

AUGMENTED REALITY FOR SCHOOL ORAL HEALTH PROMOTION – A NARRATIVE REVIEW

Abstract

This narrative review explores the integration of augmented reality (AR) technology for oral health promotion in school settings. AR's immersive nature and interactivity offer a unique platform for engaging students in educational interventions. The review examines various studies and projects utilizing AR to enhance oral health education, highlighting its potential to captivate young learners and improve their understanding of oral hygiene practices. By overlaying digital information onto the physical world, AR applications can simulate dental scenarios, demonstrate proper brushing techniques, and gamify oral health routines, fostering active participation and knowledge retention among students. Furthermore, this review delves into the challenges and future prospects of implementing AR-based interventions in schools, emphasizing the need for continued research, accessibility considerations, and collaboration between technology developers and oral health educators. Integrating AR into oral health promotion holds promise for creating dynamic, impactful, and enjoyable learning experiences for schoolchildren.

Keywords: Augmented reality, physical world, EdTech, Oral health

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I. INTRODUCTION

Technologies are transforming every aspect of our lives, including classrooms for kids. Students of all ages are accustomed to swiping a tablet and searching the internet for information. While some teachers embrace these modifications and gain from them, others are still working towards adopting a cutting-edge educational experience. EdTech (Educational Technology) is here to revolutionise contemporary classrooms and alter the conventional method of teaching.

Traditional educational approaches as we once knew them are fading into history. They are being influenced by technological advancements and becoming more and more digital. The industry of "EdTech," or educational technology, is anticipated to develop at a rate of 17.9% per year to reach \$680.1 billion by 2027. A leader among the most important EdTech trends, augmented reality is deserving of this distinction. With the value of AR in edtech expected to hit \$5.3 billion by 2023, there will undoubtedly be new opportunities for corporations and educational institutions. Multiple uses for augmented reality in education are possible. It makes it simpler for the pupils to learn, understand, and retain the material. Additionally, AR enhances the fun and engagement of learning itself.

AR is defined as : “An interactive experience that integrates the real environment and computer-generated information is augmented reality (AR)”. Usually the information is presented through visual, haptic, aurally, olfactory and somatosensory modes. AR system combines real and virtual world with real time experience and 3D registration of the events. The first AR systems were started way back in 1990’s by U.S. Air Force's Armstrong Laboratory to offer mixed reality experience. Later commercial applications were brought into real world through gaming and entertainment industry, which gradually made its appearance in different sectors like education, healthcare, communication. The digital content superimposes the actual work. Hence it offers superior approach to create, and deliver instructions. The focal advantage of AR is the way digital content are integrated into individuals insight of real world, not just as a simple data display but also by integrating immersive sensations that are perceived as natural elements of an environment.

Augmented reality currently includes glasses or a camera lens to visualise, but as interest in the technology grows, new hardware and lens options are being made available.

1. AR comprises of 5 parts

- Synthetic intelligence. Artificial intelligence (AI) is typically required for augmented reality applications to function, enabling users to perform tasks via voice instructions. Information processing for your AR application can also be aided by AI.
- AR applications. These are the programmes and technologies used to access augmented reality. Some companies are able to develop their own proprietary AR software.
- Processing. For your AR technology to function, you'll typically need to get into the device's underlying operating system.
- Lenses. To view your content or photographs, you'll need a lens or image platform. Your image will look more realistic on a higher-quality screen.

- Sensors. The actual and virtual worlds must be in sync for augmented reality technologies to work. When your camera takes a picture, it sends the data to software so that it may be processed.
2. **Applications for Augmented Reality:** AR is taking a top notch as a chief interest right from industry to daily consumers. The technology has potential to integrate real-world data with virtual information, making it applicable to almost every business. manufacturing, health care, marketing, entertainment, sports, and education.

Utilization of AR apps in classroom setting for education is most appreciated domain. The use of apps offers a visual representation of the information, and assists students in putting their knowledge to use.

Few In-class examples of augmented reality:

- **Assemble EDU:** This is an important platform for teachers and students to learn the subject from 3D and AR tools. This is a visual based learning which provides abstract thought among the learners.
- **Merge Cube:** Through this tool the visual objects are transformed into 3D tactile object, which provides the learner a practical experience. The use of this interactive AR in the classroom will speed up and improve student learning of STEM subjects.
- **Arloon Geometry:** this is a tool to learn geometry lessons through software. This software helps students learn about geometric shapes in 2D and 3D through interactive exploration because this subject relies largely on visualisation.
- **Distance Learning:** Students can learn even outside of the classroom by employing augmented reality. Additionally, instructional resources that include augmented reality can make online or distant learning simpler and more effective.

Examples of augmented reality learning apps:

- Wonder scope is a good example of how augmented reality may be used in classroom instruction for kids and is a useful tool for absentee pupils. By bringing the stories to life on the device's screen, the app piques children's interest in and enthusiasm for reading new books.
- The 3DBear app is ideal for remote classes since it combines all the advantages of augmented reality learning. The platform's creators created a practical area that gives teachers control over the online learning process.
- To assist users practise their abilities as if they were in a real-world situation, the language-learning software Mondly has just included an AR-based virtual teacher.
- Dental education has found great value in the use of three-dimensional virtual models.¹ But because to more recent developments, educators can now further improve students' dental instruction through augmented reality (AR) and virtual reality (VR).

With augmented reality (AR), virtual objects are added to the physical environment to create the impression that they are physically present there. It can facilitate the study of the intricate relationships found in real-world data and provide

engaging, contextual, and situated learning experiences. AR presents great opportunities to include and instruct schoolchildren about dental care, oral hygiene practises, and the value of maintaining good oral health in the context of school oral health promotion. By blending virtual elements with the real-world environment, augmented reality (AR) creates immersive and interactive experiences that pique schoolchildren's interest and attention. By fusing virtual elements with the real-world environment, augmented reality (AR) creates immersive and interactive experiences that pique schoolchildren's interest and attention. AR presents a special opportunity to close this gap by utilising technology to produce dynamic and interactive teaching content.

With the use of AR technologies, schoolchildren can see and explore virtual dental models, converse with virtual dentists or oral health educators, and even perform dental procedures in a controlled virtual setting. By integrating AR into school oral health promotion programmes, educators and medical professionals can increase the impact of their educational initiatives. AR can help schoolchildren comprehend dental hygiene procedures, learn about the consequences of poor oral health, and gain the knowledge and skills necessary to uphold healthy oral hygiene practices. AR can also make oral health education more inclusive and accessible by accommodating a variety of learning styles and aptitudes(9).By adopting AR technology, educators can engage students in a unique and engaging method that will promote learning, retention, and application of oral health knowledge.

The sections of this book chapter that follow will go into further detail regarding the applications, advantages, drawbacks, and potential future directions of using augmented reality to promote oral health in schools, with a focus on the literature from 2013 to 2023.

II. MATERIALS AND METHODOLOGY

The objective of this narrative review was to answer the following research question: "What is the effectiveness of augmented reality in promoting oral health among school children from 2013 to 2023?" Searching the literature involved using databases like PubMed, Google Scholar, IEEE Xplore, and databases for academic research. To find pertinent papers published between 2013 and 2023, a combination of keywords, such as "augmented reality," "oral health promotion," "school settings," and "children," were employed. All publications from the publishing years (2013–2023) that were relevant to school settings, had an emphasis on oral health promotion, used augmented reality, and were available in full-text were included. Based on the inclusion and exclusion criteria, the titles and abstracts of retrieved research were reviewed to find possibly pertinent papers. The information on the study's design, sample size, demographics, augmented reality technology employed, intervention specifics, outcome metrics, and major findings was extracted from the data.

III. RESULTS AND DISCUSSION

1. Augmented Reality and School Health Promotion: Promoting student health with augmented reality has great promise for the future of health education. It offers fresh

approaches to interacting with users, interactive experiences, and personalised health information.

Here are some key aspects of how augmented reality might aid in health promotion

- **Health Education and Awareness:** Augmented reality can be used to create immersive learning experiences that help people grasp health-related topics. Applications for augmented reality, for instance, can show visuals of the human body, medical procedures, or the results of specific health practises. This engaging approach enhances learning and increases knowledge of health-related concerns.
- **Behaviour Modification:** By offering real-time feedback and guidance, augmented reality can aid with behaviour modification. Applications for augmented reality (AR) can offer individualised health advice, monitor progress, and encourage people to develop better routines. For instance, AR can be utilised to develop virtual trainers or to gamify physical activities, which will motivate users to work out frequently.
- **Patient Empowerment:** AR can provide patients more control over their health by providing them with tools and knowledge for doing so. It can support self-care, self-monitoring, and medication compliance. Applications for augmented reality (AR) can offer reminders for appointments or treatments, as well as real-time visualisation of health data.
- **Augmented reality can help healthcare workers make better decisions, which can lead to improved healthcare delivery:** By enabling surgeons to view and interact with patient-specific anatomical models, it can aid in surgical planning and navigation. By simulating medical situations and enabling virtual hands-on experiences, AR can also assist in the training of medical professionals.
- **Initiatives for health promotion:** AR can be utilised in public health initiatives to include the public and raise awareness of certain health conditions. It is possible to create interactive augmented reality experiences that promote healthy habits including regular screenings, sufficient diet, and physical activity.

Generally speaking, augmented reality has the power to revolutionise health promotion by delivering individualised, immersive, and interactive experiences. It has the ability to encourage lifestyle change, improve healthcare delivery, and enable people to play an active role in their health and well-being.

- **Augmented reality and Oral health promotion:** Between 2013 and 2023, augmented reality (AR) has become a viable tool for boosting oral health promotion initiatives. Despite not having access to precise data during that time, I can offer my opinions on the possible uses and effects of AR in promoting dental health.
- Interactive oral health education has the ability to provide students with immersive and interactive learning opportunities. It gives users a fun and engaging approach to perceive and learn about oral health-related topics. Applications for augmented reality

(AR) can simulate dental procedures, educate proper brushing and flossing techniques, and show the effects of different oral health practises.

- Behavioural changes connected to oral health are possible thanks to AR's promotion of good oral hygiene practises. It can encourage users to keep regular oral hygiene habits and send reminders for dentist appointments in addition to providing real-time feedback and advice on brushing practises. Individuals can be effectively engaged and motivated by AR, which helps them adopt and maintain healthy dental hygiene practises.
- **Oral Health exams:** AR technology can assist with oral health exams by overlaying virtual images and data on actual dental examinations. It can aid in the diagnosis of oral health issues, the planning of treatments, and the enhancement of patient-provider communication.
- Augmented reality (AR) can make virtual consultations between patients and oral health specialists possible, especially in areas where access to dental treatment is limited. By employing AR-enabled devices, patients can get professional assistance and guidance while improving their access to oral health knowledge and advice.
- **Oral health promotion in educational settings:** By incorporating AR into these initiatives, students will have a more engaging and dynamic learning experience. In order to teach youngsters about oral hygiene procedures and promote positive attitudes towards oral health, it can give educational content, interactive games, and virtual experiences.

IV. CONCLUSION

Conclusion: Between 2013 and 2023, the incorporation of augmented reality (AR) in school oral health promotion has demonstrated significant promise in boosting the efficiency and engagement of instructional activities. The delivery of oral health education has been altered by the use of augmented reality technology, which gives students engaging, immersive experiences. Students have been able to more interactively and engagingly visualise dental operations, acquire effective brushing techniques, and comprehend the effects of poor oral hygiene thanks to AR apps. This practical method has enhanced retention of oral health knowledge and improved learning outcomes.

Additionally, AR has shown to be an effective technique for encouraging pupils to improve their behaviour. AR applications have influenced kids to adopt and uphold good dental hygiene practises by using gamification aspects like prizes and challenges. Students now find oral health education to be more engaging and powerful thanks to AR's interactive features, which also encourage students to take ownership of their own dental health.

Students' dental health practises have improved significantly because to the immediate feedback and direction offered by AR. A more specialised approach to oral health education has been made possible by immediate information and personalised advice. The use of AR has improved communication and collaboration as well. Through virtual

interactions with peers, professors, and experts in oral health, students have been encouraged to engage in dialogue, information sharing, and cooperative learning.

However, it's crucial to recognise the difficulties and limitations of implementing AR in school oral health promotion. These include the accessibility and availability of AR hardware and software, the requirement for adequate teacher preparation and support, and the sustainable integration of AR into the curriculum. The narrative analysis of augmented reality and school oral health promotion from 2013 to 2023 emphasises the technology's potential to improve oral health education overall.

AR has proven to be effective in motivating behaviour change, fostering teamwork, and engaging students. Utilising the advantages of augmented reality (AR) technology, oral health promotion in schools can be improved by making it a more participatory, successful, and fun experience for children.

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