

## Immersive Technology in the field of Digital Education

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### ABSTRACT

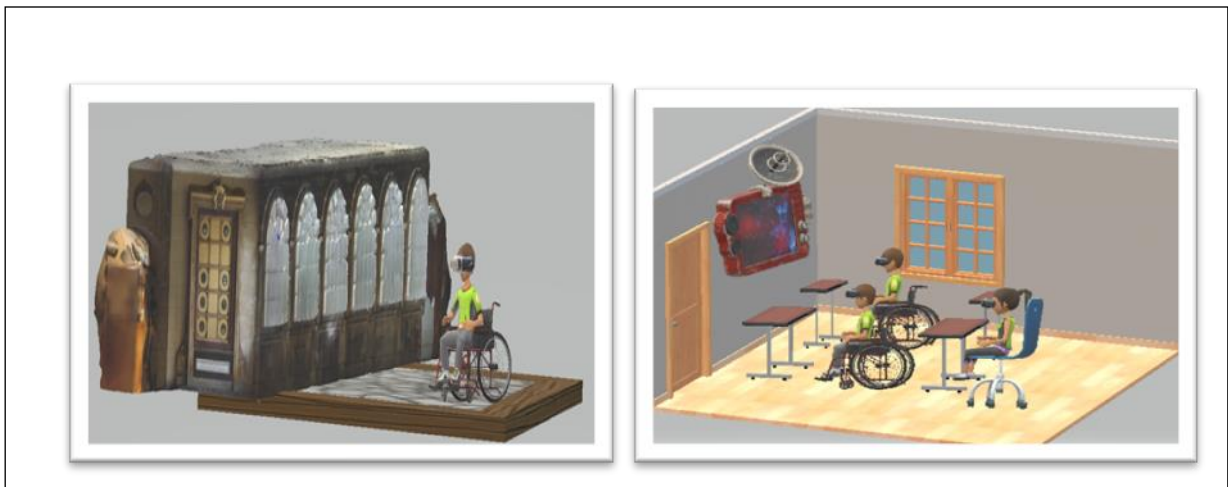
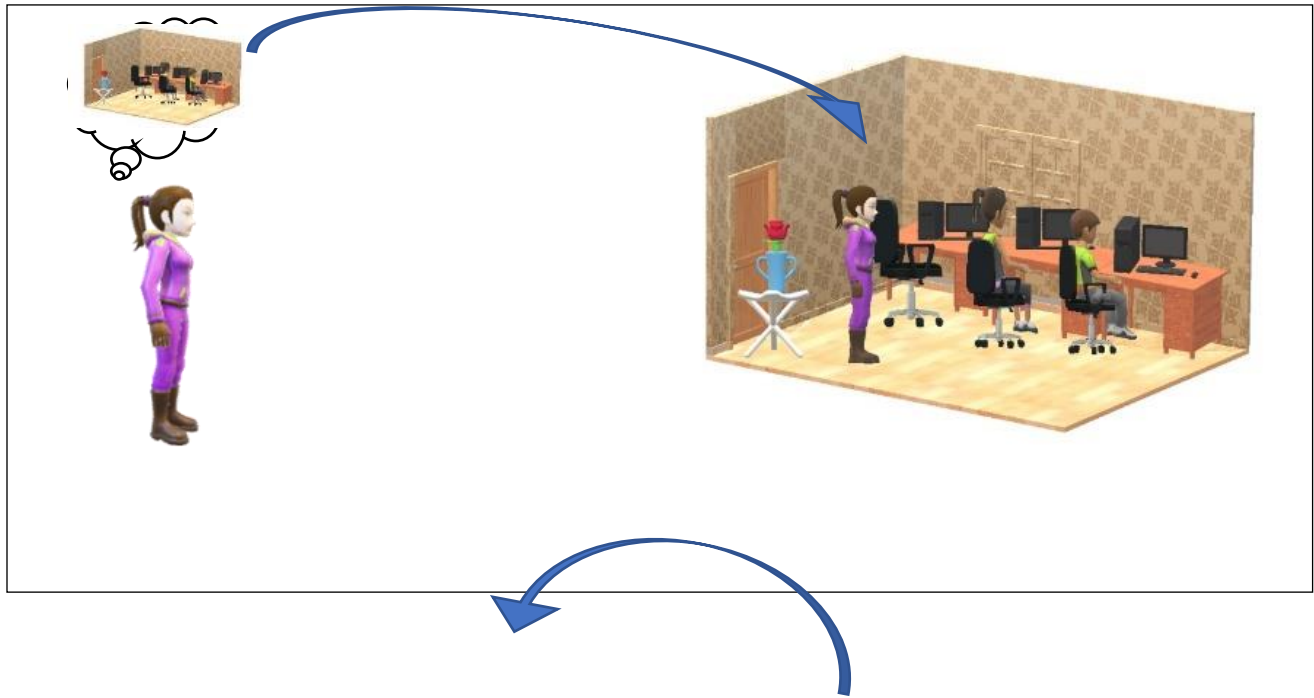
Immersive technology is transforming the current trend of digital education by offering new ways of engaging students in the learning process. With the help of Virtual Reality(VR), Augmented Reality(AR), and Mixed Reality(MR), educators can create interactive and engaging learning experiences that go beyond traditional teaching methods. Immersive technology is the Information and communication Tool (ICT). By providing students with immersive and realistic simulations, educators can help them to develop a deeper understanding of complex concepts and enhance their critical thinking and problem-solving skills. Immersive technology also provides students with the opportunity to explore different environments and scenarios, which can be particularly useful in fields like Science, Technology, Engineering, and Maths (STEM). Additionally, immersive technology has the potential to make education more accessible and inclusive for students with disabilities or learning difficulties. Overall, immersive technology can help teachers to create more engaging, effective, and personalized learning experiences for their students, and can help students to better understand and retain the material they are learning. This paper shows that how immersive technology is applied in schools, colleges according to the NEP and STEM Learning for the better future of students and teachers.

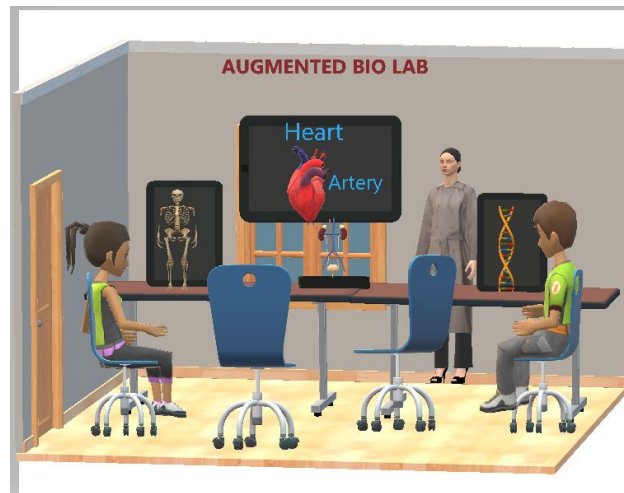
**KEYWORDS:-**Immersive Technology, STEM,Information and communication Tool,Augmented Reality, Virtual Reality.

### INTRODUCTION

Immersive Technology refers to any technology that creates a digital or virtual environment that immerses the user in a realistic or simulated experience. This can include virtual reality (VR), augmented reality (AR), mixed reality (MR), and other similar technologies. Immersive technology is very helpful for digital education. Digital education use this immersive technology in all areas of education like primary education, middle education, secondary education, Higher education and marketing of any product educational technology. Aviation Training,corporate training etc.[1].

Fig.1: IMMERSIVE TECHNOLOGY





**Fig.3:AUGMENTED REALITY**

Mixed reality combines elements of both virtual and augmented reality, allowing users to interact with virtual objects that are integrated into the real world. Other examples of immersive technology include haptic feedback devices, which provide users with tactile feedback and sensory input, and motion tracking systems, which allow users to interact with digital content using natural body movements[4].



**Fig.4: Mixed Reality**

Overall, immersive technology can help teachers create more engaging, effective, and personalized learning experiences for their students, and can help students better understand and retain the material they are learning.

STEM (Science, Technology, Engineering, and Math) education is an ideal fit for immersive technology, as it provides students with a hands-on, interactive approach to learning complex concepts. For example, students can use virtual reality simulations to explore scientific phenomena such as the human body or the

solar system, or to conduct virtual experiments in chemistry or physics. Augmented reality can be used to provide interactive demonstrations of mathematical concepts such as geometry or trigonometry. Immersive technology can also be used to teach engineering concepts, such as design thinking, prototyping, and problem-solving[5].

By using immersive technology in STEM education, educators can help students develop a deeper understanding of complex concepts, and encourage them to think critically and creatively about solving real-world problems.

### OBJECTIVES

Following are the main objectives of Immersive technology in the field of digital Education:-

- To enhance the learning experience, increase access to education, and improve educational outcomes.
- To replace the traditional method of teaching with the immersive technology that will be very helpful for the digital education.
- To make the education more accessible to everyone by using this technology, regardless of their location or physical ability. With ICT tools such as online courses and virtual classrooms, labs, augmented labs, Augmented books, students can access education from anywhere in the world, and those with disabilities can access educational materials that may not be available in a traditional classroom.
- The main objective of this technology is to increase the computational thinking and also develop the problem solving skills in the students as well as the teachers.
- To prepare the students and teachers to face the challenges that comes in the near future like COVID-19.
- Immersive technology aims to enhance learning outcomes by providing a more interactive and engaging learning experience. By using tools such as simulations, virtual reality, and gamification, students can learn in a more engaging and interactive way.
- To make the augmented and virtual reality app for increasing driven workforce.

### Integration of Artificial Intelligence with Immersive technology

Artificial intelligence (AI) and immersive technology have been integrated in a number of ways to create more engaging and interactive experiences. Immersive technologies, such as virtual reality (VR), augmented reality (AR), and mixed reality (MR), allow users to experience digital environments in a more realistic and immersive way. AI, on the other hand, provides a way for these technologies to become more intelligent and adaptive to user needs. Here are some examples of how AI has been integrated with immersive technology[5]:

**Personalization** - AI can be used to personalize immersive experiences based on the user's preferences, behaviors, and interactions. For example, AI algorithms can analyze user data, such as their past behavior, preferences, and interactions, to personalize the content and experience of VR, AR, or MR applications.

**Natural language processing** - AI can enable immersive experiences to understand and respond to natural language. This can be used to create more realistic and engaging conversational interfaces in VR or AR. For example, an AI-powered chatbot can be integrated with an AR application to provide information or assistance to users.

**Object recognition** - AI can be used to recognize objects in the real world and integrate them with immersive experiences. For example, an AR application can use computer vision and AI to recognize objects in the user's environment, such as furniture or appliances, and provide additional information or interactions.

**Autonomous behavior** - AI can enable immersive experiences to become more autonomous and adaptive to user needs. For example, an AI-powered VR application can adjust the difficulty level of a game based on the user's skill level or provide personalized recommendations for content.

Overall, the integration of AI with immersive technology has the potential to create more engaging, personalized, and adaptive experiences for users. As AI technology continues to advance, we can expect to see even more innovative uses of AI in immersive technology[37].

### **Implementation of National Education Policy by using Immersive Technology**

The National Education Policy (NEP) 2020 of India acknowledges the potential of immersive technology in transforming the education system. The NEP 2020 emphasizes the integration of technology in education and encourages the use of immersive technology to provide a more engaging and interactive learning experience for students[6]. Here are some of the key points related to immersive technology in the NEP 2020:

**Use of Virtual and Augmented Reality:** The NEP 2020 recommends the use of virtual and augmented reality to enhance the learning experience for students. The policy suggests that immersive technology can be used to create 3D models, simulations, and visualizations to make learning more interactive and engaging[6].

- **Technology-Enabled Assessments:** The NEP 2020 also recommends the use of technology-enabled assessments to provide more accurate and efficient assessments of student learning. Immersive technology can be used to create simulations and scenarios that can be used to assess student performance in a more engaging and interactive way.
- **Teacher Training:** The NEP 2020 recognizes the importance of teacher training in the effective use of technology in education. The policy recommends that teachers should be trained in the use of immersive technology and other emerging technologies to enhance their teaching skills.
- **Focus on Digital Infrastructure:** The NEP 2020 emphasizes the need to create a robust digital infrastructure to support the use of technology in education. The policy recommends the creation of digital repositories, online platforms, and digital resources to support the use of immersive technology in education.

Overall, the NEP 2020 recognizes the potential of immersive technology in transforming the education system and emphasizes the need to integrate technology in education. The policy provides a framework for the effective use of immersive technology to enhance the learning experience for students and improve the quality of education.

### **LITERATURE REVIEW**

Immersive technology has also been applied in special education, where it has been used to provide more personalized and engaging learning experiences for students with disabilities. For example, a study by Lancaster and colleagues (2018)[7] found that the use of VR technology in special education improved students' social skills and communication abilities.

One of the most significant applications of immersive technology in education is in the area of STEM education. Several studies have found that immersive technology can enhance students' understanding of STEM concepts by providing a more interactive and engaging learning experience. For example, a study by Akçayır and Akçayır (2017) [3] found that the use of VR technology in physics education improved students' conceptual understanding and motivation.

Another area where immersive technology has shown promise is in language learning. Several studies have found that immersive technology, such as VR and AR, can improve students' language skills by providing a more immersive and realistic language learning environment. For example, a study by Hwang and colleagues (2019)[7] found that the use of VR technology in English language learning improved students' speaking and listening skills.

However, immersive technology is not without its challenges in education. One significant challenge is the lack of standardized content and assessment tools, which can make it difficult to compare the effectiveness of different immersive technology applications. Another challenge is the need for specialized training for teachers to effectively incorporate immersive technology into their teaching practices[8].

One of the most significant applications of immersive technology is in the field of education. Many studies have shown that immersive technology can enhance learning by providing a more engaging and interactive experience for students. For example, a study by Betker and colleagues (2019)[8] found that using VR technology in medical education improved students' ability to diagnose and treat patients.

Another area where immersive technology has shown promise is in the field of healthcare. For example, VR technology has been used to treat various mental health conditions such as anxiety and phobias. A study by Rizzo and colleagues (2019) found that VR therapy was effective in reducing symptoms of post-traumatic stress disorder (PTSD) in veterans[8].

Dunser et al. (2008) found that there were only 10% of 161 studies (1993- 2007), in which AR applications were analyzed according to user performance, perception, usability, and collaboration. In addition, they claimed that only seven out of 169 studies evaluating usability. According to the research, due to this lack of studies on AR user experience, there are inadequate methods for a) evaluating AR experiences, b) designing experiments, c) selecting and applying proper methods, and analyzing the experiment results[9].

In conclusion, immersive technology has shown significant promise in education, particularly in STEM education, language learning, and special education. However, further research is needed to fully understand its potential and limitations and to develop strategies to address the challenges associated with its adoption.

#### **CONTRIBUTION OF IMMERSIVE TECHNOLOGY IN THE SOCIETY:-**

There are several ways in which immersive technology can be used to contribute to society, including:

- **Education:** Immersive technology can be used to create engaging and interactive learning experiences for students of all ages, improving knowledge retention and enhancing learning outcomes.
- **Healthcare:** Immersive technology can be used to improve patient outcomes and support healthcare providers, by providing new tools for diagnosis, treatment, and rehabilitation.
- **Environmental Conservation:** Immersive technology can be used to raise awareness about environmental issues and promote sustainable practices, by providing interactive experiences that illustrate the impact of human activities on the environment.
- **Cultural Preservation:** Immersive technology can be used to preserve and promote cultural heritage, by providing virtual tours of historical sites, museums, and other cultural landmarks.
- **Social Justice:** Immersive technology can be used to promote social justice and human rights, by providing immersive experiences that raise awareness of important issues and promote empathy and understanding.
- **Disaster Relief:** Immersive technology can be used to support disaster relief efforts, by providing real-time situational awareness and communication tools for first responders and other emergency personnel.

Overall, by leveraging the power of immersive technology, we can contribute to society in meaningful ways, improving education, healthcare, environmental conservation, cultural preservation, social justice, and disaster relief. [10]By working together to develop and implement innovative solutions, we can create a more just, sustainable, and prosperous future for all.-

#### **METHODOLOGY FOR IMMERSIVE TECHNOLOGY**

IMMERSIVE TECHNOLOGY TOOLS AND TECHNIQUES		
VIRTUAL REALITY		
TOOLS		TECHNIQUES
1	VR Headsets for example: Oculus Rift, HTC Vive, and PlayStation VR VR BOX(HARDWARE)	360 DEGREE VIDEO
2	Hand-Tracking Controllers for example the Oculus Touch and the Vive Controller	3D Modeling and Animation Software Maya, Blender, and 3D Studio Max
3	Room-Scale VR	Head-Mounted Display (HMD) development kits
4	Unity, Unreal Engine, and A-frame VR software development kit (SDK)	Game Engines
5	Motion tracking and input The Oculus Touch, HTC Vive controllers, and PlayStation	VR Tracking Systems
6	VR testing tools	Oculus Rift S, Valve Index, and Pimax
7	Video Stitching Software Autopano Video, Kolor Autopano Video Pro, and VideoStitch Studio	To stitch multiple camera footage together to create a seamless 360-degree video
8	3D Modeling and animation software, Example:Maya,blender,3D Studio Max	To create the 3D model.
9	Video Encoding Software	to be encoded into a format that is compatible with VR headsets
10	VR video players	VR video player such as Kolor Eyes, Whirligig, or VR Player

Table 1.1

IMMERSIVE TECHNOLOGY TOOLS AND TECHNIQUES		
Augmented Reality		
TOOLS		TECHNIQUES
1	Smartphone apps	gaming, education, and navigation
2	Head-Mounted Displays (HMDs) example: Microsoft Hololens,	Display virtual elements in the user's field of view

3	AR software development kit (SDK) like Vuforia and ARKit	To create augmented reality content.
4	AR Marker such as QR codes	To trigger the display of virtual content
5	AR Glasses as Google Glass and Nreal Light	display virtual content in the user's field of view
6	ARKit and ARCore	To develop frameworks for creating AR applications on iOS and Android devices,
7	Vuforia	To create AR applications on mobile devices and digital eyewear
8	Unity, Unreal Engine	To develop AR applications
9	Meta	To develop AR development platform that allows for the creation of AR applications on mobile devices, digital eyewear, and smart glasses
10	Hololens	To use holographic technology to create an immersive AR experience.
11	XR Development Platforms: WebXR and Three.js	To create web-based AR experiences.
11.	SketchLab	To download and manipulate the 3D objects .
12.	Paint3D	To create and edit the 3D objects and gives the texture and shading to the objects.
13	Augmented Cards	Scan by AR Application
14	ARLOOOPA	To store the 3D objects and scan that objects by using ARLOOOPA

**Table 1.2**





Fig 5:Cards



Fig 6: 3D Objects



Fig 7:Virtual Box

**IMPLEMENTATION OF IMMERSIVE TECHNOLOGY**

Programming Languages	Tools	Use
C#	Unity	A popular game engine for AR development, uses C# as its primary programming language
C++	Unreal Engine	For the development of AR application
Java and Kotlin	ARCore	To develop a framework for Android
Swift and Objective-C	ARKit	To develop AR Application
JavaScript: WebXR and Three.js	Augmented Cards, Target based image, location based image.	To create the augmented cards and application
Python and Lua	QR CODE	To generate the QR code and AI integration
HTML, CSS, and JavaScript	3D VR and AR reality	To make AR Application

**Table 1.3**

**Data Collection:**

Primary source of this paper is that, this study is apply in schools and colleges for engaging the attention of the students during the time of COVID 19 or the better clear understanding of the subject. Also this

makes the teacher skillful and In 2020 according to the new policy of education immersive technology applied in curriculum and also follows the STEM learning.

Data is collected directly from the students and the teachers, students said that they demanded engaging lectures and innovative method of techniques and the organization wants the teachers to be skilled so this paper shows the research based on this study.

Some potential secondary sources of information on immersive technology include:

Academic journals and conference proceedings: Academic journals and conference proceedings are an excellent source of scholarly research and analysis on immersive technology[11]. Many journals and conferences[12] specifically focus on this field, such as the Journal of Virtual Reality and Broadcasting or the IEEE International Symposium on Mixed and Augmented Reality, Immersive technology has been growing rapidly in recent years, with the market projected to reach \$571 billion by 2025, according to a report by MarketsandMarkets. The COVID-19 pandemic has also accelerated the adoption of immersive technology as more people turn to virtual experiences and remote work[13].

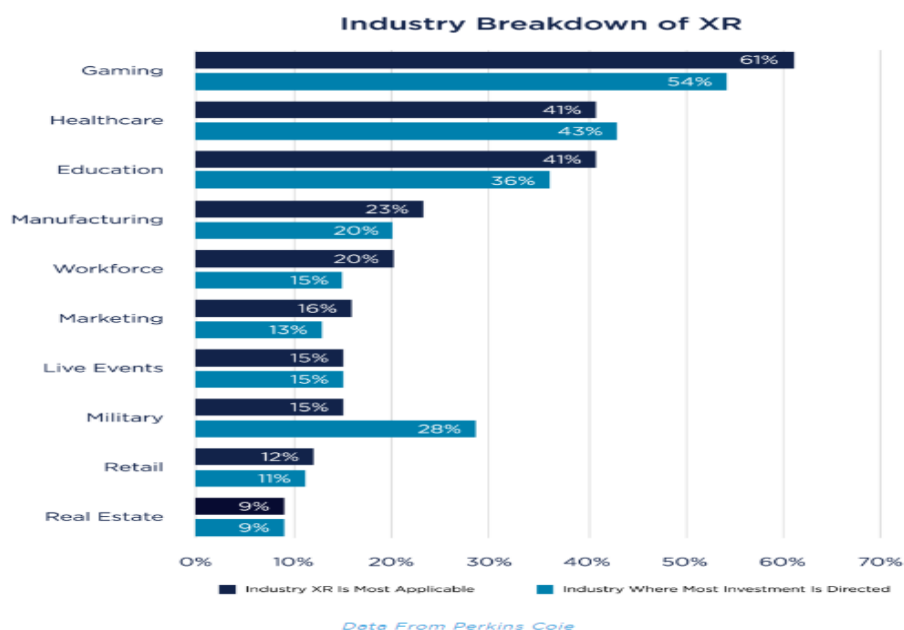


Fig:- 8: (<https://www.vistaequitypartners.com/insights/an-introduction-to-immersive-technologies/>)

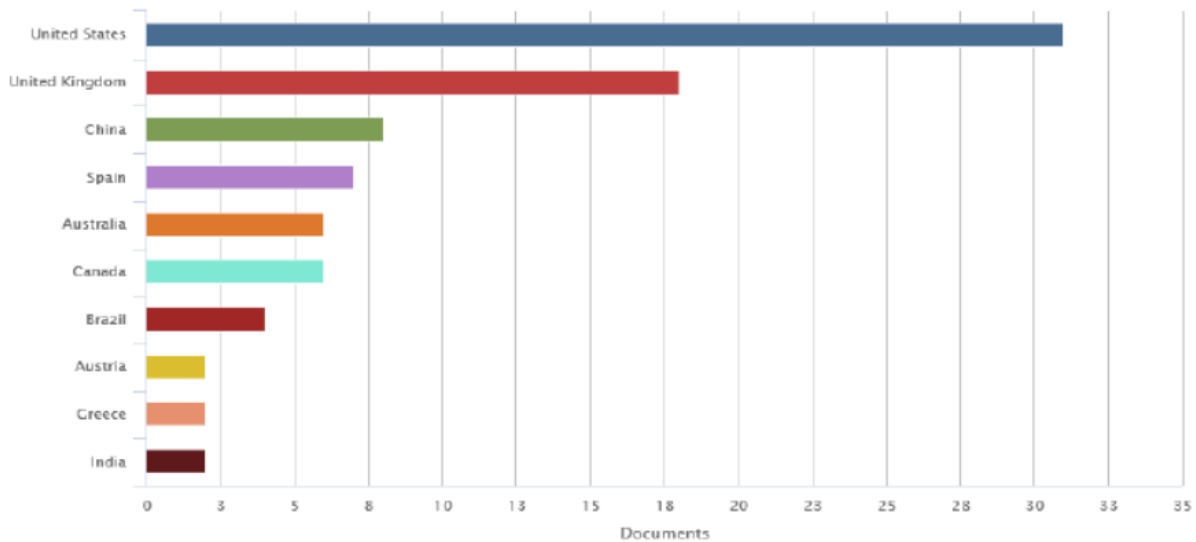
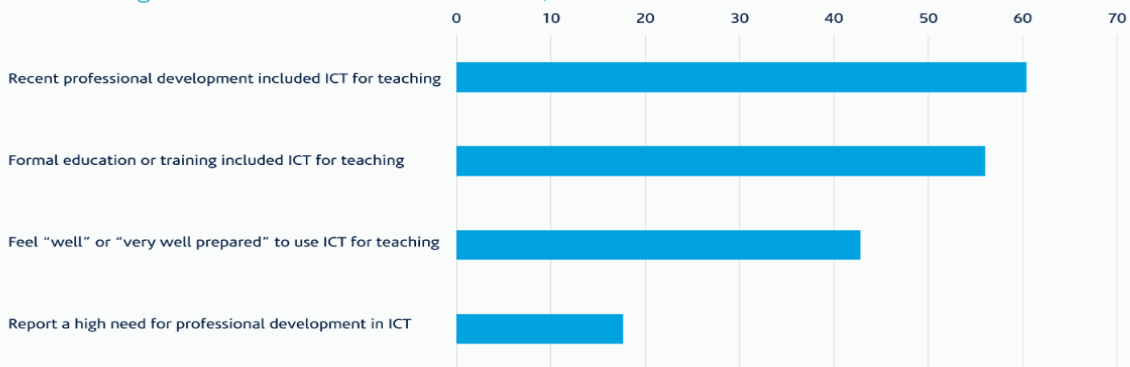


Fig -9:- [https://www.researchgate.net/figure/Immersive-Virtual-Reality-Education-number-of-papers-per-country-of-publication\\_fig1\\_280566372](https://www.researchgate.net/figure/Immersive-Virtual-Reality-Education-number-of-papers-per-country-of-publication_fig1_280566372)

When we compare the two graph, graph(1) and graph(2) shows us that graph (1) says that the use of immersive technology in the field of gaming industry is about 61% and the education is about 41%. But with this study we need to change the graph we simulate the gaming and education together. The above graph shows that Immersive technology is used in every field education, industry, gaming, healthcare all use this technology.

**Few teachers say they're prepared to use tech; fewer want more training**

Cross-country survey of teachers on information and communications technology (ICT) for teaching  
 OECD Average across 31 countries and economies, %



Source: OECD, TALIS 2018 Database, Table I.4.13; Table I.4.20; Table I.5.18; Table I.5.21



Fig-10:- (<https://www.varkeyfoundation.org/opinion/key-data-less-than-half-of-teachers-are-ready-to-use-tech>)

**Research Analysis:-**

For this paper, the research is conducted for this we used the Immersive tools and techniques to implement this techniques for digital education according to the NEP 2020.

Case 1:-

Implement the Immersive technology (AR):

Software developer	1	Cards
Desktop	AR Cards	Mobile,tablet,d

Test-1

Participants(students)	35	Botany ,computer	Class 11
Teacher	1	Andorid Mobile,Desktop	Augmented Cards

Measuring Parameteters:-

S.No.	Parameters	Yes/No	Percentage
1	Quality of Learning		93%
2	Student's Engagement		95%
3	Learning Outcomes		98%
4	User Experience		99%
5	Interactivity		100%
6	Accessibility		100%
7	Performance		80%

In this activity students are more engaged of their botany’s anatomy topic by scanning the cards and also the know about parts of computer in the class by using only some ICTs by using this techniques they are more clearly understand.

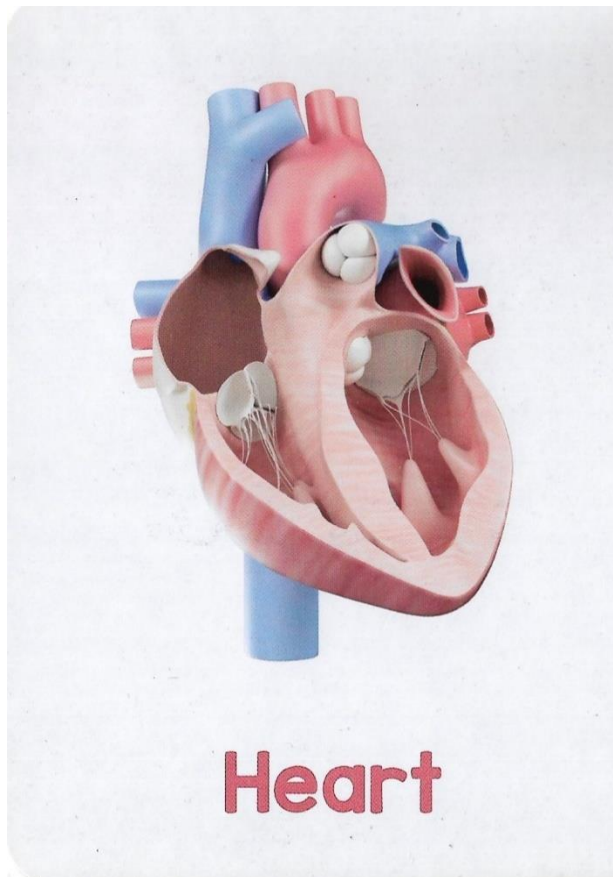


Fig:11 Heart(Traditional Method)

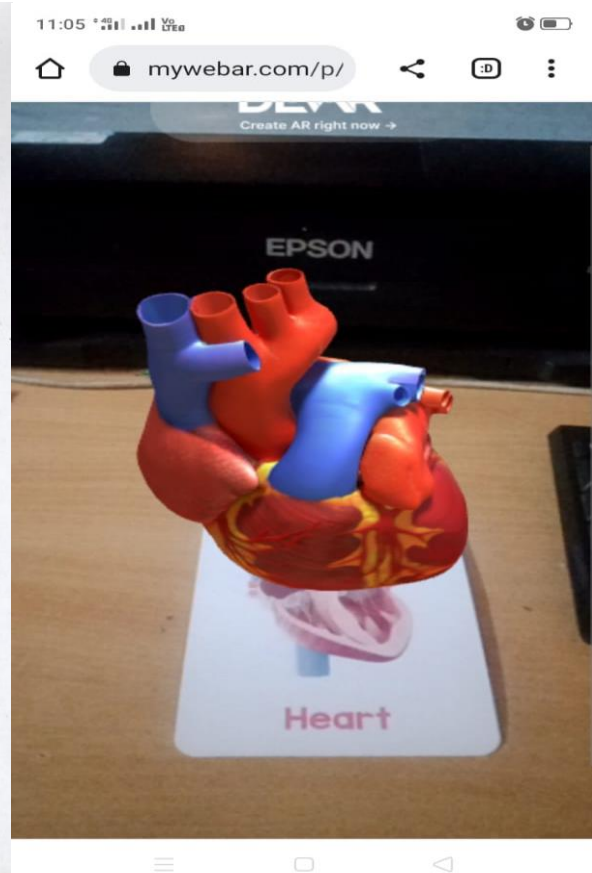


Fig:12 Heart(Augmented Method)(mobile)

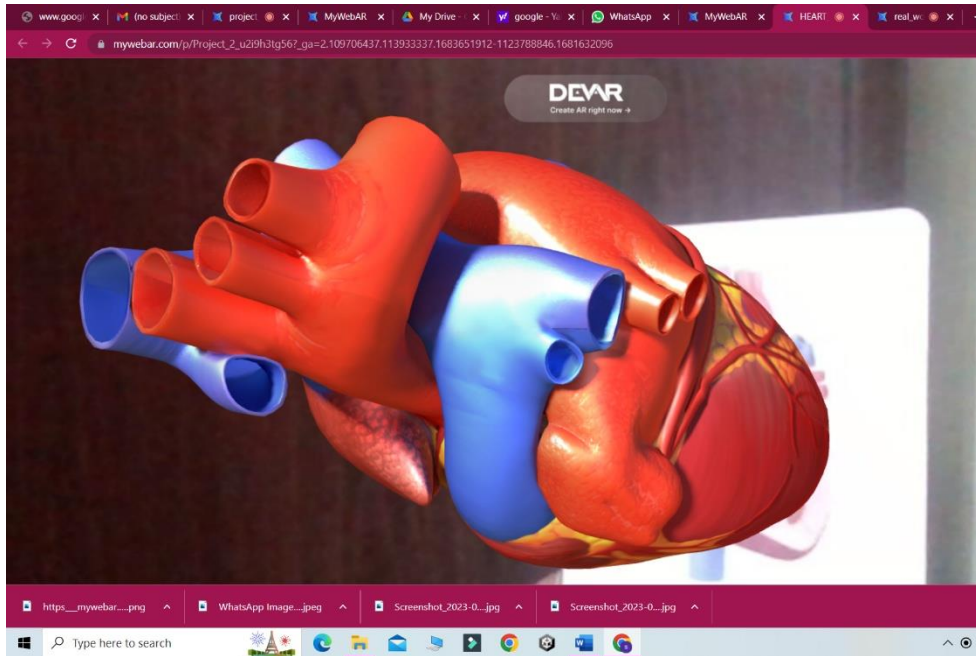


Fig:13 Augmented Reality Heart Target Based Image(desktop)

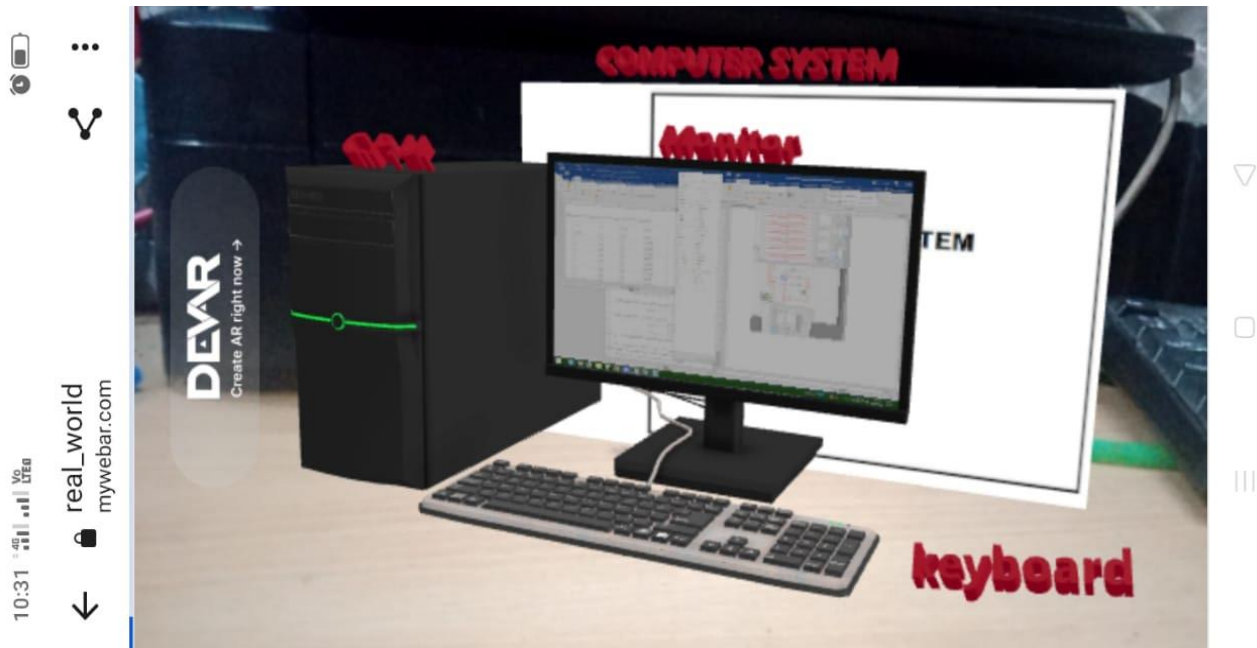


Fig-14-Parts of Computer(Location based AR Image)  
Outcome :-

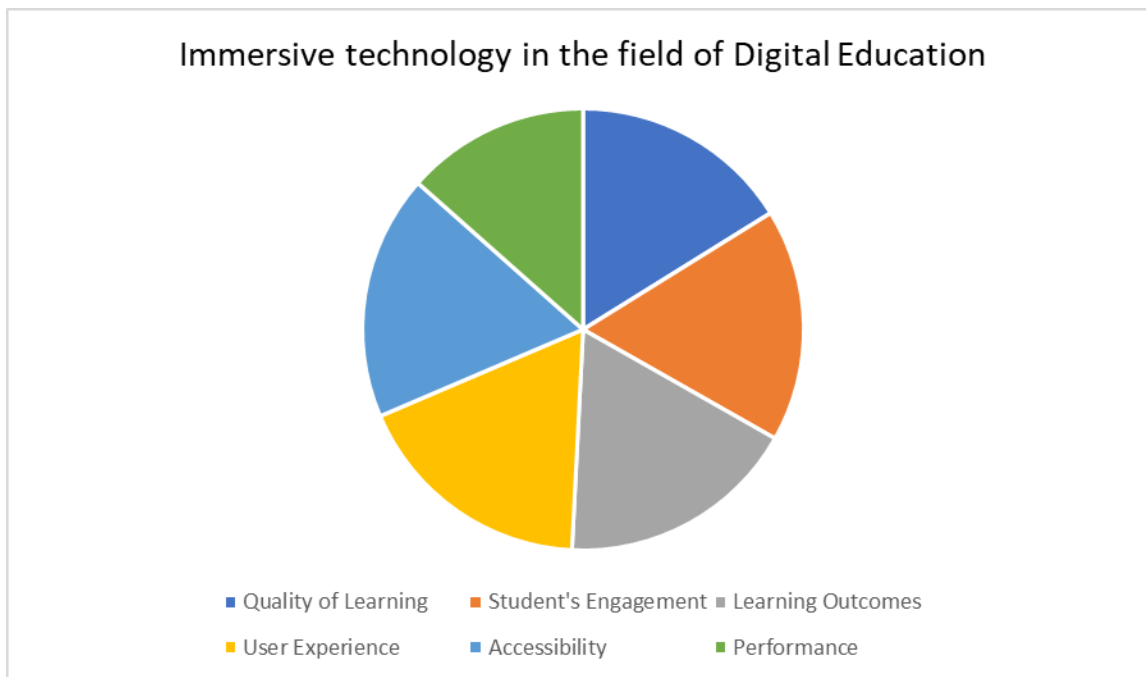


Fig-15:Measuring parameters graph

**Future:**

The future of immersive technology is exciting and holds great promise for many industries, including education, entertainment, healthcare, and more. As technology improves, it is likely that we will see more AR applications that are both practical and engaging.

Here are some possible future developments in immersive technology Adoption of immersive technology in education,training then cost of immersive technology decreases and also the advancements in hardware such as headsets and gloves which allow for more realistic immersive experience this will include haptic feedback, [17]which would allow users to feel virtual objects.In future greater emphasis will be on social interaction in virtual environment. This could include virtual classrooms, collaborative workspaces, and virtual events.Immersive technology can be more enhanced by the integration of artificial intelligence and machine learning. This could include

Overall, the future of immersive technology is bright and full of potential. As the technology continues to improve, we can expect to see more engaging, interactive, and immersive experiences in a field of education.

**CONCLUSION**

In conclusion, immersive technology has the potential to revolutionize the field of education by providing a more engaging and interactive learning experience to the students and the teachers. With immersive technology, students can explore the virtual worlds, interact with digital content in a more natural way, and gain a deeper understanding of complex concepts through experiential learning.

Immersive technology can also facilitate personalized and adaptive learning experiences, allowing students to learn at their own pace and in a way that best suits their individual learning style. This is very helpful for the physically challenged students.[18]Additionally, immersive technology can provide



opportunities for collaborative learning, allowing students to work together on projects and simulations in a virtual environment. During the time of Covid-19 this techniques save the people from the pandemic. Now government also started so many initiatives to train the teachers and the students if this type situation will arise then all the schools, colleges and university is ready to face the situation without effecting the studies of students. It has the potential to democratize education and provide a more equitable learning experience for students around the world. [19]

However, it is important to note that immersive technology should be used as a tool to enhance traditional educational methods, rather than replace them entirely. By combining the best of both worlds, immersive technology can provide a truly transformative educational experience for students of all ages and backgrounds.

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### Fig.1: IMMERSIVE TECHNOLOGY

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