

# A Review On Innovative Trends In Augmented Reality Based Collaborative Learning Approach

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## ABSTRACT

Augmented Reality (AR) – A real world interactive environment wherein the objects of real world are enhanced by computer-generated perceptual information, - across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory. It's a computer vision-based pedagogical tool that enhances the level of education, expands vision, sound, designs and other tactile contributions from our environmental factors. The upgraded, increased perspective frame on the real world, is an extraordinary method to render our condition enlightening, instructive and mechanically impersonated. For making our existence increasingly helpful and intelligent by improving genuine components around us using computer creative innovation, AR is the state of art technique. AR superimposes modernized realistic and sound signals into our genuine reality, helping our general understanding to an absolutely new plane. Augmented Reality just has computerized or virtual data overlaid on this present reality.

**Keywords:** Augmented Reality, Augmented virtuality, mobile Application, Head Mounted Display, Mobile Application Development

## 1. INTRODUCTION

"Everything" in image handling is an open exploration region. Such is the idea of image handling: the data is taken from 3D/4D and introduced in 2D.

This implies a loss of information all the while. Our cerebrums are phenomenal at inducing what that lost information is - machines are not really!

Augmented Reality is a new technology that involves using computerized virtual visual and audio inputs to augment or enhance the real-world reality through individual device cameras. It works on computer vision-based vision algorithms that augment vision, sound, graphics and other sensory inputs from our surroundings to form an enhanced, augmented view of reality.(Klinker 2000)

Augmented Reality is a great way to render our environmental information into a technologically simulated one. It makes our reality more useful, informational & interactive through the enhancing real-world elements around us through computer-generated technology. It superimposes

computerized graphic & audio cues in your actual reality, thus taking your overall experience to a totally new plane.

Augmented Reality isn't just limited to desktops & mobile phones, however, as the rise in wearable tech like Google Glass, a worn-on-head computer with an optical head-mounted display, & smartwatches has brought Augmented Reality much closer to us.

A simple Augmented Reality use-case would be: a user captures the image of a real-world object while the underlying AR platform detects a marker, which is then transformed with a virtual visual or audio input into an enhanced reality state. The augmented image/visual is then displayed on your screen via your device camera.

Without a doubt, Augmented Reality has turned into a quickly developing innovation. Global organizations including Amazon, Microsoft, Apple, Facebook, and Google have selected this progressive strategy. Directly, AR has become a prevalent route for a few enterprises including Healthcare, Gaming, E-business, Manufacturing and many more.

### **1.1 Augmented Reality in collaborative learning**

Picture/Video/Sound based advances are simply beginning to receive the rewards of better representation apparatuses, quicker figure cycles, boundless memory just as 64- and 128-piece address space. What took perpetually in the past is no more. The magnificence of the field is that you learn thoughts by observing, not through determining numerical conditions.

Collaborative Learning is still a challenging mode for many schools focused on academic performance, but it can provide a real-world challenge for a group of students to solve. Here is where the true art of story-telling begins: collaborative learning with 21st-century skills through Augmented Reality. Unlike other types of technology, Augmented Reality is more than a tool. It's a creative tool that allows you to express yourself through various digital contents.(Villonez 2018)

As the ascent in wearable tech like Google Glass, it is a well-used on-head PC with an optical head-mounted presentation has brought Augmented Reality a lot nearer to us. The interactive aspect of this technology to help increase engagement, collaboration in the classroom and material retention.(Rehman and Cao 2015)

Students can think in several dimensions thanks to multisensory learning(A, Gayathri, and Thanga 2020). Reading, writing, comprehension, and observation will all take place at the same time. Students would become Doers, Thinkers, and Creators as a result of their futuristic learning. Students should communicate with the topic they are studying, which will help them understand it better. Future technology, such as virtual reality, will also alter teaching methods. Subject matter experts will devote more time to using technology to have a deeper understanding of the subject.

So many ways to enhance education through AR. Students, or better said - people focus more on interactive learning and using 3D and AR, thus learning can be a netherworld of fun and much more understandable and memorable.

With technology like AR becoming more advanced, more available to the general public, and more popular it's only a matter of time before it's going to be used universally in and out of the classroom in order to enhance our learning experiences.

### **1.2 Application of AR in E-Learning**

Nowadays, Augmented Reality can be witnessed around the environment in various structures. From significant retail brands to eateries, sports groups and amusement monsters, vehicle organizations to gigantic partnerships, banking and money to friendliness, Augmented Reality is leaving its imprint all over.

**Education:** Augmented Reality is the next big thing in the Education industry. Many application developers are working on Augmented Reality enabled apps that embed audio, visuals, computer-generated graphics & virtual elements to enmesh with the reality. The virtual elements help students better relate to the curriculum & understand complex theories easily.

**Print Media & Advertising:** Major publishing houses around the world are developing apps to present digital content in an interactive way to their readers through Augmented Reality technology. Similarly, advertising companies around the world are also looking towards technology to enhance their customers' experience of interacting with their brand & experimenting with new, creative ways of advertising.

**Tourism and Travel:** Augmented Reality has hugely helped the travel industry by enabling tourists to access important information about any place by simply pointing their cameras at those. AR-enabled tourist self-help apps help first-time travelers gather useful information about any tourist destinations through interactive, virtual graphics and audio inputs, all made possible by Augmented Reality. AR is an integral asset for the traveller business, assisting with upgrading travel encounters by offering helpful data as far as route, aides, surveys and continuous pictures.

**Text & language interpretation:** Augmented Reality based text & language interpretation apps help people better understand a foreign language either through written or spoken word.(Nugraha 2015)

**Event industry:** If there's a single industry that has benefited the most from Augmented Reality apps, it's got to be the event & brand marketing industry. With the inception of AR-enabled apps, wearable tech & interactive options like Green screen photo booths, Augmented Reality has brought a revolution in the way people interact with brands & partake in marketing experience. After the achievement of the AR-based gaming application, Pokemon Go, the Augmented reality industry has enormously developed over the world. (Udayan et al. 2020)

**Automobile Industry:** AR offers a car availability biological system. Vehicle producer Audi was one of the main brands to improve the physical showroom and made the world's first computerized showroom. This development assists with boosting deals and giving surprising experience to the driver's wellbeing.(Wisnalmawati and Prasetyo 2019)

#### **Future of Augmented Reality :**

Augmented Reality (AR) technology has evolved over a long period. From where Sutherland created it in 1968, who initially created it for production of head-mounted display systems, and since then it has rapidly been applied in various fields.

Because of the demand in the healthcare and education sectors, augmented reality is expected to expand rapidly in the coming years.(Gerup, Soerensen, and Dieckmann 2020)

The industry is expected to benefit from the increasing popularity of e-commerce and the acceptance of digital media. Furthermore, increased knowledge of consumer purchases, sales records, and bill generation may have a positive effect on business development.(Plant 2017)

One of the major driving factors in the market is the increasing penetration of AR devices in the gaming and entertainment sectors. Demand for the technology is expected to be fuelled by technological advancements in a variety of industries, including consumer electronics and automotive. In addition, in order to provide education and training, AR is expected to rise in popularity in the manufacturing, retail, and healthcare sectors.

## **2. AR/VR in eLearning: Engross Yourself in The Augmented Reality Environment**

eLearning has become the preferred choice for training employees in different industries. When done right, eLearning is highly immersive and promotes a spirit of self-learning amongst employees. Virtual Reality (VR) and Augmented Reality (AR) are two of the most innovative technologies that can make an eLearning process a whole lot better. (Manjorin 2017)

1. Virtual Reality in eLearning – Virtual Reality is a way of using software to create a virtual environment for users to learn new things. The virtual environment needs to be created with an eye on the concepts that need to be taught. VR training methods directly engage two of our most important sensory organs i.e. sight and hearing. It is proven scientifically that information received via different sensory organs is retained better. Also, VR sessions allow for a lot of creativity and can be used for developing intrigue amongst the trainees. VR sessions are extremely useful in scenarios that are hard to recreate in the real world.

2. Augmented Reality in eLearning – Augmented Reality incorporates real-world video footage into the virtually created environment. It feels more real and engrossing, and hence, plays a vital role in the communication of real-world concepts. It is ideal for training employees on the training related to real-world scenarios. For example, an apprentice miner can learn how to dig better in a mine through an AR session or a truck driver can learn how to drive better on treacherous terrains.

Both AR and VR are highly effective in disseminating knowledge amongst trainees. The best way to utilize these two methods of training is by incorporating them as part of gamification. Building gaming sessions that have AR and VR integrated are relatively easier to understand than other modes of training. However, to conceptualize such training modules, you need the services of good eLearning service provider company like MPS Interactive. (Fu et al. 2021)

### **2.1. Instructions to Develop AR/VR eLearning Resources:**

Steps to Develop AR/VR eLearning Resources: There are numerous manners by which Augmented and Virtual Reality advancements can be utilized to make an eLearning course more beneficial, inventive and fun. You simply need to realize where and how to apply them. A portion of the applications are internet preparing recreations, expanding situations, and genuine games. In any case, as these advances are of a serious nature, fusing them in any eLearning course requires a critical venture of both time and cash. Have confidence. Whenever done accurately, they hold the ability to improve the presentation and capability of online learning students.

Determine whether AR/VR Is the Best Approach: To ensure that the message is received, it is often important to use online training exercises or hypothetical scenarios. When the subject matter is complex, involves a high level of danger, or is uncommon, it is safer to use Augmented/Virtual Reality.

Understand Your Target Audience: The secret to success is detailed project preparation. As a result, the first condition is that you understand your target audience's needs.

**Craft the Story:** Create a story that answers your users' questions and meets their needs once you know what they expect. You can either create a hypothetical scenario or use a real-life experience to accomplish this. You make the decision, but make sure to consider the user's pain points. They should also be able to connect to the storyline so that they understand the significance of the topic of their own lives. It's critical to create an emotional bond that elevates the eLearning experience's importance and makes it more memorable.

**Present Solutions in An Effective Way:** This is probably the most critical move, as it will determine whether or not your entire eLearning course succeeds. You must be certain that the solutions offered in the AR/VR experience are the best. To put it another way, the online learner must be persuaded that the solutions provided are useful and right. You may create various AR/VR eLearning tools with various outcomes to inform your online learners. This way, you can guide them to the online training's desired learning purpose.

**Build up the AR/VR Experience:** You can either outsource or build this move in-house. Whatever the case might be, the developer must be aware of the end users' standards. Then there's the technical component, which takes the most time. This stage will last anywhere from sixty days to a year in most cases. The span of the implementation stage is determined by the application's complexity. Another advantage of AR/VR technology is that it can be applied to a variety of eLearning methods. All it takes is a minor adjustment. As a result, make sure to design your AR/VR eLearning resource in such a way that it can accommodate changes and additions.

**Mastermind the Essential Equipment to Support the AR/VR eLearning Resources:** Once the development stage is completed, there are three equally important areas to consider.

- **Hardware:** Workstations, head-mounted displays, mobile devices, and other AR/VR capable devices are needed.
- **Visual:** For Visual it needs panoramic 3D footage in certain cases to create virtual worlds.
- **Audio:** For a more realistic AR/VR experience, invest in a better audio kit.

## **2.2. Imaginative approaches to utilize AR/VR advancements in web based preparing following points to Use AR/VR Technologies:**

Augmented and Virtual Reality innovations permit web-based preparing immerse to another level. Representatives can stroll into the work environment and apply what they've realized without making a stride. Subsequently, dispensing with genuine dangers and encouraging mistake driven learning openings. Inventive applications for utilizing AR/VR advances in online collaborative learning class given below:

1. **Acquiescence Online Training Simulations:** Virtual and augmented reality are excellent performance-enhancing technologies. Employees can enter simulated worlds and communicate with virtual objects in real-world scenarios. Participate in compliance online educational simulations, for example, to avoid workplace accidents and ensure consumer protection.

2. **Collaborative Task Walkthroughs:** To boost workplace results, this combines simulations with online training tutorials. Employees watch each step of the task and then complete it in a simulated environment on their own. This helps them to spot positive habits and figure out which skills they'll need to finish the process. To boost immersion and so that employees can imitate every move, the walkthrough should be as realistic as possible.

3. **Firsthand Product Demos:** Product demonstrations are usually pictures or short videos that demonstrate the features and benefits of a product. You can, however, use AR/VR technology to give workers a hands-on experience. They will explore the functionality and connect with the product in its virtual form. Allow them to go inside the product and see how it functions and examine its various components.
4. **Geolocation Sales Floor Scrounger Pursuits:** Invite the staff to take part in an augmented reality scavenger hunt on the sales floor. Here, can use geolocation and augmented reality to hide items around the facility for employees to identify. Each object links to a tutorial, activity, or other online training resource. You may also conduct a scavenger hunt to determine their product awareness. For example, ask them to find the best-selling item in your department from the previous year or the item that they would suggest to a particular customer.
5. **Emergency Attentiveness Scenarios:** Nobody knows how they'll respond in a crisis before it happens. With the aid of AR/VR technologies, it can test their ability to manage tension and solve problems in chaotic situations. Employees should be placed in the midst of an emergency to see how they respond. Employees who are unable to handle the stress will gain experience through online training simulations and branching scenarios rather than having to put their skills to the test in potentially life-threatening emergency situations.
6. **Mistake-Driven Grave Games:** All make mistakes many ways. What matters is how to deal with that mistakes to rectify and learn from that faults. Rather than allowing errors to defeat workers, alternate reality systems assist them in identifying areas for change and extracting information from previous mistakes.
7. **True-To-Life Examples and Case Studies:** Text-based examples and case studies are popular in the real world. Employees read the story and then focus on it to see if it works in a real-life setting. However, thanks to AR/VR technology, they can see the example in motion. They will watch as the interactive characters enact the scene and deal with common problems. Quizzes, tests, and other bite-sized online training exercises may also be incorporated into case studies and real-world examples. Employees are asked to answer questions at the end of each scene, for example, to test their comprehension.
8. **Simulated Workplace Trips:** This is a particularly useful online training platform for new employees. They will take a virtual tour of their new workplace and become acquainted with the tools of the trade without ever entering the actual facility. Since the VR/AR tour has already given them some experience on the sales floor, the newest employees will engage with customer personas to shorten their first-day learning curve.

### **2.3 Impact and Future of AR/VR Technologies eLearning**

(Serio et al. 2013) Digital knowledge can be superimposed and incorporated into our physical world using Augmented Reality (AR). With so many of us at home due to a global pandemic, augmented reality is a technology that can help us transform our immediate environments into learning, work, and entertainment spaces.

#### **2.3.1 The destiny of VR and ARC**

In contrast to Virtual Reality, where the student is changed into another condition, AR utilizes intuitive advanced components to upgrade genuine conditions. Trend setting innovation utilizes a camera and show, for example, cell phones and tablets, or wearable innovation like Google Glass to

show graphical data progressively. Increased Reality grasps shorter expectations to absorb information, effective workforce, and adaptable working environment condition, in this way conveying a uniform encounter. Accordingly, the fate of VR and AR is exceptionally splendid, and their developing use for corporate preparation focuses on a workforce that is more brilliant, versatile, and more gainful than any time in recent memory. Some strategies for avoiding the most common mistakes when incorporating AR/VR into eLearning methods.

1. Technology is learning aid, not learning by yourself: The biggest pitfall in all the tech-involved efforts is going overboard. For example, Hollywood blockbusters that are a bit heavy-handed with special effects seem to flop in the box office. People are always (O'Neill 1987) looking for realism, even when it comes to science and fiction. The same laws shall apply to eLearning. Overdoing this continues to happen when the technology is fairly new and brings with it a sense of innovation. But it can be a nightmare for the eLearning content and its educational benefit. The aim of eLearning is to express ideas and develop critical skills. It is also necessary to note that Augmented/Virtual Reality is just a medium for achieving these goals. Their success is measured by how well they help provide eLearning (Gayathri and Nandhini 2011) content and increase the importance of eLearning experience. Many eLearning courses now invest a lot of time on Augmented and Virtual Reality at the expense of eLearning materials.

2. Importance in writing and expression – oriented learning: When planning the eLearning course, it is prudent to experiment without having to reinvent the wheel. One of these great learning wheels is the written and verbal element. Online learners need to be able to show their experience and abilities in a specific way. In reality, reproducing and practicing what has just been taught will help to cement the information. We also welcome the examinations and the success side of learning. However, it is important to evaluate understanding and clarify core principles. No matter how sophisticated technology is, fundamental learning methods are also an important part of the equation. In other words, Augmented and Virtual Reality is not a substitute for Instructional Design philosophies, ideologies or models.

3. Clarity of intent behind any design decision: When you plan to incorporate AR/VR into your eLearning path, you will need to create a statement of intent. What are the goals and objectives of the eLearning course? What do online learners need to know by the end of their eLearning course? How does this eLearning course add to the life and intelligence of online learners? Once you have a straightforward agenda and a set of targets, you can make better technical choices and implement AR/VR wisely.

4. Increased and virtual reality are supposed to make learning more available: Trainers are trying to make studying faster. They're trying to make it more interesting and enhance its appeal. They want to enrich and extend the possibilities that eLearning can bring. There are all legitimate motivations for incorporating AR/VR into eLearning. However, without usability, it is difficult to obtain all of these advantages. What would be the point of incorporating AR/VR if the eLearning course were less user-friendly? Rather than helping, it will become a barrier to the learning process. Two golden laws for the integration of AR/VR in eLearning:

- Make sure that the AR/VR is user-friendly, self-explanatory and easy for people with various technical skills. For eg, those that are not tech-savvy.

- Online learners can never consider whether the AR/VR aspect of the eLearning is really required or just a fun engineering gimmick. Remember, the object of AR/VR in eLearning is not to impress, but to impart knowledge.(Banna 2020)

5. Alpha is coming before Beta: Alpha appears before beta in the Greek alphabet. Conduct any user research to ensure that the new AR/VR technology supports the intended results and is readily available. You may also do some Alpha/Beta training to test various iterations of the eLearning course, which helps you to choose how to incorporate AR/VR that enhances awareness and responds to a variety of learning preferences.

### 3. CONCLUSION

AR is one of the developing advancements that have an extraordinary academic potential and have been expanding perceived by instructive analysts. AR has the capacities of consolidating virtual and genuine universes together, bringing forth additional opportunities for improving the learning movement and of educating nature. The viability of AR can be additionally broadened when consolidated with other kinds of advancements - cell phones, digital gadgets, etc. Whilst, AR is interfacing with creative innovation – i.e., cell phone, the term Mobile Augmented Reality (MAR) emerges. As introduced before, MAR learning-based frameworks are generally more spotlight on games or re-enactment. In consideration of the capacity of cell phones which have unbelievable functions of transportability, social intelligence, availability, setting affectability and distinction can make learning experience more important. In light of the above explanations, the vast majority of the members had never encountered AR or MAR, but generally speaking members felt persuaded and appreciated. The exploration shows a good instructive consequence for members that prompts understudies to accomplish more elevated levels of commitment in learning execution. Taking everything into account, albeit the vast majority of past examinations demonstrated a positive effect and empowering results. We can further expect that there will be a lot more exploration on AR and MAR later on the grounds that this innovation has tremendous possible ramifications and advantages particularly in the learning process. (Koceski and Koceska 2011)

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