



Educational Media For Preventing Drug Abuse Using Augmented Reality Technology In Panggung Kidul Village

Sita Shabrina Rahmatina¹ Maya Utami Dewi² Iman Saufik³

^{1,2,3}Department of Informatics, Universitas Sains dan Teknologi Komputer Semarang, Indonesia

Email author: sitashabrina2@gmail.com¹, maya@stekom.ac.id², saufik@stekom.ac.id³,

Article Info

Article history:

Received

Revised

Accepted

Keywords:

Augmented Reality,
NAPZA,
Media Education Smartphone

ABSTRACT

Drug abuse (Narcotics, Psychotropics, and other Addictive Substances) is a serious problem that can threaten the younger generation, especially in the Panggung Kidul Village area. The lack of public understanding, especially teenagers, regarding the dangers and negative impacts of drug abuse is one of the factors that influence the high risk of substance abuse. Therefore, innovative and interactive educational media are needed to increase public awareness and understanding regarding the prevention of drug abuse. This study offers a solution by designing and developing educational media based on Augmented Reality (AR) technology as a visual and interactive tool that conveys information in an interesting and easy-to-understand manner. The use of smartphones as the main device in AR applications makes this media more easily accessible to various groups of people. The test results using the System Usability Scale (SUS) method showed a user satisfaction level of 96% which is included in the Acceptable category. Thus, this AR-based educational media is expected to be an effective means of increasing public understanding of the dangers of drug abuse and encouraging early preventive efforts.

Corresponding Author:

Sita Shabrina Rahmatina,
Universitas Sains dan Teknologi Komputer
Jl. Majapahit No. 605 Semarang
Email: join@stekom.ac.id



1. INTRODUCTION

Drug abuse (Narcotics, Psychotropics, and other Addictive Substances) is a serious problem in Indonesia with a continuously increasing prevalence, especially among adolescents and the younger generation, due to low awareness and minimal prevention education. The impact is not only detrimental to individual health, but also disrupts social life, the economy, and public security. Globally, the number of drug abusers reached 296 million people or 5.8% of the population aged 15–64 years, while in Indonesia the prevalence in 2023 was recorded at 1.73% or around 3.3 million people, with a significant increase in the 15–24 age group (BNN Humas, 2024). At the local level, Panggung Kidul Village, Semarang City, is an area prone to drug abuse due to socioeconomic factors, easy access, and the lack of effective prevention programs. The Semarang City National Narcotics Agency (BNN) has recorded a

steadily increasing trend in cases over the past five years, in line with data from the Central Java National Narcotics Agency (BNN) which revealed 1,200 cases in 2021, the majority involving marijuana, making Semarang the city with the highest drug trafficking in Central Java. Data from the Semarang City Health Office also shows cases of drug abuse in the Panggung Kidul area, based on reports from the North Semarang District Community Health Center from 2018 to 2024.

Table 1 Data on Drug Abuse in Panggung Kidul Subdistrict, Source : UPTD Puskesmas Semarang Utara

Wilayah RW Panggung Kidul	Year's						
	2018	2019	2020	2021	2022	2023	2024
RW 1	6	5	4	3	2	2	3
RW 2	4	3	3	1	2	3	2
RW 3	5	4	4	2	2	3	3
RW 4	3	3	2	2	1	0	1
Total	18	15	13	8	7	8	9

In 2019, the number of illicit drug users increased by 11% compared to 2018, with the number of suspected users increasing from 237 in 2018 to 244 in 2019 (Semarang, 2018). Furthermore, data from the community health center in North Semarang District shows that in the most recent year, 2024, Panggung Kidul Village contributed to nine cases of drug abuse (Nurfaizi, 2022). Kondisi ini mengindikasikan adanya kebutuhan mendesak untuk meningkatkan edukasi dan kesadaran masyarakat, terutama generasi muda, mengenai bahaya NAPZA dan pentingnya upaya pencegahan.

This situation indicates an urgent need to increase public education and awareness, especially among younger generations, about the dangers of drugs and the importance of prevention efforts.

Various educational efforts about the dangers of drug abuse have been conducted through conventional methods such as brochures, seminars, and outreach, but these methods are considered less effective, especially for younger generations who are more responsive to interactive approaches. Previous research emphasized the need to utilize technology, so this study developed Augmented Reality (AR)-based educational media capable of presenting information in an engaging and interactive manner via smartphone devices (Ichsan Al-Fatih & Tantriawan, 2021). AR technology allows users to scan specific objects or images to display animations, videos, or drug prevention information in real time, supported by posters with QR codes connected to an application on Google Drive. Outreach was conducted to the public, especially teenagers, through interactive activities such as a Q&A session with prizes to increase enthusiasm, and participants were asked to complete a questionnaire to assess the effectiveness of the educational media. With this innovative approach, it is hoped that the younger generation's awareness of the dangers of drugs will increase significantly compared to conventional.

2. METHOD

Multimedia Development Life Cycle (MDLC) is an explanation of the stages in the AR system in research according to Luther's method, this consists of six structured stages to produce quality multimedia applications.

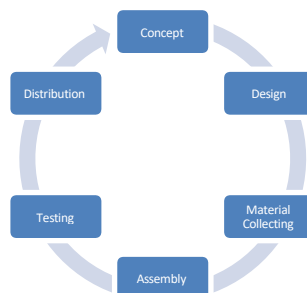


Figure 1 Research Stages MDLC Luther's Model

2.1. Concept

At this stage, the application concept was formulated as an educational medium aimed at supporting the drug abuse counseling and prevention program in Panggung Kidul Village. This application is combined with educational poster media that displays information regarding the types of drugs, their impacts, and how to prevent them, and can be scanned to display additional interactive visual and audio materials. The main target of this media is the general public, especially teenagers, parents, and health cadres or counselors who play a role in providing education about the dangers of drugs. With this concept, the delivery of information is expected to be more interesting, easy to understand, and interactive.

2.2. Design

During the system design stage, a flowchart was created to illustrate the working process of the augmented reality-based educational media being developed. This flowchart serves as a guide in the application implementation process, ensuring that each designed feature can function according to its primary objective, which is to provide education on preventing drug abuse effectively and interactively. Figure 2 below presents a visual representation of the system flowchart.

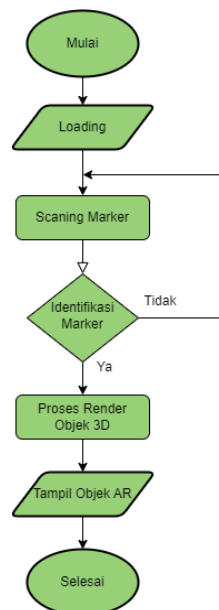


Figure 2 Rancangan Alur Sistem

2.3. Material Collecting

The material collection stage is a crucial step in developing Augmented Reality-based educational media for the prevention of drug abuse. This process is carried out to ensure that the content presented aligns with the main objective, which is to educate the public about the dangers and prevention of drugs. Information is obtained through literature studies from journals, articles, and other reliable sources relevant to the topic of drug abuse, public education methods, and the use of interactive technology. Furthermore, the necessary visual assets are also collected to support the presentation of the material, while still observing copyright legality to avoid violating regulations. By collecting appropriate and relevant material, the developed educational media is expected to present information in an interactive, informative, and engaging manner for the public in an effort to prevent drug abuse.

2.4. Assembly

In the following stages, there are several important steps that are carried out, especially in creating visual and audio objects as supporting elements.

a. 2D Augmented Reality Object Creation

The creation of 2D illustrations as the main element in the augmented reality feature was carried out to convey educational messages about the dangers and prevention of drug abuse in an

attractive and easy-to-understand display. The visual design was created in detail so that each element could be adjusted and developed flexibly, resulting in a dynamic display without having to overhaul the entire composition. With this approach, the resulting illustrations can support the delivery of educational content more effectively and interactively.

b. Voice Sound Creation

To strengthen the educational message within the app, a Text-to-Speech (TTS) feature is used, converting text into audio, making it easier for users to understand learning content through audio. This technology delivers clear, natural, and easy-to-understand audio, increasing interactivity and user experience. The addition of audio is expected to make the learning experience more engaging, inclusive, and suitable for users with auditory learning preferences.

2.5. Testing

At this stage, testing will be conducted using the blackbox testing method to ensure the application implementation is in accordance with the stated objectives. Aspects tested include application launch speed, interface responsiveness, and stability during use. Next, testing on the buttons in the application is carried out to ensure that each button functions properly according to its function, without any bugs or problems in navigation. Each button that activates a specific feature is tested to ensure that users can easily access and use the desired function. Testing uses the SUS (System Usability Scale) method which is given to users to obtain input and feedback regarding the educational media for preventing drug abuse based on Augmented Reality technology that has been developed.

2.6. Distribution

In the distribution phase, the strategy used combines digital and physical media approaches to reach a wider audience, particularly residents of Panggung Kidul Village as the primary target. The Augmented Reality application is distributed alongside educational posters or brochures containing information on the dangers and prevention of drug abuse, with attractive designs and simple language for easy understanding. The printed media is equipped with a QR Code that can be scanned directly with a smartphone to access the application download link quickly and practically, thereby minimizing technical barriers. With this strategy, it is hoped that the community will not only better understand the negative impacts of drugs but also be encouraged to use the application as an easily accessible.

3. RESULT DAN ANALISIS

This application was developed as an interactive Android-based educational tool to support the prevention of drug abuse in Panggung Kidul Village. Using augmented reality (AR) technology, the application presents educational content in an engaging, interactive, and easy-to-understand manner, enabling users to obtain information about the dangers of drugs in a more immersive manner. The application's implementation is expected to increase public understanding and awareness, particularly among adolescents, regarding the importance of avoiding drug abuse.



Figure 3 GENAR Application Result

The application of marker-based and extended tracking techniques in augmented reality (AR) technology is a crucial element in the development of educational media for preventing drug abuse in Panggung Kidul Village. Marker-based techniques are used to display virtual objects when the camera detects certain pre-designed markers, such as images or symbols related to educational material on drugs. Meanwhile, extended tracking allows virtual objects to remain visible and stable even if the marker moves out of the camera's range, by utilizing device sensors and environmental data. The application of these two techniques aims to provide a more interactive, realistic, and engaging learning experience, so that educational messages about the dangers of drug abuse can be conveyed more effectively to the public, especially the younger generation.

Table 2 AR Education System Implementation

No	Marker	AR Object
1	 <p>1 Pahami Bahaya Narkoba Narkoba merusak otak, tubuh, dan masa depanmu. Satu kali coba, bisa hancurkan segalanya!</p>	
2	 <p>2 Pilih - Pilih Teman Dekat Yang Baik Bertemanlah dengan orang-orang yang mendukung kamu, jadi lebih sehat, positif, dan dapat berprestasi.</p>	
3	 <p>3 Berani Tegas Bilang "TIDAK" Jangan takut menolak! Katakan dengan tegas "TIDAK" jika ditawari narkoba atau ajakan negatif.</p>	
4	 <p>4 Selalu Sibukan Diri Dengan Kegiatan Hal Yang Positif Sibukan diri dengan mengikuti kegiatan seperti olahraga, seni, bahasa atau organisasi. Kesibukan positif menghindarkan dari godaan NAPZA atau sekenanya.</p>	
5	 <p>5 Jadilah Contoh Yang Baik Untuk Teman Sebaya Anda Tunjukkan bahwa kamu bisa sukses tanpa narkoba. Nikmati hidup yang sehat dan bebas NAPZA.</p>	

System Usability Scale method was administered to 30 users to obtain input and feedback regarding the educational media for drug abuse prevention based on augmented reality technology that had been developed. This test aimed to assess the application's ease of use, understanding, and ability to provide a positive experience for the 30 users in accessing educational information interactively through the augmented reality feature.

To determine the percentage value for each questionnaire, the following Likert scale formula was used:

- 1) Each odd numbered question, $Result = Score - 1$
- 2) Each even numbered question, $Result = 4 - Score$
- 3) Add up all the results and then multiply by 2,5

Table 3 Calculation of SUS Method Results

Respondents	SUS Count Result										Amount	Amount x 2,5
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
1	4	4	3	4	4	2	3	4	4	3	35	87,5
2	4	4	4	4	3	4	4	4	2	4	37	92,5
3	4	4	4	4	4	4	4	4	4	4	40	100
4	4	4	3	3	4	4	3	4	4	4	37	92,5
5	4	4	4	4	4	4	4	4	4	4	40	100
6	4	4	4	4	4	4	4	4	4	4	40	100
7	4	3	4	4	4	3	4	2	4	2	34	85
8	4	4	4	4	4	4	4	4	4	4	40	100
9	4	4	4	4	4	4	3	4	2	4	37	92,5
10	4	4	4	3	4	4	4	4	4	4	39	97,5
11	4	4	3	4	4	4	4	4	4	4	39	97,5
12	4	4	3	4	4	4	4	4	4	4	39	97,5
13	4	3	4	4	4	4	4	4	4	4	39	97,5
14	4	4	4	4	4	4	4	4	4	4	40	100
15	4	4	4	4	4	4	4	4	4	4	40	100
16	4	4	3	4	4	2	3	4	4	3	35	87,5
17	4	4	4	4	3	4	4	4	2	4	37	92,5
18	4	4	4	4	4	4	4	4	4	4	40	100
19	4	4	3	3	4	4	3	4	4	4	37	92,5
20	4	4	4	4	4	4	4	4	4	4	40	100
21	4	4	4	4	4	4	4	4	4	4	40	100
22	4	3	4	4	4	3	4	2	4	2	34	85
23	4	4	4	4	4	4	4	4	4	4	40	100
24	4	4	4	4	4	4	3	4	2	4	37	92,5
25	4	4	4	3	4	4	4	4	4	4	39	97,5
26	4	4	3	4	4	4	4	4	4	4	39	97,5
27	4	4	3	4	4	4	4	4	4	4	39	97,5
28	4	3	4	4	4	4	4	4	4	4	39	97,5
29	4	4	4	4	4	4	4	4	4	4	40	100
30	4	4	4	4	4	4	4	4	4	4	40	100

From the results of the SUS score calculation, the total value can be obtained as follows:

$$\text{Result} = \frac{\text{Total Overall Value}}{\text{Number of Respondents}} \quad \text{Result} = \frac{2880}{30} = 96$$

Based on the SUS score calculation, the application received a percentage score of 96%. Therefore, based on the interpretation scale, the application falls into the Acceptable category.

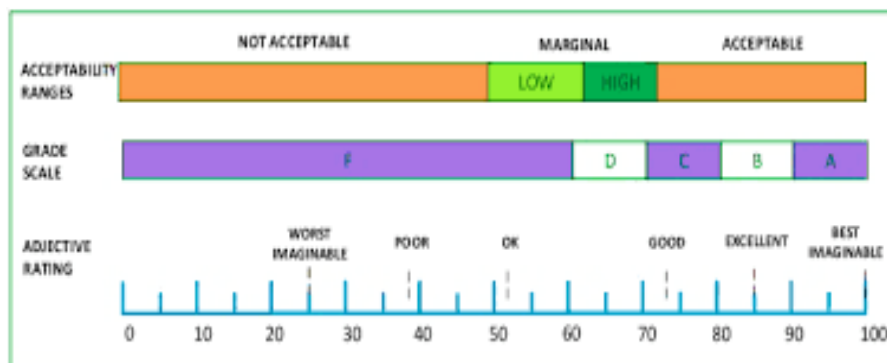


Figure 4 SUS Method Interpretation Scale

4. DISCUSSION/CONCLUSION

This study proves that Augmented Reality (AR)-based educational media is an innovative solution for increasing public awareness and understanding in preventing drug abuse, particularly in Panggung Kidul Village. The AR application is designed to deliver educational materials interactively and easily accessible via smartphone, making it more engaging than conventional methods that tend to be passive. This approach encourages active community involvement, especially among adolescents, and has the potential to be an effective tool for relevant agencies such as village offices, schools, and health workers in disseminating drug prevention information more widely and efficiently. Test results show that the application has a very high level of user satisfaction, thus supporting its effectiveness as an educational medium. The application achieved a user satisfaction rating of 96%, which falls into the best imaginable category.

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