Amir's Eyes Adventure Learning Amblyopia AR Storybook

Nur Azreene Suraya Binti Ahmad Azahar
Universiti Kuala Lumpur
Malaysian Institute
Of Information Technology (MIIT),
Kuala Lumpur, Malaysia.
azreene.azahar01@s.unikl.edu.my

Azir Rezha Bin Norizan
Universiti Kuala Lumpur
Malaysian Institute
Of Information Technology (MIIT),
Kuala Lumpur, Malaysia.
azir@unikl.edu.my

*Correspondent author: azir@unikl.edu.my

Abstract: "Amblyopia, or 'lazy eye,' is a common vision problem in children. If not treated early, it can lead to permanent vision issues. However, the current educational methods such as printed books and standard medical explanations may not effectively capture children's attention or encourage interactive learning. There is a need for an engaging, interactive, and immersive learning tool that makes understanding amblyopia fun and accessible for children. Therefore, the main objective of this research is to develop an augmented reality (AR) storybook that educates children about amblyopia, causes, symptoms, and treatments through an engaging and interactive experience. This research uses the ADDIE model for designing and developing the AR storybook. The prototype was tested with 30 children, selected using purposive sampling. Data will be collected through user experience testing and feedback surveys. Based on this research, it is expected that this project will have a better understanding of amblyopia in a more engaging and interactive way, which could improve early diagnosis and treatment adherence. Based on the results, it will be proven that AR technology can enhance children's learning experiences about amblyopia and make health education more accessible and effective.

Keywords: Amir's Eyes Adventure, Augmented Reality (AR), Amblyopia, AR Storybook, Children's Health Education

I. INTRODUCTION

Amblyopia, commonly referred to as "lazy eye," is one of the most prevalent visual disorders in children, characterized by the brain favoring one eye over the other, resulting in reduced vision in the affected eye. Early detection and intervention are critical in managing this condition effectively, as untreated amblyopia can lead to permanent visual impairment (Sen et al., 2021). Despite its clinical importance, educational resources aimed at explaining amblyopia to young audiences remain limited, particularly those incorporating interactive and engaging elements suitable for children. With the increasing integration of digital technologies in educational settings, Augmented Reality (AR) offers a promising solution for creating immersive and interactive learning experiences in health education.

This project, *Amir's Eyes Adventure: Learning Amblyopia AR Storybook*, was developed to address this need by providing an interactive AR storybook designed to educate children about amblyopia through storytelling, animations, and AR features. The storybook translates complex medical information into a child-friendly, interactive format, enhancing engagement and comprehension. This report detail the project's development process, user testing, and evaluation, demonstrating the potential of AR-based educational tools in improving children's understanding of health-related topics, specifically amblyopia.

A. Objective

This project aims to investigate the underlying factors contributing to amblyopia in children and to examine its effects on their visual capabilities and daily functioning. Amblyopia, often called "lazy eye," is a condition caused the brain and eyes to develop together. If it's not caught and treated early, it can really affect how well a child can see (*Amblyopia: Types, Diagnosis, Treatment, and New Perspectives*, 2019b). The project goes beyond about clinical research; it's also about creating a fun, interactive AR storybook made especially for kids. This tool is intended to enhance awareness of amblyopia by presenting information about its symptoms, causes, and treatment options in an engaging, age-appropriate format. The idea is to use AR technology to teach kids so that's both fun and educational, keeping them interested and curious over time. The study also wants to see how well AR works to teach kids about health. Through interactive storytelling and immersive visuals, the project endeavors to create an accessible and enjoyable learning experience, promoting better understanding and early detection of amblyopia among kids and their parents.

B. Problem Staement

Many kids and their parents don't really know much about amblyopia, a vision problem caused by brain development issues. It's important to catch it early and treat it, or else the kid could end up with long-term vision problems. Conventional health education tools, such as brochures or printed materials, often lack the capacity to effectively engage pediatric audiences, resulting in reduced comprehension and retention of critical health information. Augmented Reality (AR) is a great way to make learning more engaging by adding interactive and immersive experiences. Despite its proven potential in enhancing learning across various domains, the application of AR technology in pediatric health education specifically for eye health conditions like amblyopia remains largely underexplored. This project seeks to address this educational gap by designing and developing an AR-based storybook application. The goal is to help kids learn and stay interested by using fun stories, visuals, and videos that match how they think and learn. Using AR technology, the project hopes to make it easier for young kids to understand amblyopia so that's fun and simple to get.

C. Research Questions

This study is centered on key research questions aimed at evaluating children's awareness of amblyopia and exploring the potential of Augmented Reality (AR) as an effective educational tool in this context. The first objective is to investigate how AR technology can be strategically designed to enhance awareness of amblyopia symptoms, causes, and treatment options in a format that is both interactive and age appropriate. This includes identifying the most effective multimedia elements, interactive functionalities, and storytelling techniques that can improve knowledge retention and engagement among children.

Secondly, the study seeks to assess the extent to which the AR-enhanced storybook delivers an immersive and meaningful learning experience. It aims to evaluate how well the AR tool addresses the shortcomings of traditional health education methods, which often lack interactivity and fail to capture the attention of younger audiences (Sen et al., 2021).

The insights gained from these research questions are intended to inform the development of more effective, engaging, and accessible health education resources for children. The project is all about showing how AR can change the way we talk to kids about their health and help them learn about conditions like lazy eye early on.

II. LITERATURE REVIEW

A. Augmented Reality

Amblyopia, often called "lazy eye," is a common eye problem in kids. It's important to catch it early and keep up with treatments so it doesn't lead to permanent vision problems. However, traditional treatment methods such as eye patching and corrective lenses often face challenges with long-term compliance due to discomfort, limited engagement, and social stigma. Augmented Reality (AR) has become more popular in medicine lately because it offers fun, interactive ways to learn, especially when it comes to kids' healthcare. Studies have shown that AR-based applications can enhance children's understanding of health conditions and improve their participation in treatment through interactive storytelling and gamification techniques. Even though AR has some clear benefits, it's still not widely used for raising awareness or treating amblyopia. In fact, there aren't many storybooks using AR that are designed specifically for kids with this condition. This project addresses that gap by developing an interactive AR storybook designed to educate children about amblyopia, increase awareness of its symptoms and treatment options, and support adherence to therapy through a more enjoyable and engaging user experience (Urlings et al., 2022).

B. Case Studies

1) Your Eyes – Eyecare Adventures with Op Tish and Ann

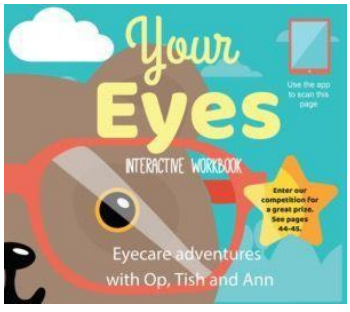

Figure 1 Your Eyes – Eyecare Adventures with Op Tish and Ann

Figure 1 presents the cover of the AR-enhanced storybook titled *Your Eyes – Eyecare Adventures with Op Tish and Ann*, released in 2021 and authored by ophthalmologist Dr. Jean Kelly. Aimed at kids aged seven to nine, this storybook tries to teach young readers important eye health tips in a fun and easy-to-understand way. To enhance the learning experience, the storybook incorporates Augmented Reality (AR) features accessible via a companion mobile application available on both the Google Play Store and Apple App Store. These AR things make the story feel more real by adding interactive animations and extra learning content, making the reading experience more engaging and memorable. By combining traditional storytelling with modern AR technology, the storybook demonstrates an innovative approach to pediatric health education, encouraging early awareness and proactive vision care in a format that is both interactive and child friendly.

2) Red Cell White Cell

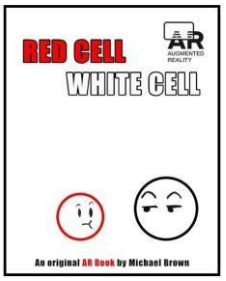

Figure 2 Red Cell White Cell

Figure 2 illustrates the cover of the AR-enhanced storybook *Red Cell White Cell*, published in June 2016. This educational resource is designed to introduce children to the human immune system through a combination of narrative storytelling and Augmented Reality (AR) technology. The story features anthropomorphized characters such as red and white blood cells, guiding readers on an informative journey through the human body. By scanning specific pages with a compatible mobile application, readers can access interactive animations and supplementary information that help simplify complex biological concepts. The integration of AR elements enhances engagement and supports visual learning, making the material more accessible and enjoyable for young audiences. *Red Cell White Cell* demonstrates an innovative approach to science education by using digital interactivity and storytelling to promote a deeper understanding of the body's immune functions.

3) Red Cell White Cell

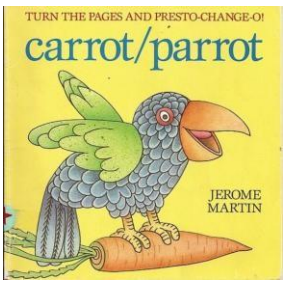

Figure 3 Parrot Carrot

Figure 3 displays the cover of the AR storybook Parrot Carrot, an innovative publication that combines traditional storytelling with Augmented Reality (AR) to create an interactive reading experience for young children. A fun and educational storybook with cute rhymes and bright pictures that help grab the attention of young kids just learning to

read. The integration of AR technology allows users to interact with the story through a dedicated mobile application available on both the Google Play Store and Apple App Store. Picking certain pages lets readers bring animated characters and scenes to life, making the experience more fun and adding an energetic touch to the rhyming words. This interactive format supports the development of early literacy skills by making reading more enjoyable and stimulating. Parrot Carrot shows how AR can turn regular reading into a fun, immersive experience that engages kids' senses.

III. METHODOLOGY

This project followed the ADDIE instructional design model, which includes five systematic phases: Analysis, Design, Development, Implementation, and Evaluation. In the Analysis phase, research was conducted to gather detailed information on amblyopia, its impact on children, and the specific needs and preferences of the target user group. The Design phase focused on planning the content, visual style, and interactive features of the AR storybook, including storyline development, illustration concepts, and user interface layout. During the Development phase, the augmented reality elements, animations, audio components, and other multimedia assets were created using appropriate software tools to bring the storybook to life. In the Implementation phase, a functional prototype of the AR storybook was tested with a sample of users to assess usability, engagement, and accessibility. Finally, the Evaluation phase involved collecting feedback through structured questionnaires and user observations to measure the application's effectiveness in enhancing amblyopia awareness and improving the educational experience for children.

A. Analysis

In the Analysis phase, the learning needs and instructional objectives related to amblyopia were identified. This process involved gaining a clear understanding of the target audience—primarily kids aged 9 to 13 and their cognitive and engagement levels. The goal was to help people understand what amblyopia is, recognize its signs, know what causes it, and learn about the available options to treat it. I also figured out the best way to teach this content using Augmented Reality (AR), making sure it fits the age and needs of the people who will be using it.

B. Design

Based on what we learned during the Analysis phase, the design stage focused on creating the basic idea for the AR storybook prototype. Developed teaching methods suited to the age group's thinking skills, created an easy-to-use interface so users can move around without trouble, and organized interactive AR features to help reinforce what they're learning. These elements were carefully planned to effectively convey information about the symptoms, causes, and treatment of amblyopia in an engaging and developmentally appropriate manner.

.

C. Develo

In the Development phase, the approved instructional designs and interface plans were translated into a functional AR storybook application. This stage involved the integration of interactive 3D augmented reality models, animations, audio narration, and user interface elements to create an immersive and engaging learning experience. Unity was the main tool used to build and run the AR features. This helped make sure everything worked smoothly across different devices and on phones and tablets. Emphasis was placed on developing intuitive user interactions and maintaining overall system stability to ensure the application was both accessible and reliable for the target audience.

D. Implementation

In the Implementation phase, the prototype of *Amir's Eyes Adventure: Learning Amblyopia AR Storybook* was introduced to a selected group of children and their parents, representing the target user audience. A mobile download link was provided, allowing participants to install the application on their personal devices and interact with the AR content in a real-world setting. This deployment enabled users to engage with the storybook as intended, offering valuable insights into the application's usability, level of engagement, and educational effectiveness. The feedback collected during this phase played a critical role in informing the subsequent evaluation and refinement of the application.

E. Evaluation

In the Evaluation Phase, user feedback was collected through questionnaires and direct observations to assess the AR storybook's effectiveness in achieving its educational objectives. The results provided insights into user engagement, interface usability, and the application's ability to improve awareness and understanding of amblyopia. This feedback was essential for identifying areas for improvement and guiding future iterations to enhance the functionality, content, and overall user experience of the Amir's Eyes Adventure: Learning Amblyopia AR Storybook.

IV. PROTOTYPE DEVELOPMENT

During the evaluation phase of *Amir's Eyes Adventure: Learning Amblyopia* AR storybook, user feedback was systematically collected through structured questionnaires and direct observation sessions to assess its educational effectiveness. The evaluation focused on user engagement, interface usability, and the application's impact on increasing children's awareness and understanding of amblyopia. Findings revealed that the interactive elements effectively sustained user interest, the interface was user-friendly, and the storybook successfully conveyed key information in a clear and engaging way. However, feedback also indicated areas needing improvement, such as enhancing content depth, expanding interactive features, and addressing minor technical issues. These insights helped shape specific suggestions for improving how the storybook works, how the content is organized, and the overall user experience in future updates.

A. Sitemap

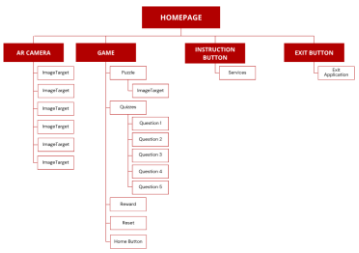

Figure 4 Sitemap

The sitemap for the Amir's Eyes Adventure: Learning Amblyopia AR storybook application functions as a structural guide that organizes the overall navigation flow, ensuring users can move smoothly between different sections of the application. It visually outlines the relationships and navigation paths connecting the splash screen, story introduction, interactive AR activities, amblyopia information sections, and user settings. This organized framework not only simplifies user navigation but also ensures that both the educational content and interactive

elements are easily accessible, supporting effective and engaging learning experience for the target audience.

B. Storyboard

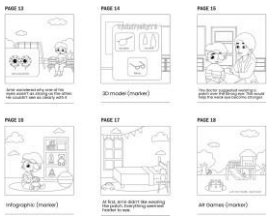

Figure 5 Storyboard

The storyboard is important because it shows how the visual parts and interactions are laid out in Amir's Eyes Adventure: Learning Amblyopia AR storybook app. It helps make moving between screens smooth and natural, keeping the navigation in line with what learners are focused on and the app's main learning goals. The storyboard shows how a user moves through the app, pointing out important parts like the 3D eye models, the vision simulation activities, and the interactive exercises that focus on amblyopia. It also explains where to put the educational content, prompts, and visual signals, giving a straightforward guide on how users should interact with the learning materials and interactive parts inside the AR environment.

C. Color Scheme

Figure 6 Colour palette

The selected color palette for the Amir's Eyes Adventure: Learning Amblyopia AR storybook application was carefully developed to prioritize visual comfort, particularly for children with amblyopia during extended use. The colors were chosen to provide an optimal balance of contrast and soft, engaging tones, enhancing visual clarity without causing strain. This intentional design approach improves readability, supports sustained attention, and contributes to a visually appealing interface, thereby enhancing both the educational effectiveness and overall user experience of the application.

D. Typhography

Figure 7 Fonts

The selection of typography is a critical design consideration for both the Amir's Eyes Adventure: Learning Amblyopia AR storybook application and its augmented reality features, as it directly influences readability, user engagement, and overall usability. I picked the right fonts to make sure kids can read the text easily, even those with visual challenges like amblyopia. The selected fonts maintain consistent readability across various screen sizes and AR overlays, contributing to a user-friendly interface and enhancing the application's educational effectiveness and interactive experience.

E. 3D Object Development

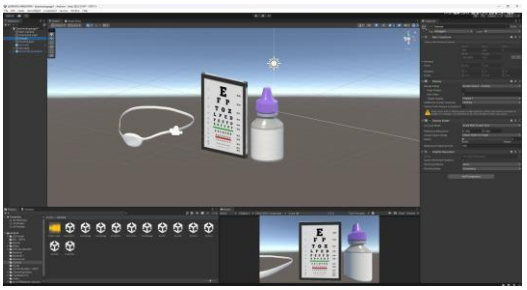

Figure 8 3D Object Design in Unity

Figure 9 Storybook Design in Adobe Illustrator

In the development of the Amir's Eyes Adventure: Learning Amblyopia AR storybook application, essential 3D objects such as an eye patch, Snellen eye chart, and eye drop bottle were modeled using Blender and exported in FBX format. These assets were subsequently imported into Unity, where materials, textures, and interactive AR functionalities were applied. Each 3D object was linked to corresponding image markers embedded within the printed storybook, enabling 3D animations and synchronized sound effects to be triggered upon marker recognition. Adobe Illustrator was used to create the 2D layout for the storybook and the different parts of the app's interface. It helped make everything look consistent, colourful, and fun, so young kids would enjoy and easily engage with the learning experience.

F. Augmented Reality Integration

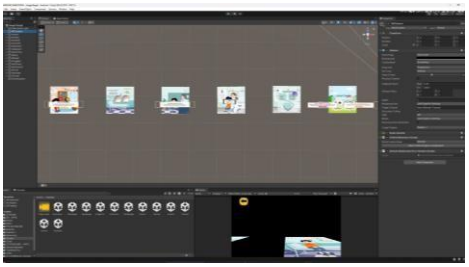

Figure 10 AR in Unity

The AR integration for the Amir's Eyes Adventure: Learning Amblyopia AR storybook application was developed using the Vuforia Engine within the Unity platform. Specific image areas within the printed storybook pages were designated as Image Targets, which, when viewed through an AR-enabled device, activated corresponding interactive digital content. Key 3D models, including an eye patch, Snellen eye chart, and eye drop bottle, were imported into Unity as FBX files and assigned to these Image Targets. This C# code, written in Visual Studio Code, controls how objects behave. It handles things like

animations, moving around, and playing sounds when something is detected. This integration made the AR experience feel smooth and fun, while also helping to tell the story and teach important ideas in the book.

Table: Visual Studio Core

Development Area	Software is used
3D Objects	Blender
Authoring	Unity 2022.3.51f1
Programming	Visual Studio Core

G. Visual and Functionality

Figure 4.8 AR Camera Display

The visual and functional design of the Amir's Eyes Adventure: Learning Amblyopia AR storybook application incorporates AR camera capabilities to deliver real-time interactive educational content. When users scan designated pages of the printed storybook using a mobile device or tablet, the application activates animations, 3D character models, and synchronized audio narration. Key interactive features include animated sequences depicting Amir applying an eye patch and interactive quizzes designed to test vision clarity. These augmented reality experiences were developed within Unity using the Vuforia Engine, with 3D models and animations precisely linked to specific image markers embedded in the storybook. This setup makes reading more engaging by blending pictures and stories with interactive, educational stuff right on the pages of the book.

V. RESULT AND FINDINGS

The testing phase for the Amir's Eyes Adventure: Learning Amblyopia AR storybook application was conducted with a group of children aged 9 to 13, accompanied by their parents, to evaluate the application's usability, interactivity, and educational effectiveness. The results indicated that most participants found the AR features engaging, intuitive, and easy to navigate. The interactive 3D models, animations, and augmented content were particularly effective in illustrating the symptoms, causes, and treatment methods associated with amblyopia. Feedback from kids and parents showed that the prototype could be a really useful tool for teaching young people about amblyopia. It seems to have good potential for helping kids understand the condition better.

The highest percentage of respondents, 46.7%, strongly agreed that the Amir's Eyes Adventure: Learning Amblyopia AR storybook effectively explains the concept of amblyopia in a manner that is easy for children to understand, engaging, and appropriate for their age group. This positive response shows that the educational content and interactive presentation are effectively helping people understand and stay interested.

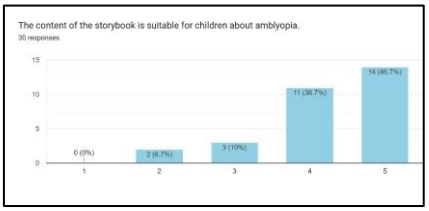

Figure 5.1 Data of User's understanding

A total of 46.7% of respondents reported that the Amir's Eyes Adventure: Learning Amblyopia AR storybook effectively enhanced their understanding of the experiences faced by children with amblyopia. About 6.7% of people said the app didn't really help them understand things much better. These findings suggest that while most participants benefited from the application's educational content, there remains a small portion of users for whom further content refinement or additional support features may be necessary.

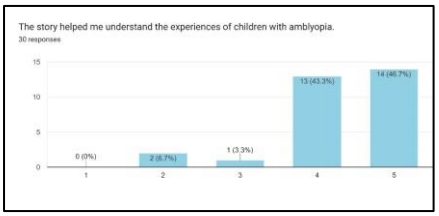

Figure 5.2 Data for recommend for others

The test results showed that Amir's Eyes Adventure: Learning Amblyopia AR storybook helped kids understand amblyopia better. It did this by using simple visuals, fun interactive AR features, and lively animations that kept children interested. User feedback was overwhelmingly positive, confirming the application's effectiveness as an educational, entertaining, and user-friendly tool for promoting eye health awareness among young learners.

VI. CONCLUSION

The Amir's Eyes Adventure: Learning Amblyopia AR storybook demonstrates the effective integration of multimedia elements, including augmented reality, animations, and interactive visuals, to deliver health education in a format that is accessible, engaging, and supportive for children.

The project successfully achieved its objectives by increasing awareness of amblyopia through a simple, child-friendly narrative and an intuitive interface, enabling young users to comprehend complex medical concepts with ease. User testing showed that the prototype kept users interested and helped them remember the information better. These results show that augmented reality could be a useful way to teach kids about health.

Overall, the project contributes to the advancement of AR applications in healthcare communication and offers a scalable framework for future educational technologies in both clinical and academic settings.

REFERENCES

[1] Sen, S., Singh, P., & Saxena, R. (2021). Management of amblyopia in pediatric patients: Current insights. Eye, 36(1), 44–56.

[2] Amblyopia: Types, diagnosis, treatment, and new perspectives. (2019, June 25). American Academy of Ophthalmology.

[3] Tan, F., Yang, X., Fan, Y., & Liao, Y. (2022). The study of Short-Term Plastic Visual Perceptual Training based on virtual and Augmented Reality Technology in Amblyopia. *Journal of Ophthalmology*, *2022*, 1–7.

[4] Urlings, J., Sezer, S., Ter Laan, M., Bartels, R., Maal, T., Boogaarts, J., & Henssen, D. (2022c). The role and effectiveness of augmented reality in patient education: A systematic review of the literature. Patient Education and Counseling, 105(7), 1917–1927.

[5] Yigitbaba. (2023, March 22). The history of Augmented Reality (AR).

[6] IJRPR International Journal of Research Publication and Reviews. (n.d.). *International Journal of Research Publication and Reviews*. International Journal Publication Fees Under 500 Rs, Fast Publication, High Impact Factor Journal, Publication Charge 14 US Dollars.

[7] Sen S, Singh P, Saxena R. Management of amblyopia in pediatric patients: Current insights. Eye (Lond). 2022 Jan;36(1):44-56. doi: 10.1038/s41433-021-01669-w. Epub 2021 Jul 7. PMID: 34234293; PMCID: PMC8727565.

[8] Admin. (2024, June 19). How augmented reality can transform healthcare in the COVID-19 era. ITRex.

[9] Mahmud, M., Sari, D. C. R., Sari, D., Arfian, N., & Zucha, M. A. (2024). The application of augmented reality for improving clinical skills: a scoping review. Korean Journal of Medical Education, 36(1), 65–79. https://doi.org/10.3946/kjme.2024.285

[10] Saidin, Nor & Abd halim, Noor & Yahaya, Noraffandy. (2024). A Review of Research on Augmented Reality in Education: Advantages and Applications. International Education Studies. 8. 1-1. 10.5539/ies.v8n13p1.

[11] Kamphuis C, Barsom E, Schijven M, Christoph N. Augmented reality in medical education? Perspect Med Educ. 2014 Sep;3(4):300–11. doi: 10.1007/s40037-013-0107-7.

[12] Zulfiqar, Fatima & Raza, Rehan & Khan, Muhammad & Arif, Muhammad & Alvi, Atif & Alam, Tanvir. (2023). Augmented Reality and Its Applications in Education: A Systematic Survey. IEEE Access. PP. 1-1. 10.1109/ACCESS.2023.3331218.

[13] Eckert M, Volmerg JS, Friedrich CM. Augmented Reality in Medicine: Systematic and Bibliographic Review. JMIR Mhealth Uhealth. 2019 Apr 26;7(4):e10967. doi: 10.2196/10967. PMID: 31025950; PMCID: PMC6658230.

[14] Sakr, A., & Abdullah, T. (2024). Virtual, augmented reality and learning analytics impact on learners, and educators: A systematic review. Education and Information Technologies.

[15] Field, S. (2025, January 9). *Augmented Reality in Entertainment & Media*. Rock Paper Reality.

[16] Mendoza-Ramírez, C. E., Tudon-Martinez, J. C., Félix-Herrán, L. C., De J Lozoya-Santos, J., & Vargas-Martínez, A. (2023). Augmented Reality: survey. Applied Sciences, 13(18), 10491.

[17] PlugXR. (2024, April 23). Marker-based AR, its Widespread Applications and Benefits. PlugXR.

[18] Admin. (2022, November 2). What is Markerless AR and Examples. Kiber.

[19] Ntagiantas, A., Konstantakis, M., Aliprantis, J., Manousos, D., Koumakis, L., & Caridakis, G. (2022). An Augmented Reality Children's Book Edutainment through Participatory Content Creation and Promotion Based on the Pastoral Life of Psiloritis. Applied Sciences, 12(3), 1339.

[20] Singh, M., Bangay, S., Grossek, H., & Sajjanhar, A. (2023). Forest Classroom: A Case Study of Educational Augmented Reality Design to Facilitate Classroom Engagement. Multimodal Technologies and Interaction, 7(5), 46.

[21] Wang, J., Li, W., Dun, A., Zhong, N., & Ye, Z. (2024). 3D visualization technology for Learning human anatomy among medical students and residents: a meta- and regression analysis. BMC Medical Education, 24(1).

[22] PricewaterhouseCoopers. (n.d.). *What does virtual reality and the metaverse mean for training?* PwC.

[23] Alsaqr, A. M., & Masmali, A. M. (2019). The awareness of amblyopia among parents in Saudi Arabia. *Therapeutic Advances in Ophthalmology*, *11*.

[24] AlJarallah OJ, AlFehaid MS, Alnadawi AA, Ghulaysi S, Almouzan AK, Aljurayyan TK, Alnemari AM, Aldawsari K, Almalki H. Knowledge and Awareness Regarding Amblyopia Among Parents in Riyadh, Saudi Arabia: A Cross-Sectional Study. Cureus. 2024 Jan 31;16(1):e53308. doi: 10.7759/cureus.53308. PMID: 38435939; PMCID: PMC10906696.

[25] Aljarallah, Othman & AlFehaid, Mohammed & Alnadawi, Aseel & Ghulaysi, Saleh & Almouzan, Alwaleed & Aljurayyan, Talal & Alnemari, Abdulaziz & Aldawsari, Khaled & Almalki, Hussam. (2024). Knowledge and Awareness Regarding Amblyopia Among Parents in Riyadh, Saudi Arabia A Cross- Sectional Study. Cureus. 16. 10.7759/cureus.53308.

[26] Dhar, Poshmaal & Rocks, Tetyana & Samarasinghe, Rasika & Stephenson, Garth & Smith, Craig. (2021). Augmented reality in medical education: students' experiences and learning outcomes. Medical Education Online. 26. 1953953. 10.1080/10872981.2021.1953953.

[27] Tan, F., Yang, X., Fan, Y., & Liao, Y. (2022). The study of Short-Term Plastic Visual Perceptual Training based on virtual and Augmented Reality Technology in Amblyopia. *Journal of Ophthalmology*, *2022*, 1–7.