

Research Article

The ASAM.ID Application as a Learning Media for Environmental Literacy

Dindin Nasrudin*, Chaerul Rochman, Pian Septiani

Prodi Pendidikan Fisika, UIN Sunan Gunung Djati Bandung, Jalan Cimencrang, Bandung 40292, West Java, Indonesia

ORCID

Dindin Nasrudin: <https://orcid.org/0000-0002-9977-1790>

Chaerul Rochman: <https://orcid.org/0000-0003-4624-2120>

Abstract.

Garbage is a crucial problem that must be resolved by all parties, including universities. Universities can contribute to efforts to increase community literacy in waste management through the development of learning applications. This paper aimed to describe the ASAM.ID application development process and its feasibility to be used as an alternative learning media in increasing students' environmental literacy in waste management. The application development process began with making flowcharts and developing application designs and content. The validation results of content and media experts showed that the ASAM.ID application can be used as an alternative learning media to increase students' environmental literacy. This study recommends this application be tested in science learning to see its effectiveness and implemented on a broader scale.

Corresponding Author: Dindin Nasrudin; email: dindin.nasrudin@uinsgd.ac.id

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1. INTRODUCTION

Garbage is a classic problem faced in many countries, including Indonesia. Garbage in Indonesia is dominated by Municipal Solid Waste (MSW), of which 50-60% comes from household waste. This waste mainly consists of food scraps, yard waste, and packing materials. It is a mixture of all types of waste, organic and non-organic waste, recyclable and non-recyclable waste, and even hazardous materials [1]. Waste problems in Indonesia occur at all stages of storage, collection, transfer, transportation, and processing to the final disposal. One of the causes of waste problems in Indonesia is the low level of public awareness, which impacts the low Level of Service (LoS) of urban waste management (MWM)[2].

Literacy could influence the low public awareness of waste management [3]. Improving community literacy in waste management is a shared responsibility, including universities. Universities can at least play a role in two things. The first effort is through the

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development of programs and applications related to waste management on campus, such as through IoT-based machine learning [4], Integral Urban Solid Waste Management [5] and waste minimization-oriented policy instruments [6]. The second effort is collaborating with other parties, such as schools and communities. An example of this effort is demonstrated through the development and implementation of STEM education [7], fostering eco-literacy by the community [8], and eco-wash literacy [9].

In line with previous research, this research aims to increase community literacy through learning in schools. Undeniably, students are part of an educated society that will spearhead change in the future. Preparing competencies, skills, and awareness of environmental issues such as waste management are crucial. Learning about waste management can be integrated into every subject. The right media is needed to teach environmental problems such as waste so that students can easily understand them. One of them is the use of the application. Ownership of smartphones by most students can be the initial capital for developing learning applications via smartphone. This paper aims to reveal the process of creating an Android-based learning application called ASAM.ID. This research answers two questions: (1) How is the ASAM.ID application developed as an alternative to learning science in the context of waste management? And (2) What is the feasibility of the ASAM.ID application as a learning medium?

2. METHOD

This study is a research and development (R&D) which aims to develop and validate a product in education. The r & d model used in this study is ddd-e (decide, design, develop and evaluate) [10], as shown in Figure 1.

DECIDE. This stage is carried out to determine the objectives of media design and identify needs. The purpose of making this android application is to provide a medium to increase student literacy regarding waste management. This application is designed as a medium of learning for high school-level students. The design of this application is driven by the lack of media literacy related to waste management in schools.

DESIGN. The main activity at this stage is making flowcharts and selecting media. This flowchart is made to visualize the entire flow of processes and activities using simple icons without requiring explanation using words. [11]. The media chosen to make this android application is Jagel. Id. At the design stage, the design of the application page display is also carried out.

DEVELOP. At this stage, the creation of application pages is started based on the design that has been made. The application page that is made is adjusted to the menu

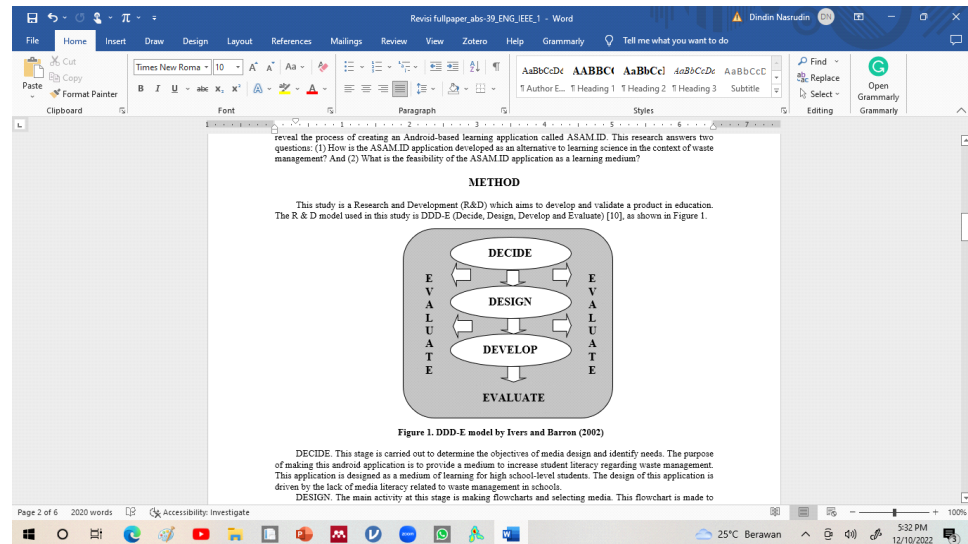


Figure 1: DDD-E model by Ivers and Barron (2002).

or content that will be presented. Furthermore, the expert team will test the feasibility of the application before it is implemented on students. The expert team consists of 6 people, three content experts and three media experts. The feasibility assessment is carried out through a scale of approval levels. The total score from expert judgment is calculated via a formula:

$$P = \frac{f}{n} \times 100 \% \tag{1}$$

with P= Percentage level of approval

f = score obtained

and n= maximum score

The average score obtained is confirmed by the criteria shown in Table 1.

TABLE 1: Application eligibility criteria.

No.	Percentage	Criteria
1.	> 80 %	Valid
2.	61% - 80%	Quite Valid
3.	41% - 60%	Less Valid
4.	< 41%	Invalid

EVALUATE. The evaluation stage is carried out at each stage by the targets and goals to be achieved.

3. RESULT AND DISCUSSION

The development of the ASAM.ID application was motivated by the need for school teachers to deliver science lessons that facilitate students in increasing environmental literacy related to waste management systems. This application can be used to improve literacy for high school students and can also be learned by the general public. The application display is designed to be simple and easy to use. The application development process is preceded by a flowchart maker, as shown in Figure 2.

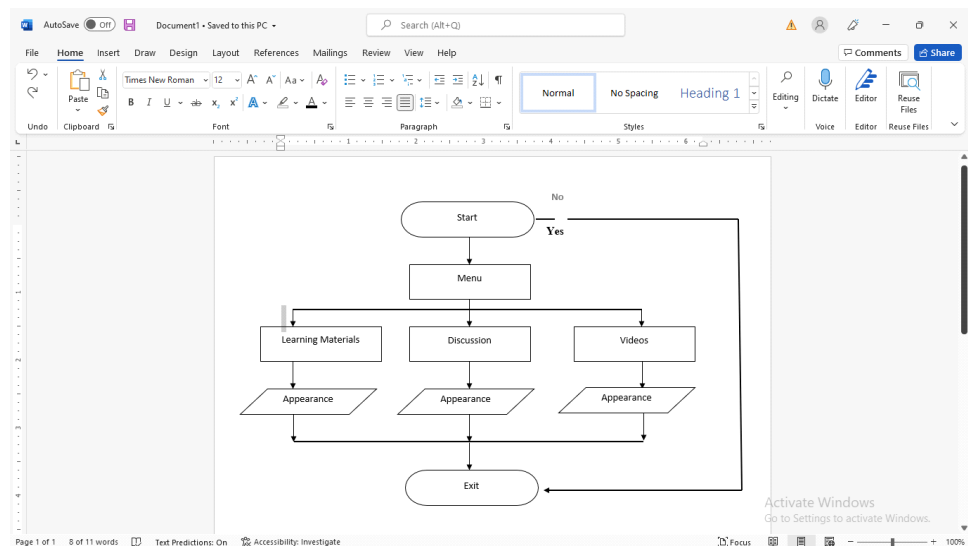


Figure 2: ASAM.ID application development flowchart.

The ASAM.ID application runs on Android-based smartphones. The menu page on the application displays several subs. On the main page display, students can access several sub-menus and some of the material content presented by researchers: waste management videos, information on waste management into renewable energy, and discussions on environmental literacy. The content of the material in the application is the result of a literature review of various articles. The content presented can be updated regularly by application developers. Images of menu pages and material content can be seen in Figure 3 and Figure 4.

Content Learning materials provide information about waste management, from sorting organic and inorganic waste, processing it into compost and pulp, and calculating the economic value of waste processing. Learning videos present content that contains the benefits of managing waste properly and correctly. The literacy discussion provides a space for interaction in managing waste into renewable energy.

The validation results of material experts obtained an average percentage of 90.5%, and the results of the validation of media experts showed an average score of 89%, as

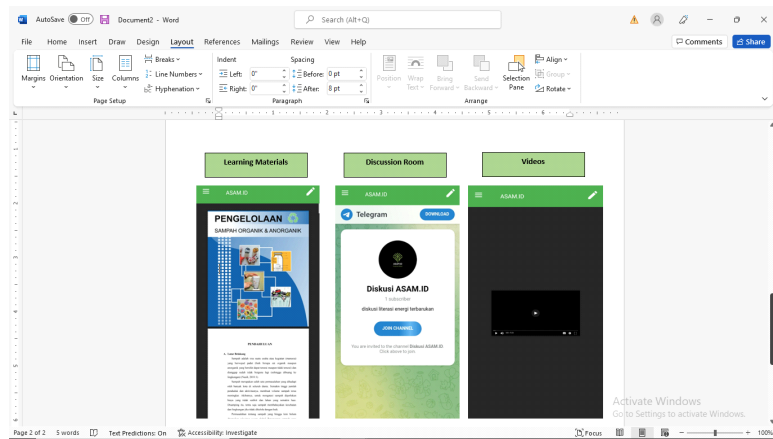


Figure 3: Menu page.

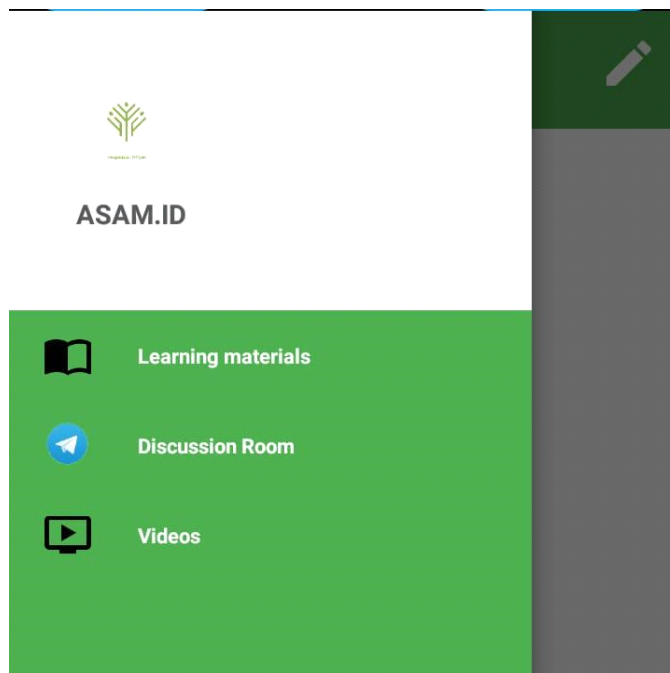


Figure 4: Material content.

shown in Tables 2 and 3. The results of this media validation indicate that application media is feasible for middle school students to use as learning media. The results of validation by experts can be seen in tables 2 and 3.

TABLE 2: Content expert validation results.

No.	Aspect	Percentage	Criteria
1	Content suitability	93%	
2	Language	88%	
Rata-rata		90,5%	valid

The ASAM.ID application is expected to be able to complement some of the results of previous research as an effort to increase environmental literacy related to waste

TABLE 3: Media expert validation results.

No.	Aspect	Percentage	Criteria
1	Appearance	91%	
2	Technique	80%	
3	Construction	96%	
	Rata-rata	89%	valid

management [12–14]. The selection of media mode on an Android basis also considers the increasingly massive availability of devices and ease of access [15]. The use of technology is one of the answers to solving the problem of increasing students' environmental literacy, especially on the issue of waste and its management [16, 17]. Utilizing technology as an electronic learning medium is also the right approach to increasing student literacy.

4. CONCLUSION

Creating an android application for waste management can be an alternative medium for increasing community energy literacy. The development of this application is based on the needs analysis results. The results of the review by material and media experts show that this application is feasible to be used as a learning medium. This study recommends using application media on a broader scale to test its effectiveness.

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