

# RETHINKING AN EDUCATION WITH EXTENDED REALITY

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## Abstract

*In today's teaching and learning process technology is playing a vital role. The increasing use of technology in everyday life is changing the way students learn and absorb information. Technology in education can influence students to learn actively and can motivate them, leading to an effective process of learning. Since its introduction, Extended reality (XR) has been shown to have good potential in making the learning process more active, effective and meaningful. This is because its advanced technology enables users to interact with virtual, real-time and human interaction generated by the computer applications and brings the natural experiences to the user. The merging of XR with education has recently attracted research attention because of its ability to allow students to be immersed in realistic experiences. (Real experience can be immersed to the students using XR in the education.) Many research papers discussed on the application of AR and VR. This paper discusses different usage of extended reality and also new risks that affect the individual, organization and community.*

## Keywords:

*Extended reality, augmented reality, Virtual reality, learning process.*

## 1. INTRODUCTION:

In the world of digital revolution use of technology has changed the way of traditional education system. New technologies create learning opportunities that challenge traditional schools and colleges. Some topics and concepts will be understood easily through lab and experiments, field trip and 3D models [2]. Using Extended reality technique learning will become easy to understand concepts, students will have the real experience, interactive and easy to remember.

**Extended reality:** Extended reality is among the top technological trends that are changing the learning experiences today. In simple terms Extended reality (XR) is a term referring to all real-and-virtual combined environments and human-machine interactions generated by computer technology and wearables, where the 'X' represents a variable for any current or future spatial computing technologies. e.g. It includes representative forms such as augmented reality (AR), mixed reality (MR) and virtual reality (VR) and the areas interpolated among them. Extended reality (XR) is a new technology that has emerged with potential for application in education. There are different types of XR technologies i.e. Virtual Reality (VR), Mixed Reality (MR) and Augmented Reality (AR). Figure 1 shows the relation between different XR technologies the transformation from real environment to virtual environment. [6]

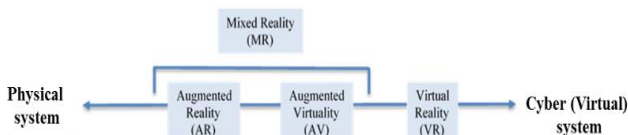


Fig. 1. Relation between XR technologies and environment, adopted from [10]

Extended reality consist of higher level of virtuality than augmented reality, mostly referred to as mixed reality, and issued for visualisation of new products and visualisation. Extended reality could be divided into three different types i.e. Hand-held device (smartphone or tablet), Head-worn (glasses) and spatial (projector/hologram) [6]. AR technology and does not have too many products on the market. Microsoft Hololens and sometimes the META 2 glasses are classed as MR glasses. In 2018 there are a lot of new mixed reality glasses launched to the market were Microsoft is part of five new releases (Samsung, Acer, HP, Dell and Lenovo)[6]. The overall mean value obtained for the current teaching method was 3.05 and the overall mean value for the use of the Anatomy 4D mobile applications was 3.49. An increase in the attention, confidence, and satisfaction factors was found after using the Anatomy 4D mobile application [4]. XR technology spending, according to the report. However, XR industry is the fastest-growing sector[9].

Lessons that are supported by technology will lead to more innovative forms of teaching and learning. This is because the use of technology involves real-world problems, current informational resources, simulations of concepts, and communication with professionals in the field [1]. Augmented Reality can be applied for learning, entertainment, or edutainment by enhancing a user's perception of and interaction with the real world. User can move around the three-dimensional virtual image and view it from any vantage point, just like a real object. The information conveyed by the virtual objects helps users perform real world tasks. Tangible Interface Metaphor is one of the important ways to improve learning. This property enables manipulation of three-dimensional virtual objects simply by moving real cards without mouse or keyboard[1]. As augmented reality, extended reality will be the added applications and features in the field of education.

COVID-19 has demonstrated that technologies that enable distance learning are critical to the survival of institutions of higher education. Although one of the most important uses of XR is to provide experience of environments that are remote or dangerous, we did not imagine that would include our campuses. By providing "hands-on" experience, XR helps promote student engagement with learning materials and deepens student interaction with complex problems.[2]

## 2. APPLICATIONS OF XR IN EDUCATION

This section presents a review of the extant research on the application of XR. This review is organized according to the application of XR and AR. AR technologies in a number of fields of study in education, namely, Medicine, Chemistry, Mathematics, Physics, Biology, Astronomy and History. Research on the application of AR in these fields is reviewed in order to evaluate the potential of AR in education. Table 2 summarizes the meta-analysis of the research conducted on AR in different fields. The analysis includes examples of how the AR technology was implemented in the respective fields [1]. Author discusses different applications of AR in education. I strongly believe

that XR can be widely used in all these fields for layout planning and virtual training.

### 2.1 Fun learning for Complex topics

Even difficult subject like Mathematics can be integrated with AR to help students understand the concepts. The teacher gives students the printed AR math activities or a PDF file. Students using AR technologies can point a tablet or Smartphone on top of the paper or the PDF file in the computer to see the videos about the theoretical materials and the problem solutions in detail. This is an emerging trend of merging traditional learning with technology in a way that's fun, exciting and more immersive than any other form of learning.[3]. And also topics like solar system will be very effective with the XR.

### 2.2 Anything, anywhere

Students can connect with their teachers from anywhere, making education accessible on a global level. Diversity in content can bring out the true potential of the range of things that could be achieved. For certain topics or subjects, some XR-based applications have options for the students to answer questions by typing into their laptop or tablets. While the students and the teacher would be able to see the same things or be in a same session, the teacher can highlight or lecture on chosen things more relevant to the lesson.

### 2.3 Interaction

XR is that it combines the physical experience of holding a book and turning the pages with the magic of digital content that appears to almost leap out from the pages. For instance, from Science to English, students can now engage with 3D animations, sound, narration and other interactive games for a better learning experience. 'Peter Rabbit' brought to virtual life via augmented reality app Boxful, launched by an Israeli immersive content company called Inception, is a good example of the technology in education. It features an e-book version using illustrations that come to life throughout the book; the "play" option induces activities where children can interact with characters from the book relating to the story, thereby allowing readers to form deeper connections with the book.

### 2.4 Virtual laboratories

Another way of teaching the concepts of XR, AR and VR in schools is by setting up laboratories that build the cognitive and non-cognitive skills of learners. The content today is mapped with CBSE and all other state boards with AR lessons and immersive VR journeys and school should have the required infrastructure to set up the laboratories in their own premises. They can also use computer labs, libraries or virtual dedicated classroom for setting up XR labs in the schools along with required hardware such as VR Headsets, AR Booklets, and tablets. Another advantage of the technology is that the solutions provided are cost-effective. Hence, schools with low budgets can also deploy AR/VR pods where students can experience the learning at their leisure.

### 2.5 Government aid

Today, government schools are also taking steps to improve the learning outcomes and enhance student learning experiences. The usage of technology has led to a marked improvement in the learning outcomes of the students. For example, in Jawahar Navodaya Vidyalayas, the government-run schools primarily for children from rural parts of India provide access to quality education through digital learning across their network of 500 schools. These digital classrooms have increased student attention, and reduced absenteeism and school dropouts. It has also improved student familiarity and comfort with technology.

The Education Welfare Department can help revolutionise education in the country by taking the technology to remote areas as well. The content can be altered to vernacular languages to facilitate understanding of rural students. The regional associations can also participate in fulfilling each child's Right to Quality Education – either by raising funds for the technology through charitable events and/or collaborating with government bodies.

### 2.6 Active Learning Environment

AR also facilitates user-controlled interactions and learning. All one needs to do is download an app on a smartphone or tablet and have access to trigger/tracker images. It provides an active learning

environment for the learner, otherwise unattainable. It also provides a great tool for evaluation because of easy monitoring in a virtual/digital environment.

### 2.7 Leap Motion Technology

Emerging technologies like Leap Motion technology where users can explore a VR environment with hand motions can be a game-changer. One essentially uses subtle hand gestures to push, pull, or twirl objects in a VR setting. So the opportunities for XR to successfully aid education are immense. Immersive experiences help make otherwise tedious subjects engaging and fun for the students. These technologies are redefining the teaching-learning process to make it more efficient and interactive besides inculcating in students a genuine thirst for knowledge.

There are many fields in which XR technology is adapted and applied for teaching and learning. Most of the research studies demonstrated the positive feedback of the participants regarding the AR system under investigation. In conclusion, more research on the integration of AR in teaching and learning should be conducted because of its clear benefits not only to students but also to teachers. With the aid of AR technology, the teaching of subjects that involve visualization will be enhanced, compared to the use of traditional methods alone.[1]

## 3. NEW RISKS

Opportunities plenty but new risks How it effects an individual, organization and community.[5]

### 3.1 Misuse of Personal Data

Companies collect massive data for processing Highly popular AR apps and XR solutions, example could be around collecting eye movement, heart beats, walking signature, likes, and dislikes on social media, facial expressions, speech data, and even retina patterns that can be used to uniquely identify us. XR experiences provide value by gathering and interpreting data. With XR, however, the data is of the most personal variety imaginable. These data could be vulnerable to be misused, unless proper compliance is not in use.

### 3.2. Synthetic Realities

Concern over fake news could turn to fake experiences. Consider a news source taking us to a controversial war zone through a virtual experience

### 3.3. Cyber Security

While there are many opportunities for XR, there are also considerable risks and dangers. The data underlying XR is vulnerable to bias, misuse and cyber-attacks. Both virtual and augmented reality can be manipulated for adverse purposes that could threaten our individual, mental and societal well-being

### 3.4. Tech Addiction

High engagement nature of technology, could affect quality time. Studies say that more use of technologies gets anxieties, headache and may lead to mental fatigue

### 3.5. Antisocial Behavior

Due to closing up the gap of social media and XR, lead to people Living a split personality on these platforms and take refuge to internet to avoid reality. Leading to anti-social behavior.

### 3.6. Digitally divided worlds

There will be two worlds virtual and real. When the avatars we develop to represent ourselves within these virtual spaces inevitably become tied to our real-life personas. If you have a strong character in the virtual world and not in the real. There will be a very small gap between virtual and real, which will become difficult to manage.

## CONCLUSION

XR challenges the traditional organizational models that exist in higher end. XR technology changes rapidly, and the domain in which it is

deployed might change from project to project. There might be power in having a center or initiative, but there is also power in having an agile and flexible, constantly shifting collaboration around XR.[2]. There is no doubt that the XR technologies are here to stay in future. The literature indicated that there is insufficient research on the impact of using mobile XR in education, and there is room to explore the potential of XR to improve student learning motivation and contribute to improved academic achievement and this paper given the risks of using XR new technologies.

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