.
https://www.researchgate.net/publication/277985946_Improving_education_experience_with_Augmented_Reality_AR/link/5578016e08aeacff20005794/download?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19

Bhargav et al. (2025) explore the transformative role of Augmented Reality (AR) in education, focusing on its potential to revolutionize teaching and learning practices. The paper highlights how AR can bridge the gap between abstract concepts and real-world experiences, enhancing student engagement and knowledge retention. The authors

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emphasize AR's ability to foster collaboration, support diverse learning styles, and provide immersive, hands-on learning experiences. Additionally, the paper discusses the practical benefits for educators, such as creating dynamic learning environments and leveraging existing resources innovatively. https://www.ijraset.com/research-paper/the-role-of-augmented-reality-in-education **Sharmila (2024)** examines the impact of Augmented Reality (AR) on enhancing learning outcomes in educational settings, focusing on its potential to transform traditional teaching and learning practices. The paper discusses how AR can provide immersive, interactive, and personalized learning experiences, bridging the gap between abstract concepts and real-world applications. It highlights AR's ability to foster deeper understanding, improve retention, and cater to diverse learning preferences.

Challenges in Implementing AR in Education

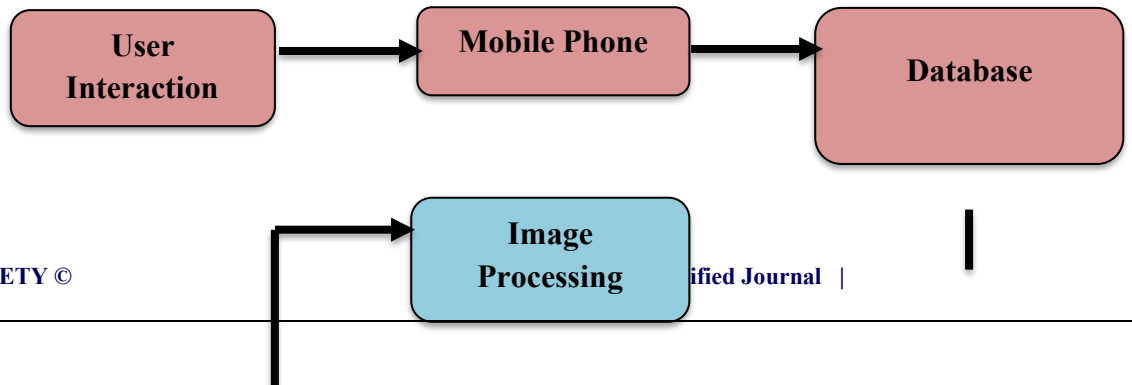
Martin et.al (2015), aims to discuss the difficulties and possibilities of using augmented reality in education, especially for musical education. Among the difficulties addressed are the following types of issues: physical, technological, sociocultural, pedagogical and managerial. The possible solutions presented involve the use of authoring tools that are easily usable by teachers. An augmented reality application to teach musical perception was developed using an authoring tool, and tests with children are presented and discussed. https://www.researchgate.net/publication/279854640_Challenges_and_Possibilities_of_Use_of_Augmented_Reality_in_Education_Case_Study_in_Music_Education

Iqbal et al. (2021) discuss the challenges and future research directions in the use of Augmented Reality (AR) for education, particularly in STEM fields. The paper highlights the successful applications of AR in education, noting its potential to enhance interactive and hands-on learning. It provides a taxonomy of existing AR educational projects, categorizing them based on educational levels, subjects, and technologies used. The authors identify several key research gaps, including the need for real-time touchless hand interaction, kinesthetic learning, and machine learning agents to support remote learning. The paper also emphasizes the importance of developing more sophisticated AR interfaces and collaborative learning environments. **Al Shafeey and Bin Lakulu (2021)** provide a systematic review of augmented reality (AR) in education, focusing on the challenges it presents, particularly at pre-university levels. The paper emphasizes AR's potential to enhance knowledge and education by improving the perception of knowledge space, highlighting benefits such as increased student engagement and deeper understanding. However, significant challenges remain, such as technical issues, high equipment costs, limited AR knowledge among teachers, and insufficient training. The review identifies several barriers, including students' difficulties in using AR, lack of sensory perception, and cognitive overload.

III. METHOD DETAILS

Method Validation

The solution to the intended AR-based educational system is constructed on the blending of interactive AR models for instructional purposes. The system captures user interactions, such as taking photos of instructional materials, through handheld devices. The images are subsequently processed in multiple stages for effective recognition and categorization. The system is based on a large dataset, split into training, validation, and testing sets to support sound model performance. Validation is carried out through typical metrics including accuracy, precision, recall, and F1-score to gauge how well the model works. A confusion matrix is employed to show important data points such as true positives, false positives, true negatives, and false negatives, which is vital in order to improve the model. This validation mechanism guarantees the stability of the system and its ability to produce effective AR content that offers users worthwhile, interactive learning experiences.



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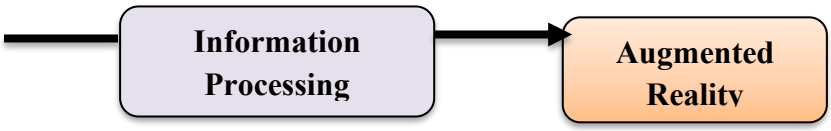

Figure 3: The Flow Diagram of the Proposed Work

User Interaction: It starts with the user's interaction with the system by capturing images, e.g., road signs, on their mobile phone. The user takes the picture to be processed by the system to be displayed through Augmented Reality (AR).

Mobile Phone: The mobile phone is the device used to scan and process the image. It records the image data and sends it to the system for analysis and AR creation.

Database: The database contains the images and information required for processing. It contains the data required for the AR experience, such as image datasets and any associated resources needed for proper image recognition.

Image Processing: The image taken by the mobile phone is processed in this step. This includes image recognition and processing, like detecting road signs and recognizing their features to enable correct classification or action.

Information Processing: The information is processed once the image is processed in this stage. The system gathers the data, for example, the kind of road sign that is required to produce the appropriate AR output.

Augmented Reality: Lastly, the information is utilized to superimpose augmented content over the actual environment. The AR system overlays visual information, like text or 3D models, on the recorded image, giving the user an informative and interactive AR experience.

IV. RESULT AND DISCUSSION

This study presents an assessment of the effectiveness of Augmented Reality (AR) in education, particularly in terms of its role in engaging students and improving learning outcomes. The study examines the performance of AR models across disciplines, measuring user response and its effectiveness to enhance understanding, retention of knowledge, and interactive learning in real-time.

After Processing and Detecting the Image target

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Figure: AR process for displaying 3D solar system model.

The figure demonstrates the AR process where a static image of the solar system (left) is scanned and processed by the AR system. After detecting the image target, the system renders a 3D model of a planet (right), which appears to float above a physical surface like a laptop. This interactive feature allows users to visualize and explore celestial bodies in a dynamic and engaging way, enhancing learning by bringing theoretical concepts to life through AR technology.

3D Models

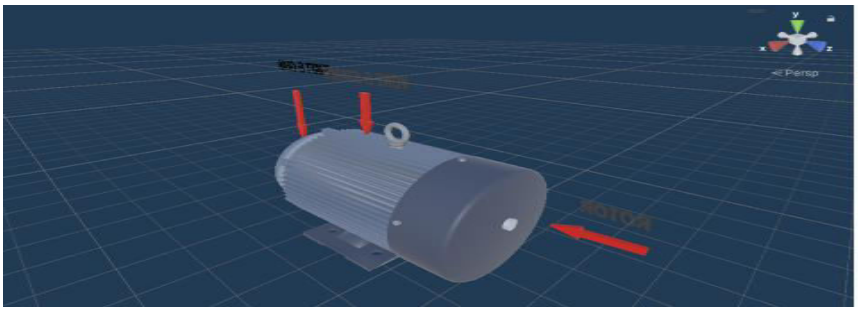

Figure 1: 3D model of a motor with labeled components in an AR environment.

The figure above displays a 3D model of a motor within an Augmented Reality (AR) setting for interactive learning. The AR technology allows students to investigate and manipulate the components of the motor and better understand mechanical systems. Arrows in the picture indicate salient features of the motor and facilitate instructional learning. This is congruent to the AR framework presented in the presentation, which seeks to incorporate AR into learning, presenting students with immersive, interactive experiences to enable them to see complex subjects and interact with material in a more interactive and accessible manner.

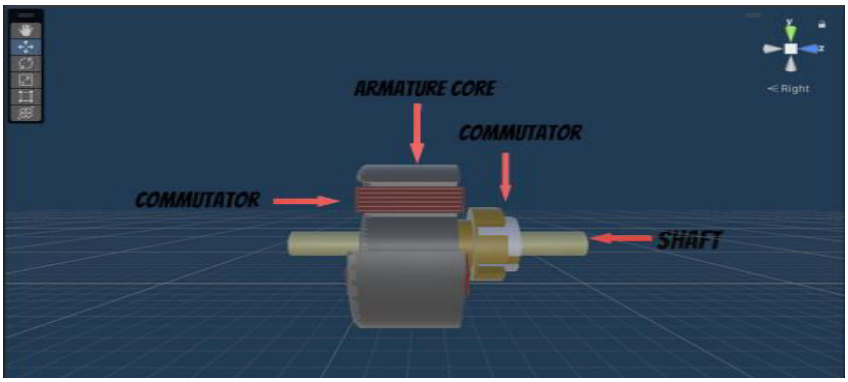

Figure 2: 3D model of an electric motor showing the armature core, commutator, and shaft in an AR environment.

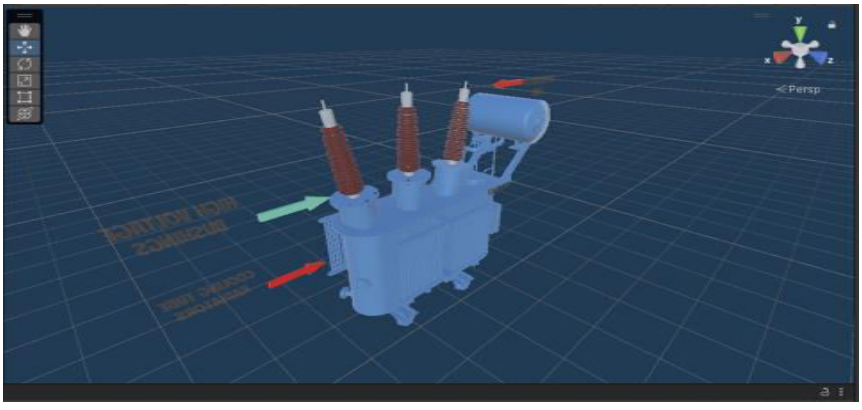

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Figure 3: 3D model of a transformer with labeled components in an AR environment.

The figure is a 3D diagram of a transformer within an Augmented Reality (AR) setting. Important features such as the high voltage bushings, cooling tube, and tap changer are highlighted for clarity. The users can interact with the model via the AR system, and it gives them an immersive learning experience whereby they can discover the structure of the transformer as well as how its parts operate. This form of visualization assists in making complicated electrical ideas easier to understand and facilitates learning through direct manipulation of the model.

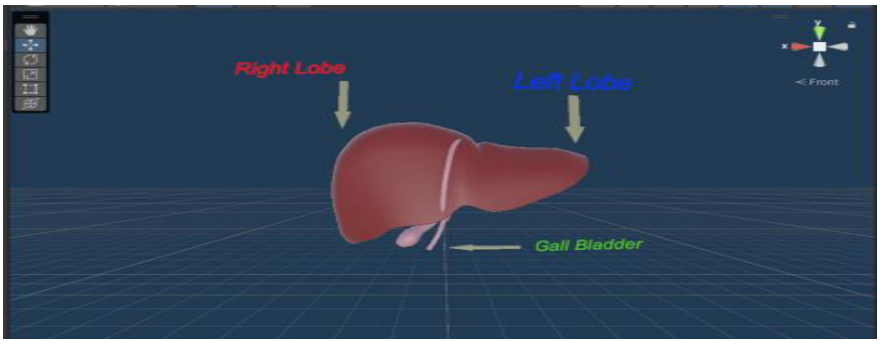

Figure 4: 3D model of a liver with labeled components in an AR environment.

The figure is a 3D model of a human liver in Augmented Reality (AR), showing the right and left lobes, and the gall bladder, in clear markings. The AR perspective allows one to interact with and study the anatomy of the liver, offering an interactive learning experience. By emphasizing key elements, it enables users to appreciate the anatomy and physiology of the liver in a fuller and more captivating way, which facilitates learning about intricate biological phenomena.

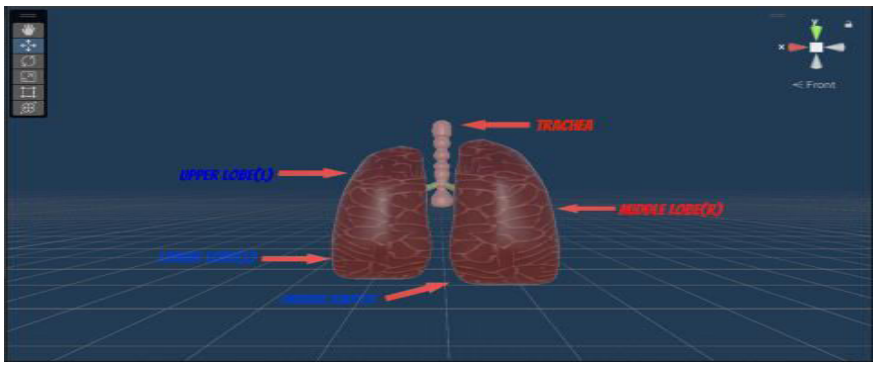

Figure 5: 3D model of human lungs with labeled components in an AR environment.

The figure shows a 3D representation of the human lungs with important features like the trachea, upper lobe, middle lobe, lower lobe, and the cardiac notch. The AR visualization allows users to interact with and investigate the intricate structure of the lungs, facilitating the understanding of the anatomy and functionality of each component.

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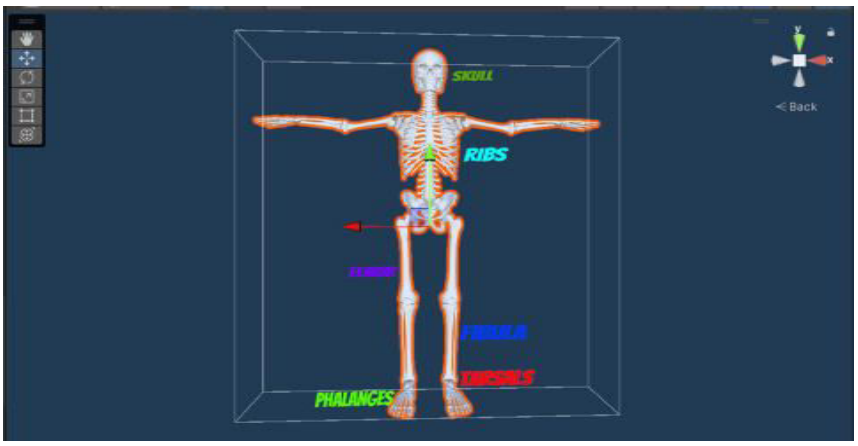

Figure 6: 3D model of a human skeleton with labeled components in an AR environment.

The figure displays a 3D model of the human skeleton highlighting major bones in the body like the skull, ribs, femur, fibula, tarsals, and phalanges. AR visualization in the form of the image is offered as an engaging learning tool which enables the interactive exploration of how the human skeleton is structured. The labeled bones assist in differentiating various sections of the body, increasing the understanding of human anatomy and improving visualization of how bones connect to each other and their roles within the skeletal system.

V. CONCLUSION

Augmented Reality (AR) has been a revolutionary tool in the educational sector, providing interactive and immersive learning experiences that are greatly improving students' engagement and understanding. AR technologies make complex topics visible to students, making them easier and more accessible to comprehend. By integrating AR into the classroom, students are given the chance to learn in a hands-on manner that encourages creativity, critical thinking, and collaboration. Allaying the integration challenges, like technical glitches and prohibitive costs, are the advantages of AR for generating immersive, personalized learning experiences. As technology continues to advance, the possibilities of AR in learning will grow, providing even more opportunities for creative teaching and learning.

VI. FUTURE SCOPE

The future of Augmented Reality (AR) in the field of education is promising as the technology itself advances. With AR becoming more affordable and accessible, it will extend its reach into learning spaces. The potential to deliver interactive, immersive experiences will improve students' engagement and comprehension, especially in disciplines with complex visualizations, such as anatomy, engineering, and history. In addition, AR's versatility in meeting the various learning modalities of kinesthetic, auditory, and visual will create an environment of inclusiveness and differentiated education. Obstacles involving expense, technological hindrances, and educator training must be overcome, but as the technology continues to develop and improve with usability, such hurdles will lessen. Ultimately, AR has the potential to disrupt traditional instructional techniques, opening the door for more interactive and experiential forms of education.

REFERENCES

[1]A. M. Al-Ansi, M. Jaboob, A. Garad, and A. Al-Ansi, “Analyzing augmented reality (AR) and virtual reality (VR) recent development in education,” Soc. Sci. Humanit. Open, vol. 8, no. 1, p. 100532, 2023, doi: 10.1016/j.ssaho.2023.100532.
[2]K. H. Mkwizu and R. Bordoloi, “Augmented reality for inclusive growth in education: the challenges,” Asian Assoc. Open Univ. J., vol. 19, no. 1, pp. 88–100, 2024, doi: 10.1108/AAOUJ-09-2023-0113.
[3]B. Kraut and J. Jeknić, “Improving education experience with augmented reality (AR),” 2015 38th Int. Conv. Inf. Commun. Technol. Electron. Microelectron. MIPRO 2015 - Proc., no. May, pp. 755–760, 2015, doi: 10.1109/MIPRO.2015.7160372.
[4]D. Kamińska et al., “Augmented Reality: Current and New Trends in Education,” Electron., vol. 12, no. 16, 2023, doi: 10.3390/electronics12163531.

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[5]M. Z. Iqbal, E. Mangina, and A. G. Campbell, "Current Challenges and Future Research Directions in Augmented Reality for Education," Multimodal Technol. Interact., vol. 6, no. 9, pp. 0–17, 2022, doi: 10.3390/mti6090075.
[6]B. Palada, C. V S, C. P. Gowda, and P. Nikitha, "The Role of Augmented Reality (AR) in Education," Int. J. Res. Appl. Sci. Eng. Technol., vol. 12, no. 3, pp. 1400–1408, 2024, doi: 10.22214/ijraset.2024.59079.
[7]M. A. M. AlGerafi, Y. Zhou, M. Oubibi, and T. T. Wijaya, "Unlocking the Potential: A Comprehensive Evaluation of Augmented Reality and Virtual Reality in Education," Electron., vol. 12, no. 18, 2023, doi: 10.3390/electronics12183953.
[8]N. Suhail, Z. Bahroun, and V. Ahmed, "Augmented reality in engineering education: enhancing learning and application," Front. Virtual Real., vol. 5, no. October, pp. 1–22, 2024, doi: 10.3389/frvir.2024.1461145.
[9]R. Sharmila Professor, "The impact of augmented reality (AR) on enhancing learning outcomes in educational settings," Int. J. Virtual Augment. Real., vol. 2, no. 1, pp. 1–11, 2024.
[10]J. Garzón, "An overview of twenty-five years of augmented reality in education," Multimodal Technol. Interact., vol. 5, no. 7, 2021, doi: 10.3390/mti5070037.

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