Socio-scientific issues in gadget: interactive multimedia to increase z-generation scientific literacy

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Abstract—**Indonesian student scientific literacy needs to be improved. Middle school students today are millennial (generation Z) who cannot be separated from gadget in almost all of their daily activities. This study aims to find alternative ways to improve Z generation science literacy by utilizing gadget, namely studying Socio Scientific Issues (SSI) and their analysis which are packaged in a multimedia interactive (MI) form. The MI-SSI-gadget development uses a 4-D model, with adjustments to the design stage. This study uses i-spring, AIR_SDK, Andaired, and JAVA to develop gadget-based multimedia. This study is on the validity stage according to experts on MI-SSI-gadget to improve scientific literacy. Validity data is obtained from the expert assessment using a multimedia validity assessment instrument. Data were analyzed by descriptive analysis. The results showed that the MI-SSI-gadget according to experts is suitable for learning to improve generation Z scientific literacy, with some suggestions for improvement.**

Keywords— Socio Scientific Issues, Devices, Interactive Multimedia, Science Literacy, Generation Z

I. INTRODUCTION

Student scientific literacy in Indonesia needs to be improved. This is evident from the publication of the Organization for Economic Co-operation and Development - Program for International Students Assessment [1] which reveals a comprehensive picture of student literacy. The average literacy ability of Indonesian students, which includes scientific literacy skills, is still not encouraging. Nevertheless, the OECD revealed that science education in Indonesia is proceeding to progress tremendously so that from 2012 to 2015 there was an increase in literacy scores of up to 21 points [1].

As the Head of the Research and Development Agency (Balitbang) the Ministry of Education and Culture (Kemdikbud), Totok Suprayitno, said that the increase in Indonesia's achievements in 2015 was enough to provide optimism, although it was still low compared to the OECD average. Based on average values, there was an increase in the PISA value of Indonesia in the three competencies tested. The biggest increase was seen in scientific competence, from 382 points in 2012 to 403 points in 2015.

This fact shows that Indonesian students' scientific literacy can be improved, which is also in line with efforts to increase scientific literacy through the research of [2] and [3]. The results of the research that have been conducted also show creative ways that are of interest to students, so that students become interested in reading, thinking, conducting investigations, and making decisions related to socio-scientific issues. Creative ways that can be done are by using a flip-book [4], and a blog [3].

At present school-age students are generation Z students, generations born in the 2000s [5]. This generation is characterized by their tendency that cannot be separated from the device. These conditions can be utilized and provide a large space for teachers to use these devices as a means of supporting science learning. As research by [6], shows that the proper use of devices tends to arouse student learning, and [7] show that devices become productive for students if accompanied by proper usage rules. Based on this phenomenon, the author has developed a device-based interactive multimedia as a medium to improve scientific literacy skills in junior high school students.

The features contained in the device contain content that contains Socio Scientific Issues (SSI), concepts of relevant material and issues that are used as themes, and tests used to measure students' scientific literacy skills. SSI is a social issue that is controversial, unstructured, has a close relationship with science, and is open, allowing many alternative solutions to solutions. SSI also give a chance to student for dialogue, discussion, and debate [8,9].

SSI was chosen in the development of device-based interactive multimedia (IM-SSI-gadget) because SSI was able to promote scientific literacy by emphasizing students' ability to apply their knowledge and morals in responding to and solving problems in real life [10,11]. Research studies have shown SSI to be effective in improving students' understanding of science in various contexts [12], argumentation, empathy, and moral reasoning skills[13].

II. METHOD

This study uses a 4-D model, by adjusting the design stage. This study uses i-spring, AIR_SDK, Andaired, and JAVA to develop device-based multimedia. This study arrived at the desk evaluation stage according to experts on IM-SSI-gadget to improve scientific literacy to find validity of IM-SSI-gadget. Validity data is obtained from expert

assessment using a multimedia validity assessment instrument. Data were analyzed by descriptive analysis.

III. RESULTS AND DISCUSSION

Based on the research that has been done, the following products and data are obtained:

1. IM-SSI-Gawai

[14] defines computer-based multimedia as "a type of interactive communication system that is computer controlled, which creates, stores, and re-displays network text, graphics, and audio information". In other words, computer-based multimedia involves computer presentations from various media formats (eg text, images, sounds, and videos) to convey information in a linear or nonlinear format. In general, multimedia means the use of several media including text, graphics, animation, images, videos, and sounds to present information [15].

In this study, the devices used use the Android platform. Interactivity in multimedia will occur naturally, if this multimedia is packaged in an application file format (APK) that can be installed into the device. The programs needed in making the IM-SSI-gawai are as follows:

a. i-Spring, is software that can convert.PPT files to .swf.
b. Air_SDK. The Software Development Kit (Air_SDK) is used to build Android applications, such as editing HTML and source code.
c. Youired is software that can convert flash games to .apk.
d. Java is a programming language that uses software or software development.
e. Flash Player, is a software that allows users to run files that release flash player support.
f. Video Converter, is software that can convert video formats to .mp4, .flv, .swf, .mpg, .avi, .wmv, .mkv, .mp3, .wav, .ogg and .aac.
g. Coreldraw and photoshop to create icons and image editing.
h. Microsoft PowerPoint version 2010.

The flow of device-based multimedia development based on the development conducted is shown in Figure 1.
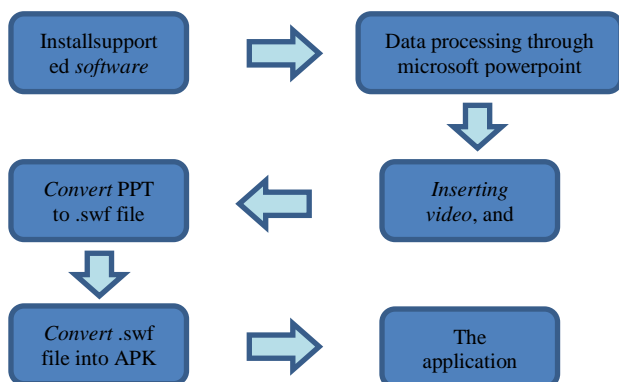

Figure 1. Flowchart of Android APK development [16]

The product produced in this study was a device-based science learning multimedia. Product specifications are as follows.
a. Multimedia is packaged in the form of an application file (APK) that can be installed into an Android-based device.
b. Multimedia contains socio-scientific issues that are packaged in text, image and audio-visual-motion formats.
c. Multimedia facilitates training and final tests of scientific literacy.

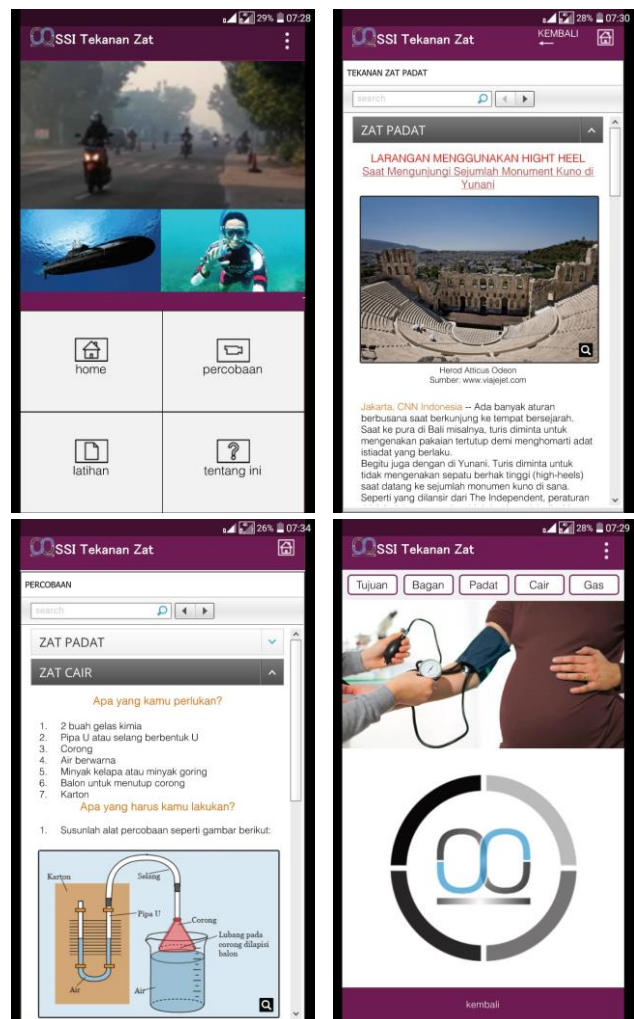Here are some of the APK screen-shots.

Figure 2. The Screen Shoot of The Application

This IM-SSI-gadget is not only provide some information about the topic that student will be learned, but also provide some activities that allow student to do some experiments. Teacher can use structured inquiry to use this application in class in order to enhance students' scientific literacy [17].

2. Validity of IM-SSI-Gawai

Table 1 shows the results of the analysis of 3 expert assessors of IM-SSI-Gagdet developed in terms of content, technical and presentation eligibility criteria.

TABLE I VALIDITY OF IM-SSI-GADGET

Aspect	Criteria	Score			Modus
		V1	V2	V3	
Content	Concept truth	4	5	5	5
	Depth of concept	4	4	5	4
	Concept breadth	4	5	5	5
	Practice how to solve problems	5	5	5	5
	Practice scientific literacy skills	5	5	5	5
	Presentation structure	5	5	4	5
	Presentation flow	5	4	4	4
	Written language	5	5	4	5
	Narrative language	5	5	5	5
Technical	Menu and sub-menu link	4	4	5	4
	Navigation link	5	5	5	5
	Help menu	5	5	5	5
	Exercise answer choice	5	5	5	5
	Media elements	5	4	5	5
	Interactivity	5	4	4	4
	User friendly	5	5	4	5
Display	Clarity	5	5	5	5
	Relevance	4	5	4	4
	Organizing	5	4	5	5
	Attraction	5	5	4	5
	Confidence	4	4	5	4
	Satisfaction	5	5	4	5
	Results	4	4	4	4

Table 1 show that the concept explained in IM-SSI-gadget is already correct without any misconception. The depth and breadth of the concept is also suitable for secondary students. Table 1 show that the activities practice how to solve problems. This learning material will lead students to enhance their scientific literacy by doing some activities related to SSI [17]. Table 1 also shows that the application has is an interactive menu that provide some exercise and the answer.

Z-generation is the generation that can be separated from digital devices, so this IM-SSI-gadget hopefully can increase their scientific literacy during learning process. The task in this application will lead students' curiosity and problem solving. This kind of activity will increase students' scientific literacy [18].

IV. CONCLUSION

Based on the results of data analysis, it can be concluded that IM-SSI-gadget is suitable for use in learning in z-generation to improve scientific literacy.

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