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### Research Article

## Development of augmented reality-assisted health education posters on Covid-19

Hendra Nelva Saputra<sup>1\*</sup>, Alfiah Fajriani<sup>2</sup>

1) Information Technology Education University of Muhammadiyah Kendari, South East Sulawesi, Indonesia.

2) Information Technology Education University of Muhammadiyah Kendari, South East Sulawesi, Indonesia.

### ARTICLE INFO

**Submitted** : 03<sup>st</sup> February 2021

**Accepted** : 03<sup>st</sup> May 2021

**Published** : 25<sup>st</sup> July 2021

### Keywords:

augmented reality videos, poster, health protocols, media promotion

### \*Correspondence:

[hendra.nelva@umkendari.ac.id](mailto:hendra.nelva@umkendari.ac.id)

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### ABSTRACT

The changes in the social order of life in the new normal era due to the Covid-19 pandemic have caused various sectors of the work environment to create new habitual adaptation policies so that the service process continues to run well. One method used was to use poster media to be displayed in the office environment as a media for health protocol information. The purpose of this research was to create a poster based on *augmented reality videos* that were suitable for use as media for information on health protocols in public health centers in Kendari City. The research model for *augmented reality* media development uses a model developed by Lee & Owens that consists of four stages: assessment/analysis, design, development, implementation, and evaluation. Based on the findings in this study, obtaining the media expert's assessment results provided a feasibility level of 91.58%, categorized as very feasible. The tests conducted on material experts obtained a feasibility level of 89.09% that categorized as very feasible. Poster-based on *augmented reality videos* have been tested on Puskesmas health workers with a mean percentage of assessment of 80.42% that categorized as suitable for use. In comparison, the test results obtained from the public health services visitors obtained a percentage of 81.25% that have been categorized as suitable for use. The tests carried out on all test subjects showed that the poster-based on *augmented reality videos* was very suitable for use as a health promotion media at Puskesmas in Kendari City.



## INTRODUCTION

Indonesia continued to struggle against Covid-19 was a global pandemic since it first appeared in Wuhan at the end of 2019. Covid-19 was a dangerous and easily contagious disease. Covid-19 transmission between humans could occur in three ways, namely: (1) respiratory droplets and aerosols, (2) air transmission, and (3) surface transmission of objects. Covid-19 as a pandemic has disrupted the lives of three-quarters of the world's population who were in low and middle-income countries (Utama, Levani, Rumkhullah, & Paramita, 2020). Various handling and prevention efforts continuously have being made to deal with the development of Covid-19 that has changed the order of social life and threatens the stability of the Indonesian economy. Agung (2020) explained that the real impact of Covid-19 was death, economic recession, disruption of educational activities, and the most worrying were the psychological impact and behavior change on society. These impacts have massively changed the social and economic foundations of Indonesia. In order to reorganize the return passage of the Indonesian economy, the government has established many regulations in the life of the "new normal".

The change order in social life in the new normal era has resulted in various sectors making and implementing new habit adaptation policies in the work environment so that the service process continues to run well. One of the methods used was to use poster media had to be displayed in an office environment as an information medium for new habits. Ulya, Iskandar, & Asih (2017) explained that poster was a medium that presents visual form information and stimulates the sense of sight. The poster was a visual communication tool in the form of images and writings had intended to attract people's attention so that the message to be conveyed can be accepted

simply by others (Putri & Kurniawan, 2017). Based on this description, posters could say to be a means of presenting information in a form that was attractive, easy to understand, influences knowledge. They could motivate readers to follow the information presented.

Numerous studies had been conducted on the use of posters. Luthfia & Siswantara (2018) using posters and hand lettering as health promotion media regarding the dangers of smoking for adolescents. This study showed that hand lettering was more effective in increasing adolescent knowledge about the dangers of smoking than using posters. It showed that posters no longer became a major media in health promotion because other media could use the *hand lettering* forms that have proven to be more effective in increasing knowledge.

Utomo et al. (2018) tried to develop health promotion methods in several media, including visual media (posters and *leaflets*), audio-visual media (*slide* presentation using power points), and the game media called *Rabies Games for Kids*. The results showed that the posters and leaflets provided simultaneously gave higher knowledge and length memory than audio-visual media and game media. The research method used a pretest-posttest design was an experimental research method. Development research should use development models such as the Lee & Owens model, the ADDIE model, the ASSURE model, and so on depending on the needs and the research product had developed. The same problem also occurs in research by Hermina & Prihatini (2016) that used qualitative methods, while the research problem was the development of posters as a tool for nutritional education.

Based on the outline, poster media has provided benefits both as a health promotion medium and as a learning medium. It was because posters have the following advantages: (1) it could simplify and accelerate understanding



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of the messages presented; (2) could be complemented with colors so that it attracts students' attention; (3) simple in shape without the need for special equipment and easy to place, requiring little additional information; and (4) easy to manufacture and low price (Sumartono & Astuti, 2018). On the other hand, if an in-depth study had carried out, posters have several weaknesses, namely: (1) it required special skills in its manufacture; (2) reading skills had required to understand the contents of the poster; and (3) presenting messages only in the form of visual elements.

The description of the poster's weaknesses above can be accommodated by the development of posters based on *augmented reality videos*. Craig (2013) explained that *augmented reality* was a medium where digital information added to the physical world. *Augmented reality* also meant the actual objects in *real-time* that added with a virtual object that appeared when using tools or devices on the actual objects (Soepriyanto, Sulthoni., & Ulfa, 2017). *Augmented reality* used an interface in a figurative physical object that had manipulated virtual information imaginatively.

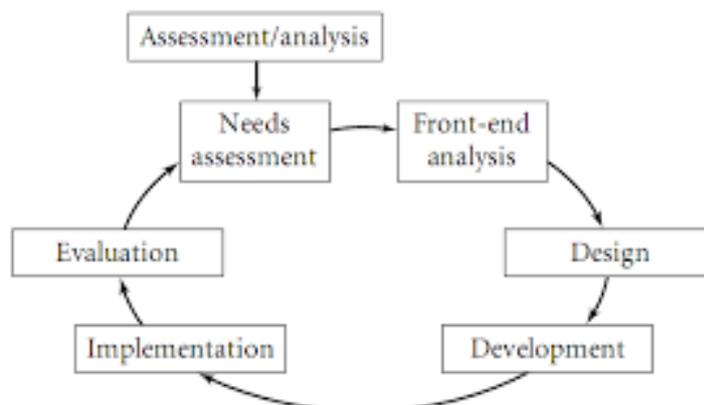
The description above showed several reasons for the importance of poster development based on augmented reality videos, as follows (1) posters that could only present visual information in the form of text and images were starting to get less response from readers because there are other media such as hand-lettering that made it easier to understand the information presented; (2) posters and audio-visual media as promotional media were often separated so that the recipient of the information still has to read and see two different media, even though the two media that had combined only in one media; (3) there was still no poster based on augmented reality videos that had developed as a health promotion media.

Primary healthcare facilities play essential roles in disease control and prevention. Changes in healthcare-seeking behavior during the Covid-19 pandemic, especially to primary care, might impact overall public health. Puskesmas is a first-level health service center in Indonesia that carries out its activities in a comprehensive, integrated, and sustainable manner in a community that lives in a particular area. In supporting the prevention of the spread of Covid-19, Puskesmas play an essential role as a first-rate facility for the public in disseminating information related to health education about Covid-19.

Starting from the description that has been presented, it could be said that posters have become a health promotion medium that has provided many benefits. On the other hand, posters still have weak points because they could only present visual information in the form of text and images, so they needed to be developed into a medium capable of presenting text, images, and videos. Media that could be meeting these criteria was only by using *augmented reality*, so it was necessary to develop posters based on *augmented reality videos*. The purpose of this research was to make posters based on *augmented reality videos* that were suitable for use as promotional media in the form of health protocols in the work environment of Puskesmas in Kendari City.

## METHODS

The research model of media development *augmented reality* using a model developed by (Lee & Owens, 2004). Lee & Owens' model consists of four stages: *assessment/analysis, design, development, implementation, and evaluation*. The development models based on Lee & Owens, it could be seen in the figure below:



**Figure 1.** Lee & Owens Development Model Steps

The analysis stages aimed to determine the gap between the existing conditions and the expectations to be achieved. The population of this research was health workers at Puskesmas and visitors of Puskesmas in Kendari City. The samples in this study were 10 health care workers at Puskesmas and 20 visitors of Puskesmas in Kendari City which included Puskesmas Abeli, Puskesmas Nambo, Puskesmas Poasia, Puskesmas Jati Raya, and Puskesmas Lepo-Lepo. Samples were taken using a simple random sampling technique. At this stage, it was found that the respondents had different characteristics. The development also analyzed the available technology; developing augmented reality requires AR application developer software and 3D models. There was two software used to develop *augmented reality* media, namely *augmented reality* application developer software Vuforia and supporters Unity. Software developers *augmented reality* application had used to adjust the layout of a 3D image and enter the *script*. Supporting software had used to upload a *marker* that could be scanned. Both of the software were selected based on research Prasetiyo, Setyosari, & Sihkabuden (2017). Their research explained that the two applications could be used properly and cause the visualization to resemble the original object. In this study, the augmented

reality media was developed by an expert who has a background as an alumnus of the State University of Malang Postgraduate Learning Technology Study Program. Meanwhile, researchers in development activities focus more on making videos and posters as media that must be provided before making augmented reality media. The technology available to implement *augmented reality* media was a *smartphone* device owned by health workers and visitors of the Puskesmas.

The design stage had carried out to determine the specifications of the poster that would be made, including a printed poster that contains a QR code as a marker for displaying 3D objects and videos that were added in the real environment, as well as an *augmented reality* videos application that could be installed on a smartphone. The poster content arrangement that included text and images was regulated by the developer with attention to attractiveness, typography, and layout. The development and implementation stages consist of developing markers, 3D products, videos, posters, and applications.

The last stage in the development of posters based on *augmented reality videos* was evaluation. This stage aimed to obtain responses from media experts, material experts, Puskesmas officers, and visitors to health centers in Kendari City. The

instrument used to collect data using the Likert scale form. The research instrument developed generally focuses on (1) accuracy in selecting fonts and images, (2) accuracy in organizing posters, (3) ease of use of augmented reality media applications, (4) ease of understanding the information presented in posters and videos, and (5) the suitability between the poster and the video used. The eligibility criteria for the media in this development could be seen in Table 1.

## RESULTS

This development research produces posters based on augmented reality videos that can be used as health promotion media in the Puskesmas environment. The development stages in this research include the development of markers, videos, posters, and applications. The marker design used was a QR Code with an image in the

middle to make it easier for users to recognize 3D objects in the form of a video that would appear. Prasetyo, Setyosari, & Sihkabuden (2017) described the selection of QR-Code as a marker because QR-Code has a contrasting color and a high level of augmentable. The marker design for the video poster at the health center could be seen in Figure 2 below. and visitors to health centers in Kendari City. The instrument used to collect data using the Likert scale form. The research instrument developed generally focuses on (1) accuracy in selecting fonts and images, (2) accuracy in organizing posters, (3) ease of use of augmented reality media applications, (4) ease of understanding the information presented in posters and videos, and (5) the suitability between the poster and the video used. The eligibility criteria for the media in this development could be seen in Table 1.

**Table 1.** Eligibility Criteria Media

Percentage (%)	Validity Information	Conclusion
25,00-40,00	Invalid	Should not be used
41,00-55,00	Less valid	Should not be used
56,00-70,00	Quite valid	Can be used after major revisions
71,00-85,00	Valid	Can be used after minor revisions
86,00-100	Very valid	Very good to use

(Adopted from Akbar, 2016)



**Figure 2.** Video Poster Marker Design at Puskesmas

## PROTOKOL KESEHATAN PUSKESMAS



**Anda harus menyediakan**



Masker



Face Shield



Hand sanitizer

**Saat anda ke puskesmas**  
Gunakan kendaraan pribadi



Jika menggunakan kendaraan umum

- Jaga jarak
- Hindari bersalaman
- Tidak menyentuh wajah

**Saat tiba di rumah**



● Mandi



● Cuci pakaian

**Saat tiba di puskesmas**

- Mencuci tangan di air keran
- Cek suhu tubuh
- Pada saat pemeriksaan, pasien dan dokter tetap jaga jarak dan menggunakan masker



**Ikuti prosedur berikut untuk melihat video protokol kesehatan PUSKESMAS.**

1. Ketik [http://bit.ly/aplikasi\\_educasi\\_covid-19](http://bit.ly/aplikasi_educasi_covid-19)
2. Klik download, lalu tetap download
3. Klik unduh, lalu tunggu hingga pengunduhan selesai
4. Buka tempat pengunduhan, lalu klik file edukasicov19.apk
5. Klik install, lalu tunggu hingga proses penginstalan selesai
6. Buka aplikasi edukasicov19, lalu scan barcode ini.




Figure 3. Public Health Protocol Poster based on *Augmented Reality Videos*



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The final stage in this process is application development. This application's output is a file in the application package file (.apk) extension that can be installed on a smartphone. This application is named edukasicov19 and can be downloaded at the link [http://bit.ly/aplikasi\\_educasi\\_covid-19](http://bit.ly/aplikasi_educasi_covid-19).

This study examined the importance of developing the posters based on *augmented reality videos* that had been implemented as a media for promoting health protocols in the new normal era in the work environment of Puskesmas. In getting a suitable poster for use, several tests must be carried out, including testing of media experts and material experts and field testing of health center officers and visitors to health centers in Kendari City.

The research begins with the testing in each of 1 person, media experts and material experts. The media expert aimed to see the media's feasibility level about the color suitability of visual and verbal elements, the layout of the poster content, the ease of understanding the information conveyed in posters, markers, application installation instructions, and the attractiveness of the entire poster content. The material expert aimed to see the media's feasibility concerning poster content, video content, completeness of health protocols, and suitability of posters and videos. The media expert assessed the media using a research instrument containing 19 statements with a maximum value is 5, so that the maximum value obtained was 95. Based on the data analysis results, the value given by media experts was 87, so the percentage of media expert scores was obtained from the media expert scores (87) divided by the maximum value (95) times 100%. Based on the results of tests conducted on media experts, it was found that the feasibility level was 91.58% which was categorized as very feasible for health protocol posters at the Puskesmas.

The material expert assessed the poster using a research instrument containing 11 statements with a maximum value is 5, so that the maximum value obtained was 55. Based on the data analysis results, the value given by material experts was 49, so the percentage of the material expert's score was obtained from the material expert's value (49) divided by the maximum value (55) times 100%. The tests conducted on material experts obtained a feasibility level of 89.09%, which is categorized as very feasible for health protocol posters at the Puskesmas. In detail, the test results of media experts and material experts on the developed posters can be seen in Figure 4.

The test results of media experts and material experts who have shown to be very feasible constitute a requirement that this research had continued with field testing. The field test had carried out on each of the ten health workers and 20 visitors to the Puskesmas in Kendari City. Health workers assess posters using a research instrument containing 19 statements with a maximum value is five so that the maximum value obtained is 95 multiplied by ten visitors to 950. Based on the results of data analysis, the score given by health workers is 764, so the percentage of the score for health workers is obtained from the score of the health worker (764) divided by the maximum score (950) times 100%. The test results obtained from health workers obtained an average percentage of 80.42% had categorized as suitable for use.

Puskesmas visitors assessed the posters using a research instrument containing 19 statements with a maximum value is 5, so that the maximum value obtained was 95 multiplied by 20 visitors to 1900. Based on the results of data analysis, the value given by the number of visitors to the puskesmas visitors was 1544. The percentage value of puskesmas visitors the number of visitors to the puskesmas (1544) was divided by the maximum value (1900) times 100%. The test results obtained from

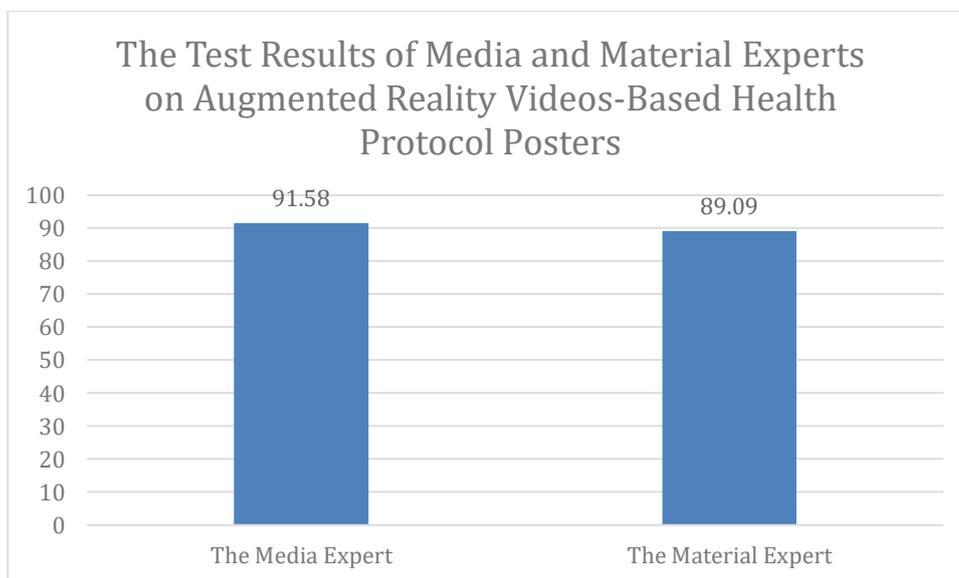


Figure 4. The Test Results of Media Experts and Material Experts on Posters of Health Center Health Protocols based on Augmented Reality Videos

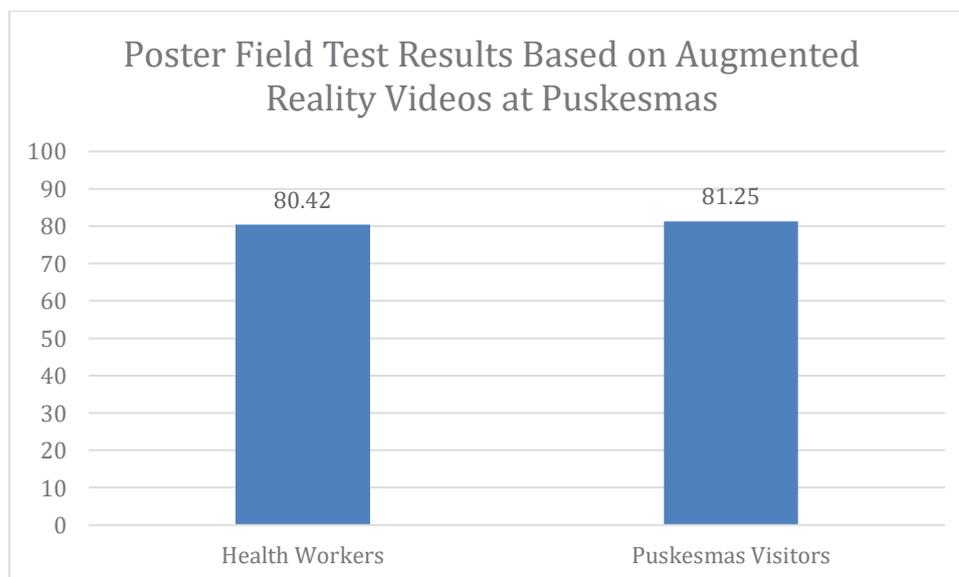


Figure 5. The Field Test Results against Posters Based on Augmented Reality Videos at Puskesmas



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### DISCUSSION

The results of tests carried out on media experts, material experts, and field tests show that the poster based on augmented reality videos developed in this study was suitable for use as a health promotion media in the form of health protocols in the work environment of Puskesmas in Kendari City. Posters appealed if the verbal and visual elements have been organized appropriately. The addition of videos packaged using *augmented reality* on the posters further adds to the complexity of the media for delivering information and existing aesthetic values, thus attracting the attention of those who see them.

A media poster was a written message, both in the form of pictures and writing, that intended to attract many people's attention so that the message conveyed could be accepted by others easily (Sumartono & Astuti, 2018). Azis (2012) described in compiling a poster, the steps that should be considered were (a) determining the object to be posted, (b) formulating messages to be conveyed to the public, (c) formulating short, concise, and clear sentences so that the essence of the problem could be read casually, and (d) using suggestive words (cajoling).

The selection of posters that got the added real environment of augmented reality videos was not without reason. *Augmented reality* could combine virtual objects and the real world in one medium (Saputra, Salim, Idhayani, & Prasetyo, 2020). Ilmawan & Kurniawan (2017) explained the advantages of augmented reality were: (1) more interactive; (2) effective in use; (3) could be widely implemented in various media; (4) simple object modeling, because it only displays a few objects; (5) manufacture that does not cost too much; and (6) easy to operate. Similar statements were described by Adami & Budihartanti (2016) explained that *augmented reality*: (1) makes it easier and attracts interest in learning material, and (2) the excellent learning media because it can be

accessed using Android so that it can be used by everyone as long as the *augmented reality* application has been installed on a *smartphone*.

The use of posters as a medium for health promotion had become the object of research that was often carried out in health. Wiji & Fitri (2020) using posters as a media strategy for nutrition education to increase knowledge of postpartum mothers, babies, and toddlers. Another research was conducted by Andriani, Suwarni, & Arfan (2020) by using posters as an alternative media to wash hands. Wiji & Fitri (2020) and Andriani et al. (2020) have something in common with this study, namely using poster media as a health promotion medium. The results also showed that posters were suitable for use as a health promotion medium. However, the difference was clear that the two studies above only focus on using posters as a promotional medium. In contrast, in this study, posters got an additional environment in augmented reality video, making it easier for readers to understand the information presented.

Yip, Wong, Yick, Chan, & Wong (2019) conducted research using augmented reality videos as a learning medium. The research concluded that student learning outcomes using *augmented reality videos* were higher than students who read papers. Ananda, Safriadi, & Sukanto (2015) examined the application of augmented reality as a learning medium to recognize planets in the solar system. Juannita & Adhi (2017) examined the development learning media development digestive system with android-based *augmented reality* features. Kamiana, Kesiman, & Pradnyana (2019) their research also concluded that based on the *augmented reality* book application testing process, the media was in an excellent category for use in the learning process. Significant differences between some of the above studies and this study included: (1) no *augmented reality* media



had used as a health promotion media, and (2) *augmented reality* developed in this study was in the form of a marker that would be placed on the poster.

The results found that the poster based on *augmented reality videos* developed was very suitable for use as a health promotion media in the form of health protocols in the Puskesmas work environment. However, when viewed in more detail, several weaknesses need special attention, namely: (1) the reader needs direct guidance to install the developed application, (2) the video that appeared when the reader performs a marker scan cannot be enlarged to follow the smartphone screen size, and (3) the poster size should be larger than the A3 paper size.

The findings in this study were very important considering there were no posters developed with the addition of an *augmented reality video* environment that has been used as a health promotion media. The study results also contributed to the availability of posters that can be used in Public Health as a medium for preventing the transmission of the Covid-19 virus in the work environment. This study's findings could also become the inspiration for other institutes to make similar posters in their work environment. This finding further adds to the existence of Muhammadiyah in making a real contribution in helping the progress of the nation because this research is funded in the Program Research Grant Batch 4 Assembly Diktilitbang PP Muhammadiyah.

## CONCLUSION

Based on the findings in this study, the information had obtained that the results of the media expert's assessment provided an eligibility level of 91.58% that categorized as very feasible for health protocol posters at Puskesmas. The tests conducted on material experts obtained feasibility was 89.09%,

that categorized as very feasible for health protocol posters at the Puskesmas. Posters based on *augmented reality videos* were also tested on Puskesmas health workers with a mean percentage of assessment of 80.42% that categorized as suitable for use. In comparison, the test results obtained from visitors of the Puskesmas gained a percentage of 81.25% that categorized as suitable for use. The tests carried out on all test subjects showed that the poster based on *augmented reality videos* developed in this study was very suitable for use as a health promotion media at Puskesmas in Kendari City.

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