Hero in Augmented Reality (HEAR): Interactive Learning Media to Increase Learning Interest in Knowing about Indonesian Heroes for Kindergarten Student

[1]Septyara Khotimaharani
Fakultas Ilmu Pendidikan, Universitas Pendidikan Indonesia, Bandung, Indonesia
septyarak@upi.edu

[2]Nissa Nur Azizah
Fakultas Pendidikan Matematika dan Ilmu Pengetahuan,
Universitas Pendidikan Indonesia, Bandung, Indonesia
nissanrazizah@upi.edu

[3]Salma Rahmadianti,
Fakultas Pendidikan Matematika dan Ilmu Pengetahuan,
Universitas Pendidikan Indonesia, Bandung, Indonesia
salmadianty@upi.edu

[4]Angga Kahaerul,
Fakultas Pendidikan Ilmu Pengetahuan Sosial,
Universitas Pendidikan Indonesia, Bandung, Indonesia anggakahaerul@upi.edu

[5]Hilda Yanuar Abadi,
Fakultas Pendidikan Matematika dan Ilmu Pengetahuan,
Universitas Pendidikan Indonesia, Bandung, Indonesia
hildaabadi090102@upi.edu

[6]Fajar Nugraha Asyahidda,
Universitas Pendidikan Indonesia
nugrahafajar@upi.edu,

***Abstract*— Historical subjects are mandatory for kindergarten students. One of the best examples is to recognize every national hero of Indonesia to nurture high devotion to patriotism. But there are some problems such as the laziness to read some textbooks and the difficulties to memorize some long materials that sometimes come up to the student. With the use of the development of technology, this study aims to introduce several heroes in Indonesia through learning media which is a learning application based on augmented reality. This application can help kindergarten school learners to increase their insight or knowledge, especially on historical subjects. This research is using R&D (Research and Development). The main focus of this study is to design a digital learning application about national heroes in Indonesia. There are some features offered on this app including 3D (three dimensions) animations, audio features (audio information), and text is written materials based on augmented reality. 25 kindergarten school students responded and answered the questionnaire. The use of HEAR as a learning media can be increasing kindergarten students' reading intention and knowledge, especially on how they recognize the Indonesian hero figure. This innovation is designed to help the student to recognize the national heroes of Indonesia which are integrated with technology so that they can use it anytime and anywhere**

Keywords: augmented reality, kindergarten school, hero character, history

I. INTRODUCTION

Historical learning is a study which explain about human in the past period with all of the aspect in human activities such as, politic, law, military, social, religions, and creativity (related art, music, islam architecture), science and intelectual [1]. For kindergarten school students in Indonesia, history subjects contain the struggles of the Dutch era, independence, and the struggle for independence. Historical lessons about the history of Indonesian heroes are important to learn because historical stories can serve as examples and role models as well as a reflection of how to face the future. Not only that, history subjects about the national hero of indonesia can be set as a goals on every student to build local value which can be use to train intelligence, shape attitudes, character and personality of students and to instill a sense of pride and love for the homeland [2].

Learning history according to [3] Zian & Pertiwi (2021) states that the material is difficult to understand especially for the student, because of the large amount of material that must be memorized, students often feel bored and sleepy during the lesson because the teacher often uses the conventional lecture method. History learning is often done by reading thick and big books which causes students to become lazy. There is another problem, according to UNESCO data, the interest in reading of the Indonesian people is very poor, only 0.001%, meaning that out of 1,000 Indonesians, only 1 person is diligent in reading. In addition, the digital marketing research institute Emarketer estimates that in 2018 the number of active smartphone users in Indonesia is more than 100 million people. Although interest in reading books is low, wearesocial data as of January 2017 reveals that Indonesians can spend time at gadget screens for approximately 9 hours a day. This means that the Indonesian population is active in surfing the Internet, but this is not balanced by the high interest in literacy [4].

In the problem of current conditions, it is necessary to innovate or develop interesting teaching media so that students are able to understand the material quickly, are willing to read, and are not boring. There are several previous studies that developed historical learning media, namely, 1) Research on the development of media for history learning was conducted by [5] about the influence of the sorogan method in learning history which found an increase from the application of the sorogan method to historical understanding and awareness. This is because the sorogan method is student-centered, and the teacher acts as a tutor/guidance. 2) Other research was also conducted by [6] Suryani and Ardianto (2020) on Digital Flipbook Empowerment as A Development Means for History Learning Media which succeeded in significantly increasing student scores. Another study was conducted by [7] Zubaidah & Musadad (2022) related to the use of digital catalogs as a medium for learning history where it was found that the use of catalog media in learning history can facilitate the teaching and learning process. 3) Research on the use of AR 3 as a learning media was conducted by [8] Utami & Luthfi (2019) which stated that the use of AR media in learning history, especially on Hindu heritage materials from the Singhasari era, was considered effective because it could increase the average score of students.

From the problems that have been described and previous research that developed various learning media, the researchers developed an alternative learning media that can be used through smartphones with augmented reality called HEAR. HEAR (Hero in Augmented Reality) provides an innovative media in the context of learning heroes through an application that can be an interactive medium for students at the kindergarten school level. This application allows students to understand the history and background of the heroes with interesting audio-visual concepts. In the implementation process, augmented reality in HEAR will be implemented in the smartphone, using the Simple AR System flow where real media markers are used as markers to display virtual objects in application. The 2D or 3D object will be the stimulus as the capturing module, to display the overlay after tracking the appropriate orientation from the results of the image capture (scan) in the tracking and virtual components stage. After that, the rendering process will combine real and virtual components with predetermined poses on the application display [9].

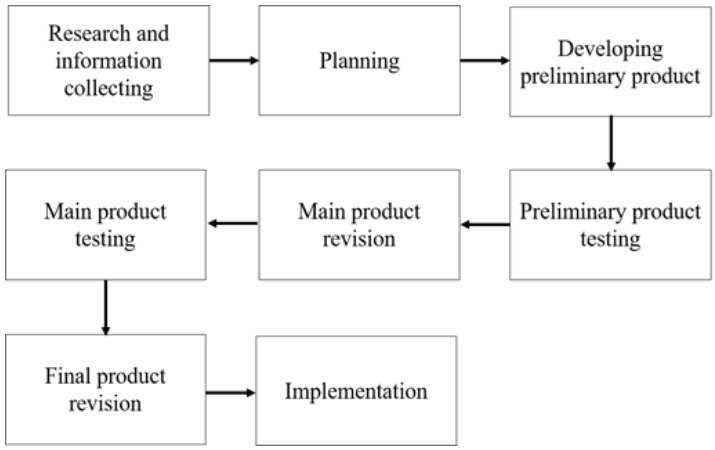
The purpose of making the HEAR (Hear in Augmented Reality) application is to help kindergarten school students who have difficulty in understanding historical material because there are many writings that need to be memorized or read, one of which is the introduction of heroes. So that it can increase reading interest, student understanding, and have a positive impact on smartphone use. In addition, with HEAR, technological developments in Indonesia which are growing rapidly can be balanced by the high interest in literacy, by not eliminating elements of technology and keeping up with the times. It is hoped that HEAR can increase students' interest in studying the history of heroes so that they can increase students' knowledge.

II. METHODS

This study was using a quantitative approach to analyze perceived pieces of information from the respondent. Data on this research have been collected by questionnaire. Questionnaire instruments were created by google form and the respondent answered two different types of questionnaires. The first form consisted of five questions related to respondents' affective on how they distinguish Indonesian national heroes. The second form provided five questions about respondent evaluation according to HEAR (Heroin Augmented Reality) that have been developed. On this exploration, the researcher focused more on one variable which is the kindergarten student intentions for identifying or knowing Indonesian national heroes. The questionnaire has been spread and distributed using online media, starting from 17 February 2022 until 19 February 2022 to the kindergarten school learner. 25 accumulated respondents have been collected for this study. In addition, this research also uses a combination of Research and Development (R&D) and Multimedia Development Life Cycle (MDLC) methods in developing augmented reality-based interactive learning media. The R&D method is used in producing and developing a product to the stage of testing the effectiveness of the resulting product. Meanwhile, the MDLC method is used so that the resulting product can fulfil the functional needs of students as users.

Moreover, the Research and Development (R&D) method in this study focuses on developing interactive learning media based on augmented reality. This method is used to generate and produce a product until it can be used for effective product test purposes. There are several processes to develop a product for this research. Firstly, researchers did preliminary studies such as collecting information and identifying the relevant nowadays learning media problems. Secondly, the development process for developing interactive learning media based on augmented reality has been proposed to fulfill the indicator on the student’s needs and make sure the product test would have been done. Furthermore, the evaluation process was conducted according to the product implementation until in the end, the impact on this media can be identified. A detailed process on product development based on R&D Method can be seen in Figure 1.

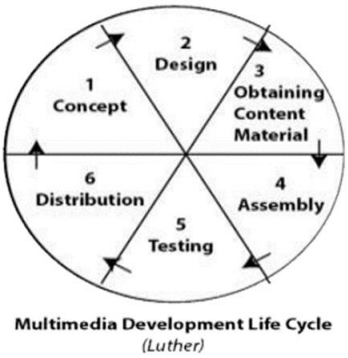
Figure 1. Research and Development Method.



Research and data collection step conducted with literature study and observation, so that the potential problem from the history learning on how students recognizing the heroes can be identified. The planning process creates several solutions which are related to the existing issue. The product development step initially started with the concept, design, and prototyping HEAR (Hero in Augmented Reality). The next step was testing the product to fit into the functional needs. After the test section, in the next part, there will be some evaluation on some products that have been created.

In this study, HEAR also uses the MDLC method which has six stages according to Luther (Figure 2) [10] (in Haq, 2020: 103), which are as follows.:

Figure 2. MDLC method illustration [11]



1) Making the concept by determining the main goals of making applications, users, material scripts, and the concept of facial motion in introducing heroes;

2) Design in the form of making storyboards and sketches, compiling audio, and navigation controls relevant to the HEAR application;

3) Collecting basic materials by combining various elements and objects needed in the HEAR application;

4) Making media (assembly) for the realization of the design results using Adobe Photoshop, Blender 3D, and Unity 3D supporting programs;

5) Testing through an evaluation of the input and output of the HEAR application from a functional perspective;

6) Distribution to target participants as a concrete test of the application.

III. RESULTS AND DISCUSSION

III.1 HEAR (Hero in Augmented Reality) as an interactive learning media innovation in getting to know Indonesian heroes

HEAR is an innovative learning media designed using augmented reality technology. History lessons are taken because they tend to be more difficult for children to learn, especially if the history learning media is only written in thick books without any pictures. This learning media is specifically aimed at kindergarten school children who have difficulty learning history in distance learning. The history raised in HEAR is focused on the history of Indonesian heroes, so that the material raised does not burden kindergarten school students and is relatively easy to learn.

In this study, we innovate an augmented reality-based interactive learning media that can create embossed images that will attract children's attention to learn. This HEAR learning media will later be in the form of an application that can be accessed using a smartphone. When the application is opened, the names of Indonesian heroes will appear. The animation in the application brings out the physical form of one of Indonesia's historic heroes so that not only reading, students are able to see the original form of the historic hero in 3 dimensions. Not only showing 3D AR animation, the HEAR application is also equipped with audio features. This feature displays information or narration in the form of voices from presenters that have been recorded properly with the sensors provided. The audio feature narrates biographies of Indonesian heroes such as their full names, date of birth, and the hero's role in Indonesian history. This feature is not only intended to attract children's interest, it is also suitable as a learning medium for children who still can't read but want to learn the history of heroes.

Figure 3 shows the respondent's situation and condition regarding the introduction of heroes in history learning. Figure 3a shows that the majority of respondents find it difficult to recognize Indonesian heroes due to their lack of ability to remember and uninteresting reading sources. The introduction of these heroes is very important so that we can respect, remember and imitate the heroes who have fought for the independence of Indonesia. (See Figure 3b). Figure 3c shows that the respondents know the names of several Indonesian heroes. However, they did not know much about the role of these heroes in Indonesian independence (Figure 3d). Figure 3e shows that respondents strongly agree that an interesting application is needed to get to know the heroes. They are also very interested if interactive learning applications can be used via smartphones.

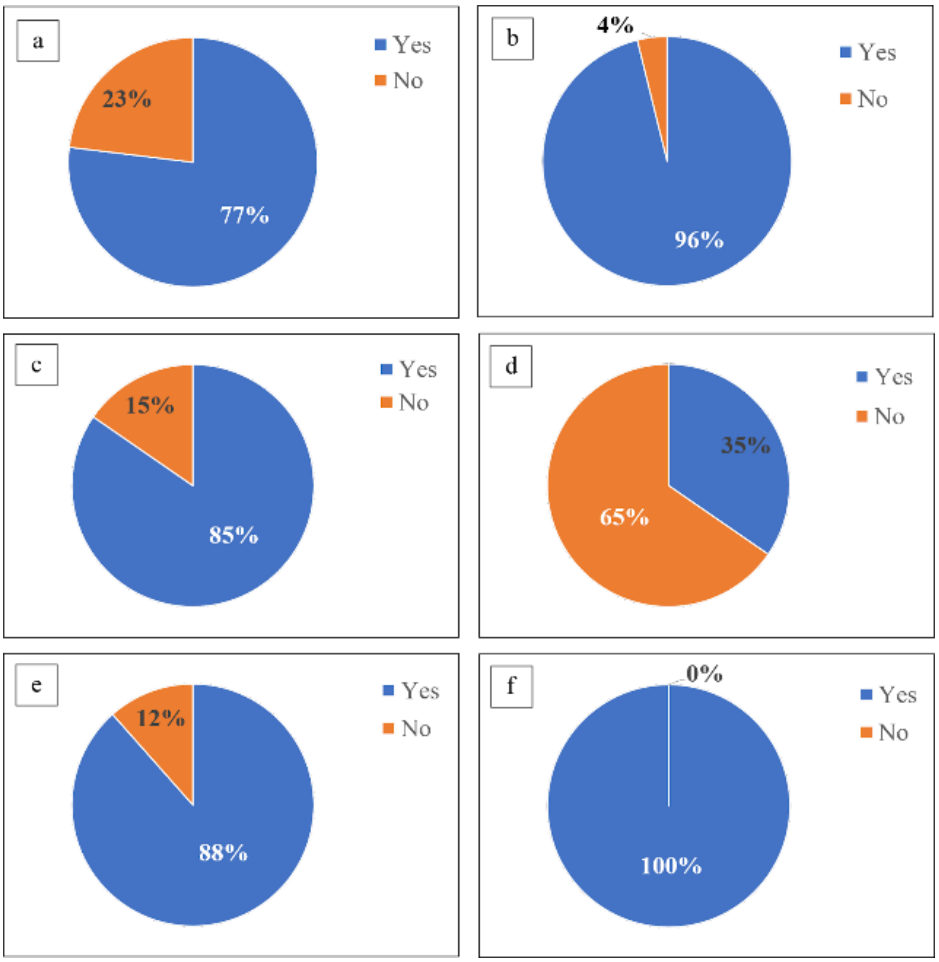


Figure 3. a) The difficulty of recognizing heroes, b) The importance of knowing the heroes, c) Respondents knowing the names of Indonesian heroes, d) Respondents knowing their biodata and the roles of Indonesian heroes, e) The need for interactive learning media about Indonesian heroes, f) The interest of respondents if there is an interactive learning media that introduces the heroes through smartphones.

III.2 HEAR (Hero in Augmented Reality) Application

HEAR is designed with digital Augmented Reality (AR) technology. The use of Augmented Reality (AR) technology in the HEAR application provides two-dimensional and three-dimensional virtual objects such as 3D heroes into a real 3-dimensional environment and then projects them in real time.

Overall this HEAR is designed using several supporting software and applications. Namely Blender, Adobe After Effects, and Unity3D+Vuforia SDK. Blender is an open source software that is used to create multimedia content, especially 3D. HEAR utilizes this software to create virtual models of hero characters. Adobe After Effects is a very professional software for motion graphic design needs. By utilizing this software, the visualization of two-dimensional and three-dimensional virtual objects is felt to be more real and more attractive. Unity3D+Vuforia SDK is software that makes applications with digital Augmented Reality (AR) technology into the HEAR application. Unity acts as a tool for creating Android applications that integrate with the Vuforia SDK. The Vuforia SDK itself plays a role in projecting 2D and 3D virtual models from Blender into a real environment [12].

HEAR is an application that displays heroes and their role in independence by combining augmented reality technology. When the application is opened, the names of Indonesian heroes will appear. Then the application is equipped with a motion graphic sensor on each illustration image. To activate the Augmented Reality (AR) feature, the smartphone must be directed according to the instructions that appear on the application. Hero characters that have been modified with Augmented Reality (AR) technology will appear and can be projected properly in the real environment.

There are ways to use the HEAR application as follows, which can be seen in Figure 4:

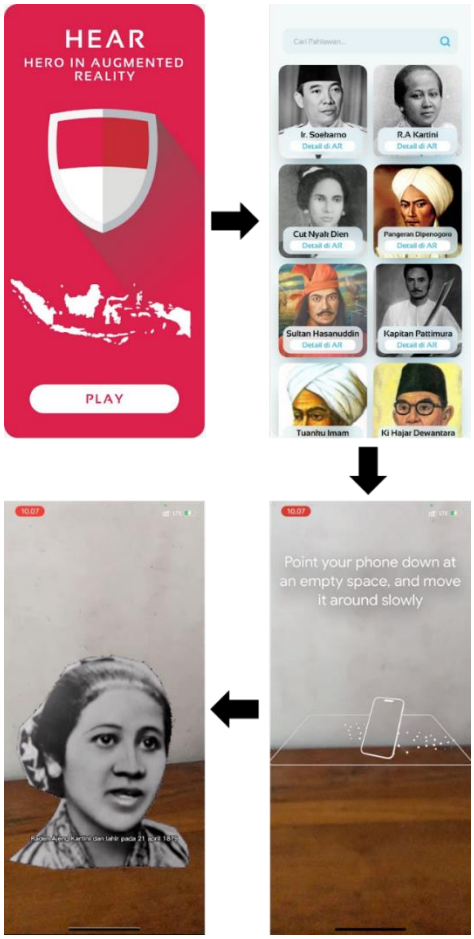
1) The HEAR application when opened will display the name, logo, Indonesian flag, and a map of the country of Indonesia. students can directly click the play button to start learning.

2) HEAR will feature national figures in Indonesia. Students can directly choose one of the characters they want to study, by clicking the design button in AR

3) Next, the smartphone will automatically open the camera feature, and instruct you to point your phone down at an empty space, and move it around slowly.

4) The last display of HEAR, students can see the face of the selected hero. an example showing R.A Kartini's 2D face by making a sound, which briefly describes R.A Kartini's life

Figure 4. HEAR (Hero in Augmented Reality) application



The digital features provided allow students to explore modern technology by viewing and listening to explanations delivered through screen and voice displays. In this application there is a simple selection menu with play navigation and easy-to-understand hero selection. The design is designed using shades of red and white with the aim of giving a nationalist impression. In addition, the explanation in the form of audio is compiled concisely and refers to the characteristics of each hero which is easy for students to understand.

III.3 The Potential of HEAR (Hero in Augmented Reality) in helping kindergarten school students learn about Indonesian heroes

The application of HEAR learning media is expected to have a good impact on kindergarten school students. Of course, in accordance with the initial purpose of making this idea so that kindergarten school students can increase interest in reading and learning and build motivation in students in getting to know Indonesian heroes. Not only to increase students' interest in reading and learning, the HEAR application can also be used as an interesting learning media for students. In its realization, learning media is used to clarify, facilitate, and make interesting the material that educators want to convey to students so that the material to be presented looks effective and efficient and can build learning motivation in students themselves [13]. Learning media in the form of the HEAR application is one of the unique and efficient learning models. This is caused by the shape displayed by the HEAR application which can inspire neurons in the human brain to work creatively and build a sense of pleasure in humans[14].

HEAR with this innovation is designed to make it easier for students to understand the narrative presented. By prioritizing elements of technology that can be easily used anytime and anywhere. The 3-dimensional animation feature is designed to add to the attractiveness of students so that students can understand the storyline of the character being told well. An audio feature was added to make it easier for children who still can't read but want to learn the history of heroes. The use of audio media in learning methods can generate long-term memory in students as well as be able to absorb information well without certain obstacles [15].

Respondents' assessment of HEAR after the HEAR application was displayed is shown in Figure 5. Respondents indicated that respondents were much more interested in getting to know the heroes. Figure 5a shows that getting to know the heroes using the application is considered much more interesting. Respondents also tend to want to get to know heroes using the HEAR application that has been made compared to using reading sources in general (Figure 5b). Respondents considered that the HEAR application was very helpful in getting to know Indonesian heroes (Figure 5c).

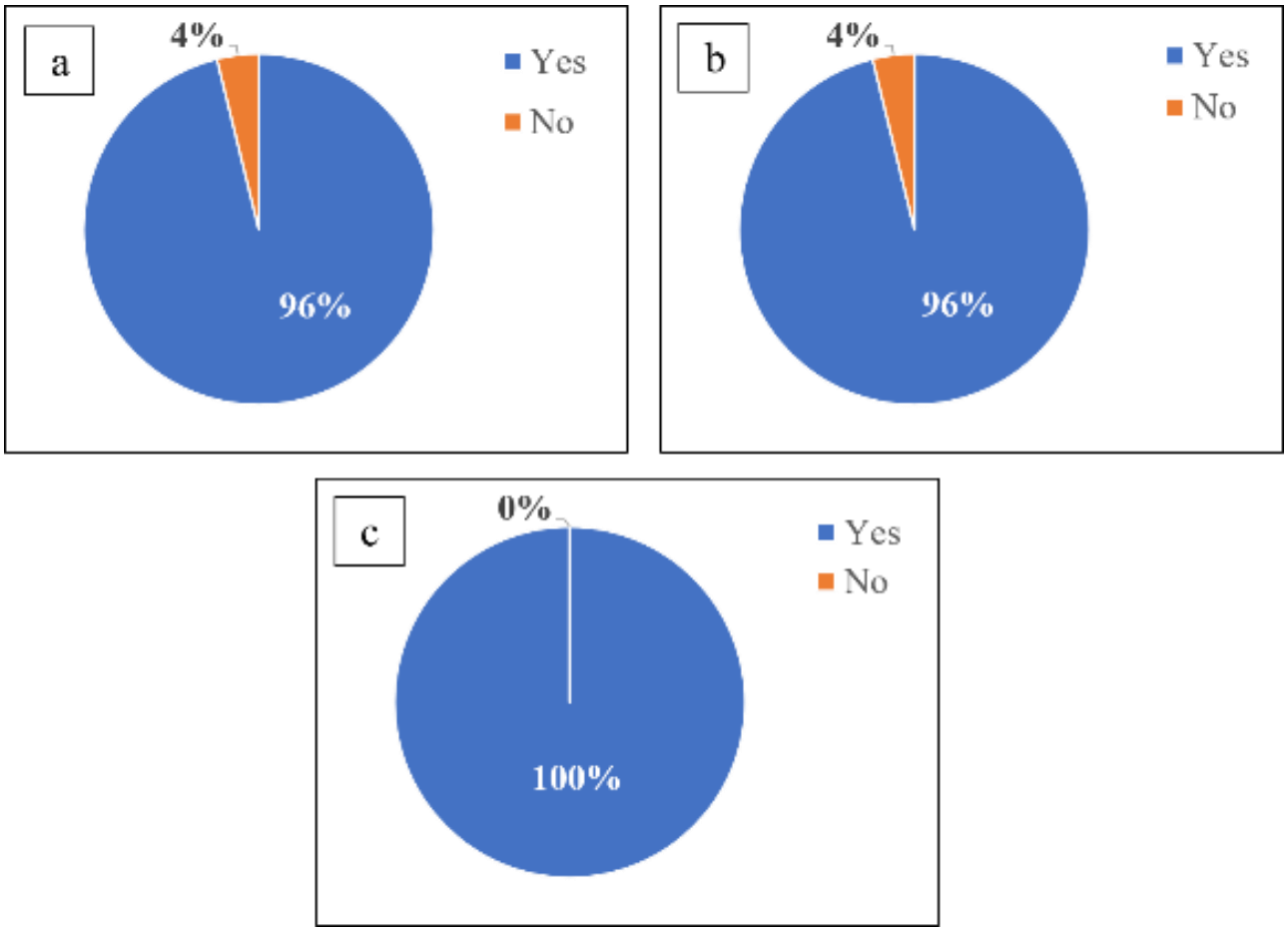


Figure 5. a) HEAR (Hero in Augmented Reality) in the form of an application looks interesting to use, b) Respondents' interest in learning about the heroes after seeing the HEAR application, c) This application can help respondents in getting to know Indonesian heroes.

Based on the respondent's assessment, the content or material about the characters becomes easier to understand (Figure 6a). The augmented reality-based hero image is clear enough to see (Figure 6b). Figure 6c shows that the audio or sound produced is easy to hear. This shows that the HEAR (Hero in Augmented Reality) application can be well received by students and helps them get to know Indonesian heroes.

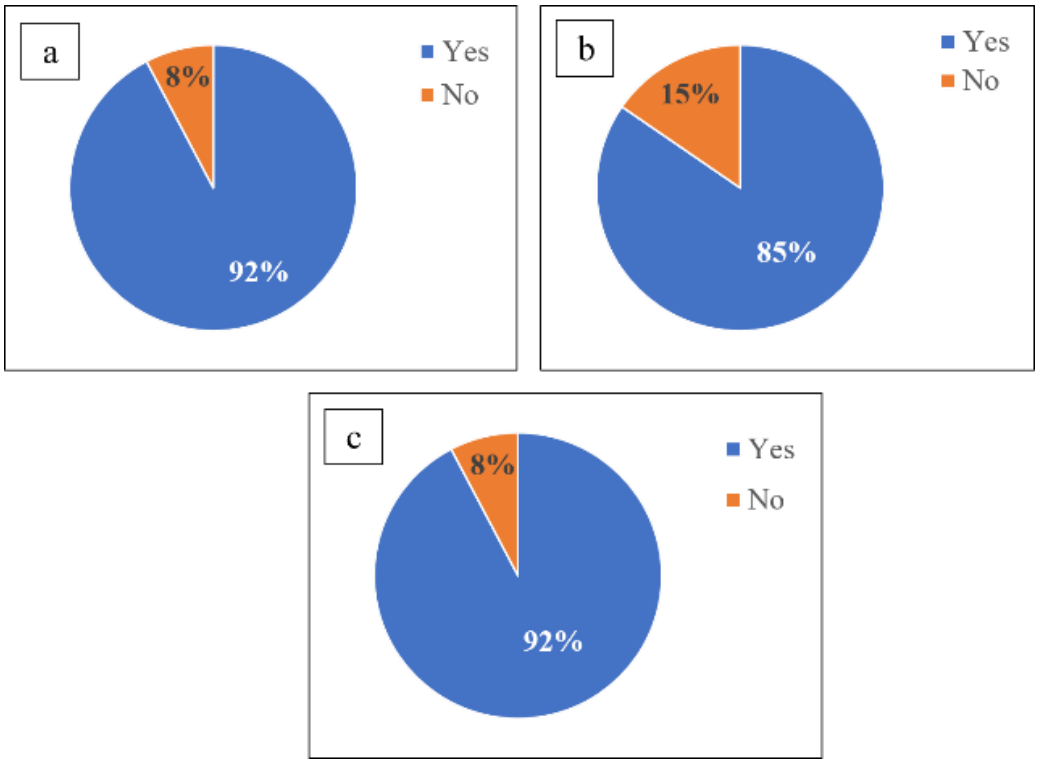


Figure 6. a) The explanation of the hero character in the HEAR application is easy to understand, b) The image of the hero displayed is clear enough to see, c) The audio (voice) produced is easy to hear.

III. CONCLUSION AND RECOMMENDATION

HEAR (Hero in Augmented Reality) as an interactive learning media to increase interest in learning about Indonesian heroes in kindergarten school students. Based on the results of the participant survey, one of the biggest problems in learning and interest in kindergarten schools is about the history of heroism. 77% find it difficult to recognize heroes, even though 96% feel that the history of heroes is crucial. As many as 88% stated that interactive learning would be very helpful, then 100% were interested in using augmented reality media through smartphones. The results of the HEAR (Hero in Augmented Reality) practical trial show that 96% of participants feel interested in using it and a number of 100% find it helpful to know the heroes through the application. From a functional point of view, HEAR (Hero in Augmented Reality) is considered capable of providing material that is easy to understand and has clear images by 92% of respondents, 85% consider the images provided to be quite clear. Thus, it can be concluded that the use of augmented reality-based HEAR applications with image, sound, and text display features can help students learn about heroes with an easy and interesting implementation

IV. ACKNOWLEDGMENTS

The author would like to thank the organizers of the SEAMEO CECCEP who have provided the opportunity to innovate, the Indonesian Education University which provided facilities and accommodation, the supervisors who have provided relevant directions, the respondents who participated in the HEAR (Hero in Augmented Reality) research. and all related parties who have contributed in the preparation of this scientific paper.

REFERENCES

Fadli, M. R., Sudrajat, A., & Amboro, K. (2021). The Influence of" Sorogan" Method in Learning History to Increase Historical Understanding and Historical Awareness. *International Journal of Evaluation and Research in Education*, *10*(1), 300-307.

Haq, N. M. (2020). Augmented Reality Sejarah Pahlawan Pada Uang Kertas RupiahDengan Teknologi Facial Motion Capture Berbasis Android. Jurnal Informatika Dan Rekayasa Perangkat Lunak, 1(1), 100-108.

Ibharim, N. A. N., Ramli, S. Z., Zahari, S. A., Edyanto, N. A. A., & Zawawi, M. A. A. (2021). Learning History Using Augmented Reality. International Journal of Multimedia and Recent Innovation, 3(1), 1-10.

Iryanti, I., Rustono, W. S., & Saepulrohman, A. (2014). Pengembangan media pembelajaran berbasis pendekatan scientific pada subtema gaya dan gerak. *PEDADIDAKTIKA: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *1*(2), 141-150.

Lizuka, S., Endo, Y., Mitani, J., Kanamori, Y., & Fukui, Y. (2011). An interactive design system for pop-up cards with a physical simulation. The visual computer, 27(6), 605-612.

Mahendra, I. B. M. (2016). ImplementasiAugmented Reality (AR) MenggunakanUnity 3D Dan Vuporia Sdk. Jurnal IlmuKomputer, 9(1).

Maarni, D. E., Ali, M. V. M., Nguyen, P. H., Kling, W. L., & Jerele, M. (2015, September). A case study of using OLTC to mitigate overvoltage in a rural european low voltage network. In *2015 50th International Universities Power Engineering Conference (UPEC)* (pp. 1-5). IEEE.

Pertiwi, E. Y. R. (2018). Upaya Meningkatkan Kesadaran Sejarah Nasional Dalam Era Globalisasi. *Civic Edu: Jurnal Pendidikan Kewarganegaraan*, *2*(1), 1-10.

Samosir, R. S., & Purwandari, N. (2020). Aplikasi Literasi Digital Berbasis Web Dengan Metode R&D dan MDLC. *Techno. Com*, *19*(2), 157-167.

Suryani, N., & Ardianto, D. T. (2020). Digital Flipbook Empowerment as A Development Means for History Learning Media. *JPI (Jurnal Pendidikan Indonesia)*, *8*(2), 266-275.

Utami, I. W. P., & Lutfi, I. (2019). Effectivity of Augmented Reality as Media for History Learning. International Journal of Emerging Technologies in Learning, 14(16).

Trustyanda, N. D., Rizki, C. R. A., & Dhanurwendo, Q. O. S. (2021). Budaya Clickbait pada Judul Berita di Era Digital 4.0. *Syntax Literate; Jurnal Ilmiah Indonesia*, *6*(9), 4601-4611.

Zahro, M., Sumardi, S., & Marjono, M. (2017). The Implementation Of The Character Education In History Teaching. Jurnal Historica 1(1), 1-11.

Zain, A. A., & Pratiwi, W. (2021). Analisis Kebutuhan Pengembangan Media PowerPoint Interaktif Sebagai Media Pembelajaran Tematik Kelas V SD. Kindergarten School: Jurnal Pendidikan dan Pembelajaran ke-SD-an, 8(1), 75-81.

Zubaidah, N., & Musadad, A. A. (2022). History Learning Based On Digital Catalog Media In Increasing Student's Historical Awareness. International Journal of Educational Research & Social Sciences, 3(1), 273-278.