PAPER

# Development of Android-Based Video Series on Climate Change Topic to Empower Students' Environmental Literacy

Nurma Yunita Indriyanti(✉),
Khairunnisa Febryana, Bayu
Antrakusuma

Department of Science
Education, Universitas
Sebelas Maret, Surakarta,
Indonesia

nurma.indriyanti@
staff.uns.ac.id

**ABSTRACT**

Learning in the 21st century requires students to have problem-solving and critical thinking skills. In problem-solving related to the environment, students need a strong foundation in environmental literacy. The environmental literacy of eighth-grade students still falls relatively low within the unfavorable category. It was found that several students still needed to increase their awareness of protecting the environment. Students still need assistance in learning about climate change because there are several abstract concepts to grasp. The characteristics of Generation Z include a low attention span and a dislike for lengthy explanations. The purposes of this study were to (1) determine the characteristics of Generation Z, (2) assess the feasibility of utilizing Android-based video series as a learning medium, and (3) analyze the response of Generation Z to such educational content. This research and development method refers to the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The outcome of this research and development is a video series focusing on climate change, presented in the form of an android. Observation, interviews, and questionnaires are data collection techniques. Learning media validation was conducted by two media experts: a subject matter expert and a language expert. The validity test results were calculated using Aiken's V index formula. The results obtained for the three experts were 0.92, 0.93, and 0.90. The results of the analysis of teacher and student response tests form the expected characteristics of the video series, receiving very positive feedback.

**KEYWORDS**

Android-based, video series, climate change, environmental literacy

## 1 INTRODUCTION

Learning in the 21st century requires students to have problem-solving skills and critical thinking. In problem-solving skills related to the environment, students

need a high level of environmental literacy [58]. According to The Minnesota Environmental Protection Act, environmental literacy refers to an individual's knowledge and understanding of the factors that shape the environment, the underlying principles at work, and the ability to take action to preserve environmental quality in daily life [25–28].

There are four main components of environmental literacy, namely ecological knowledge, cognitive skills, and environmentally responsible attitudes and behaviors [30]. One of the efforts made to increase environmental literacy is through environmental education. One of the public schools in Surakarta City, Indonesia, has incorporated environmental education through the *Adiwiyata* program [5–9]. However, based on the analysis of environmental literacy instruments for 8th-grade students in the school, two indicators were identified that did not meet the criteria. Specifically, the indicators of knowledge and cognitive ability scored 40% in the unfavorable category. The same results were found in research [44], which conducted an analysis of the environmental literacy of junior high school students in Pekanbaru, Indonesia. It was found that cognitive ability had the lowest score, specifically a score of 29, while aspects of knowledge, attitudes, and behavior had scores of 48, 73, and 71, respectively [56–57].

According to an interview with a science teacher at a public school in Surakarta, Indonesia, low environmental literacy knowledge and cognitive ability are attributed to the fact that most students have little interest in reading and have never had direct learning experiences to address environmental challenges [57–58]. This learning related to the environment is primarily based on textbooks, supplemented by additional information provided by teachers on environmental issues. According to research [42], cognitive knowledge is categorized as poor because the learning conducted offers more information on environmental challenges but has not been developed to apply this knowledge to solving environmental problems.

Junior high school science topics closely related to environmental literacy include climate change. By mastering this topic, students' environmental literacy in various aspects will be enhanced [15–19]. However, it has been found that science teachers and students still find it challenging to learn about the topic of climate change because teachers' understanding is still limited to climate, and several concepts are considered abstract by students. This is despite the fact that climate change is a global issue that continues to unfold, and its impact is felt in society [5]. Based on observations, learning materials are necessary to explain the effects of climate change in a clear and simple way to enhance environmental literacy without requiring students to conduct observations outside the school environment, given the limited class hours available for learning.

The authors recognized the potential and proposed the utilization of cell phones as learning media, specifically by developing mobile learning applications for all Android-based cell phones [25–28]. Android-based online learning applications can be a key factor in delivering educational materials, as evidenced by the integration of smartphones into student life [19]. This was reinforced through observations at a public junior high school in Surakarta, Indonesia. Students were permitted to use Android devices as a learning tool, particularly with educational resources that could be accessed freely and at any time. This allowed students to study without time constraints, anywhere and anytime [29].

The development of Android-based learning media is highly supported by teachers and students. This enables them to offer a variety of learning materials

in addition to manuals and PowerPoint presentations. According to one student, carrying textbooks for all subjects made it difficult for students to fit them in their bags due to their excessive weight. Based on teacher interviews, the most preferred learning media among students is learning videos. The characteristics of teaching videos that students prefer are their interest and short duration. Students tend to get bored quickly and prefer concise delivery. This was also reinforced by the results of the learning style test for students, most of whom have an auditory learning style [56].

Creating short educational videos delivered through the Android platform (Android-based video series) can address current challenges. Based on research [13], Android-based learning videos can significantly enhance students' environmental literacy and receive positive feedback from both teachers and students. Short learning videos also receive positive feedback from students and create a favorable impression of the learning process [5–7].

This educational video is designed to be no longer than 1 minute to cater to the attention span of Gen Z, who typically have a limited ability to focus. In contrast, the Gen Z cohort can only focus on the initial 7–10 minutes; they also dislike long-winded delivery [51]. Reduced internet and social media usage also affects teenagers, who do not enjoy reading. To cater to Generation Z, who prefer visual information, have a thirst for knowledge, and constantly seek to update their understanding. One effective learning medium is to incorporate educational material presented in the form of short video content. This is done so that Generation Z can absorb lessons more quickly and accurately [45–48].

Several studies have been conducted using Android-based media. One such study, based on research [31–37], involved creating short learning videos on the topic of stoichiometry within the innovative community feature of the *Aku Pintar* application. The study yielded very positive results in the decent category. In addition to the background that has been explained, research on developing an Android-based video series on climate change to enhance environmental literacy has never been conducted before. Previous studies have discussed the development of instructional videos, but most of the material delivered is lengthy, often exceeding 20 minutes. Hence, the videos become monotonous and seem dull [55]. The research questions are as follows: (1) What are the characteristics of Android-based video series? (2) How feasible is the media? (3) What are the responses of students and teachers after using the media?

## 2 METHOD

This study utilized research and development (R&D) methods to innovatively create a new product or enhance existing products to improve the material [13–15]. The balancing model employed in this study uses ADDIE (analysis, design, development, implementation, and evaluation). The ADDIE model is the most popular model used in product manufacturing due to its easy flow, flexibility, and effectiveness in product balancing. It consists of five stages: analysis, design, development, implementation, and evaluation [3–5].

In an outline, the data collection instruments are presented in Table 1, which covers technical, instructional, and subjective aspects, grouped according to research balancing steps [52–54].

**Table 1.** Data, data collection techniques, and instrumentation

| Target | Technique | Instrument | Subject |
|---|---|---|---|
| Needs analysis | Survey, interview, observation, literature review | Questionnaire | Teacher and students |
| Expert assessment of pre-designed android-based video series | Discussion | Video series design matrix | Expert panel |
| Validation | Video series content validation | Validation sheet | Two experts on each aspect; Media, Science and language |
| Teacher and student responses to the video series | Survey | Questionnaire | Teacher and students |

The data analysis technique used in this study is descriptive quantitative and qualitative analysis, commonly known as mixed-methods, which involves describing and interpreting both quantitative and qualitative data. Before being analyzed, the data from the questionnaire was quantified, and then it was analyzed using descriptive statistics [50–53].

The capital analysis questionnaire was developed to intuitively assess the environmental literacy of 8th-grade students who have yet to meet the criteria [52]. The results of the environmental literacy thesis on students' knowledge and cognitive abilities [47].

$$\%\text{Environmental literacy} = \frac{\sum gain\,score}{\sum maximum\,score} \times 100\%$$

The results of students' environmental literacy tests on attitude and behavior indicators are calculated using the following formula:

$$\text{Attitude and behavior} = \frac{\sum score\,of\,the\,respondent's\,answer}{Skor\,x \sum soal\,x\,score\,x \sum Respondent} \times 100\%$$

The expert validity test serves as a benchmark to assess the technical proficiency in creating visual learning materials and the effectiveness of the educational media produced. This test involves two experts in the field of learning media: one subject matter expert and one linguist. The formula used to calculate Aiken's V index is as follows [19–23].

$$V = \frac{\sum s}{n\,(c-1)}$$

After analyzing product results, student response questionnaire data, and guidance, we examined students' feedback and recommendations to ensure a balanced approach to the products. Student and teacher response questionnaire analysis used a Likert scale (1–4) with criteria of Strongly Disagree (STS), Disagree (TS), Agree (S), and Strongly Agree (SS) [49].

## 3 RESULTS AND DISCUSSIONS

### 3.1 Need analysis

A questionnaire was conducted to assess students' environmental literacy regarding the issue of climate change [50]. The analysis results of students'

environmental literacy on indicators of knowledge and cognitive skills show an awareness level of 40%, falling into the category of less proficiency, as illustrated in Figure 1.
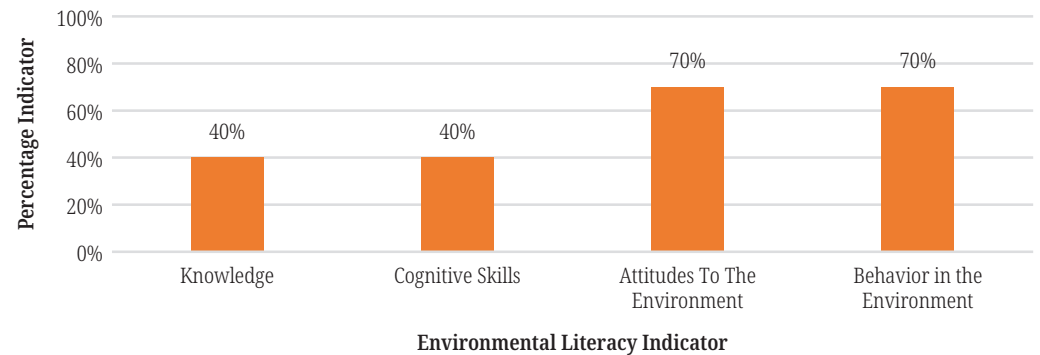


**Fig. 1.** Results of the environmental literacy questionnaire

Based on Figure 1, students' low environmental literacy in knowledge and cognitive skills indicators is attributed to their lack of interest in reading. Most of the students, especially in grade 8, exhibit the characteristic of becoming bored quickly when engaging in prolonged and monotonous learning activities, such as reading [48]. This is in line with the results of the analysis of environmental literacy questions. Students require assistance in completing environmental literacy questionnaires and seem unfocused when reading case studies about current environmental challenges worldwide [46].

## 3.2    Design stage

The creation of video content that was carried out was adapted to maintain a balance.

Competency achievement indicators (GPA) related to climate change for 8th-grade students are illustrated in Figure 2.
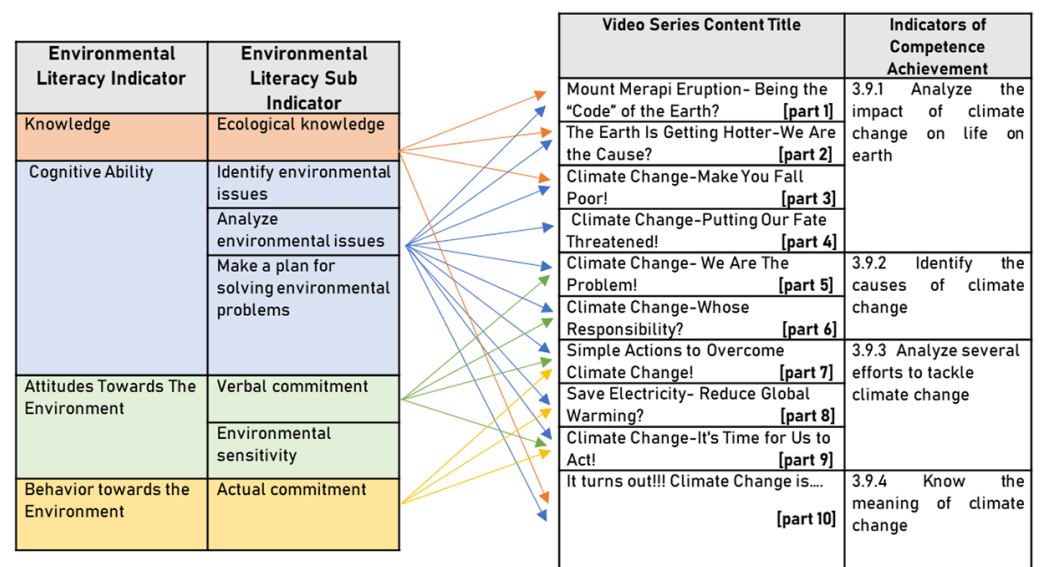


**Fig. 2.** Linking video series content themes to environmental literacy indicators

The next stage involves creating the video script, specifically focusing on video capture and recording. The recording starts from the 1st video series to the 10th. The devices used when carrying out video recording include a ring light, a Bluetooth headset, and a smartphone [47]. The Takei video is produced according to the pre-made script. Next, editing the video is carried out after the video is complete. The process of editing videos involves using editing applications such as Capcut, Canva, PicsArt, and VN, as illustrated in Figure 2.

### 3.3    Development stage

The media balancing stage is carried out after the analysis and design stages. The analysis results and the media design are used to balance this medium [45]. The packaging of the *Sainspedia* video series application is an attempt to intuitively innovate on media, as demonstrated in Figures 3–6.
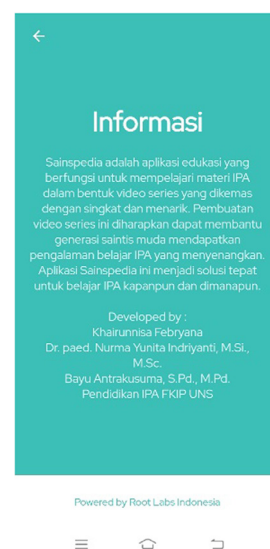


**Fig. 3.** Menu main page
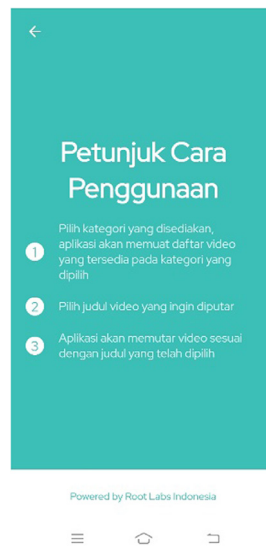


**Fig. 4.** Application information page

**Fig. 5.** Instruction page on how to use



**Fig. 6.** Climate change topics page

The next step is expert validation. Media expert validation provides an initial product assessment based on criteria or aspects related to the learning media [42]. Based on the calculation using the coefficient analysis technique, Aiken's V validation obtained an average value of 0.92. Material expert validation provides an initial product assessment based on criteria or aspects related to the material presented in the learning media [39]. Based on the calculation using the coefficient analysis technique, Aiken's V validation obtained an average value of 0.93. Linguistic validation provides an initial assessment of a product based on criteria or aspects related to language in learning media. Based on the calculation using the coefficient analysis technique, Aiken's V validation obtained an average value of 0.90. Based on Aiken's V limit table, it is stated that the three values with the highest validity test, ranging from 0.8 to 1, are considered highly valid [37].

After expert validation, the next step is to assess the responses of students and teachers to the developed media [1]. The results of student and teacher response tests produced balanced media characteristics, namely: (1) videos with a maximum

duration of 1 minute that adjust to the capabilities of Gen Z; (2) packaged in the form of an Android-based application;(3) user-friendly; (4) the titles in each video series are created using a "clickbait" strategy; (5) the material is presented in a multimedia; (6) the size format, and graphic resolution are optimized for Android-based smartphones; and (7) the delivery of the material in the video series is structured in a sequential manner with links between the video series [25].

This study aims to develop an Android-based video learning platform named *Sainspedia*, focusing on climate change, to enhance the environmental literacy of 8th-grade students. The research method used is the ADDIE model, specifically focusing on the development or balancing stage [2]. Simultaneous evaluation is carried out at each location. The limitation is that the researcher only represents the product that is feasible to use but needs to go further to implement the media as well as assess the effectiveness or impact on students. The resulting characteristics of the implementation of Android-based video series media development include videos with a maximum duration of 1 minute. This caters to the preferences of Generation Z, who have a limited attention span. Research shows that Gen Z individuals can only concentrate for the first 7–10 minutes of a class session and prefer concise delivery [51]. Reduced internet and social media usage also affects teenagers, who are not fond of reading. To cater to Generation Z, who prefer visual information, have a thirst for knowledge, and constantly update their understanding [8]. One learning medium that can be utilized is incorporating educational materials presented as short video content. This is done so that Gen Z can absorb lessons more quickly and effectively [48–49].

The additional features of the development of this Android-based video series media are packaged in the form of an Android application, which can be downloaded on an Android smartphone [52]. Using smartphones as learning tools is a novel experience for students due to their simple design and widespread accessibility, making them easy to use anytime and anywhere [25–27]. The video series developed also has the characteristic of being user-friendly. The material is delivered using language that makes students feel comfortable and familiar, and explanations for abstract concepts are compared to simple things relevant in students' real lives. So that students can understand the message of learning more meaningfully and receive the information in a way that facilitates automatic storage in long-term memory [14].

In addition, making titles in each video series is done with a "clickbait" tactic, which is a strategy for creating enticing titles that prompt people to click on the content. This strategy was applied in developing this video series with the aim of sparking curiosity among students for each video in the series [57]. An example of using the title in a clickbait manner can be found in the 10th video series entitled "Apparently!" Climate change is …. A label can be considered clickbait if the title used arouses curiosity. The title evokes the reader's emotions and includes humorous and memorable images [10].

This Android-based video series was also created with a focus on media visualization. The content is presented in a multimedia format, incorporating text, animation, sound, and video to enhance the delivery of information in each video. Furthermore, the video also utilizes various graphic sizes and resolutions that are compatible with Android-based smartphones. The content delivery in this video series is presented in a conversational manner and links the video series [21–23].

There is a relationship between the content themes of video series 1 to 10. Video series 1 to 4 specifically focus on discussing the impacts of climate change. After students understand the effects, they will watch a video series consisting

of 5–6 episodes discussing the causes of climate change. The 7th to 9th video series discusses the efforts that must be made to tackle climate change. Finally, after students have learned about the causes, impacts, and countermeasures, they will enter the 10th video series discussing climate change [32]. Creating video series content with a compelling plot is expected to capture students' attention and pique their curiosity, encouraging them to watch episodes 1 to 10. Upon completing the entire video series, students will acquire a deeper understanding of the causes of climate change and related environmental issues, which can motivate them to participate in efforts to mitigate the impacts of climate change [29].

## 4    CONCLUSION

The conclusions from this research are as follows: The media characteristics that are balanced include: (1) Videos with a maximum duration of 1 minute tailored to the preferences of Gen Z, (2) packaged in the form of an Android-based application, (3) user-friendly, (4) video series titles created using a "clickbait" strategy, (5) content presented in a multimedia format, (6) optimized for size and graphic resolution on Android-based smartphones, and (7) material delivery in the video series following a sequential and interconnected structure. The feasibility tests conducted by material, media, and language experts have yielded values of 0.92, 9.93, and 0.90, respectively. The highest value falls within the range specified by Aiken's V table for 10 intellectual items, where values between 0.8 and 1 are considered highly valid. The test was conducted in the form of a teacher-student interaction test regarding the media that was created. The try-out was conducted on 32 students in grade 8 and science tutors from grades 7 and 8. The results of the teachers' and students' response tests were analyzed by calculating the frequency distribution. It was found that most of the video series received a high percentage, scoring of 3–4 on each item indicator. As a result, the teacher and student responses were categorized as very positive.

## 5    ACKNOWLEDGMENT

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# 7 AUTHORS

**Nurma Yunita Indriyanti,** Department of Science Education, Universitas Sebelas Maret, Surakarta, Indonesia (E-mail: nurma.indriyanti@staff.uns.ac.id).

**Khairunnisa Febryana,** Department of Science Education, Universitas Sebelas Maret, Surakarta, Indonesia.

**Bayu Antrakusuma,** Department of Science Education, Universitas Sebelas Maret, Surakarta, Indonesia.