Developing e-module of environmental health for gaining environmental hygiene awareness

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Abstract. As a developing country, handling garbage is one of the major problems of the Indonesia’s society. Thus, introducing the environmental education (especially, environmental health) could be used as one solution. Therefore, the education on environmental health is needed to gain the awareness of Indonesia’s society toward environmental hygiene awareness. In order to support the environmental health education, e-modules can be considered as a tool to spread environmental education. The developed module is designed for Indonesia’s society. Here, the developed e-module is tested based on validation of experts, and the implementation to user has been observed, which showed that 84.91% users can accept the modules.

1. Introduction
One of the major problems of many developing countries is to handle the garbage, as in Indonesia. On the other hand, in waste management, developed countries considering many factors to handle it. Developing human resources is a part of the factors which is considered to be external support package. Here, the governments provide poster and other media to educate the community to manage the garbage, such as, separating and recycling the garbage[1]. Hence, environmental education should be considered as a solution to educate the community to manage their garbage, and it could be also implemented in Indonesia.

Smartphone applications can be used as educational media such as interactive e-modules that are expected to be accessed easily and could be developed in order to attract the users. Thus, e-modules, which could be accepted by all users, are developed in this research. The proposed topic is Interactive Modules “Environmental Health” to improve the Community Awareness toward Environmental Hygiene.

2. Research Methods
The aim of this paper is to development education media as interactive modules environmental health to improve the community awareness toward environmental hygiene.
2.1. Interactive E-Module

Generally, the improvement of computer and information technology, the functionality of e-modules are increasing rapidly. E-modules are earning modules, which is used to support distance learning, so those modules can be widely accessed as interactive media without constrained time[2]. Currently, most of users use smart-phones to access the learning materials. A smart-phone can be used as a tool, which support high mobility with features, such as telephone, personal digital assistants (PDAs), email, camera, video recording and player both. These features make smart-phones possible to be developed as learning media, such as the development of games as a medium of learning application that makes learning modules become increasingly interactive.

![Environmental Health Diagram](image)

**Figure 1.** Scheme of environmental health module

2.2. Health Environments Awareness

The word “environmental”, however is almost always used in reference to human interaction with the ecosystem[3], which consist living things, inanimate object, and also human. Maintenance the environment is one of the major problems in Indonesia society, where large amounts of garbage have been produced by household every day. Based on the news reported by ‘Kompas media’ in March 7th, 2014, it was stated that every person generates 0.8 – 1.5 kg of garbage every day. While the Indonesia’s population will be 270 million people by 2025[4], then it will be predicted that 270,000 tons of of landfill waste bins.

Awareness of Indonesian society to participate in reducing the volume of waste is still low. Some people have not sort out the rest of the kitchen waste with other waste, such as plastic, paper, bottles, cans, and so on. This situation contrasts to the situation in developed countries, such as Japan, where people from elementary school students to elderly community, very conscious of the sorting bins, which is reflected in our daily activities. Those activities show the continuity of education at schools and at home. Therefore, Increasing the public awareness in terms of maintaining the cleanliness needs to be improved by aligning education at school and at home.
2.3. Developing E-Module of Environmental Health

E-module of environmental health is developed using a Sadiman’s development model [5], which will be used to develop the material. E-module "environmental health" was developed to be interactive and accessible using smart-phones. Android technology allow applications to be made available whenever and wherever without limited space and time. Microsoft Power Point program can be integrated with developing Android-based modules. It can be done by converting Powerpoint file to Android file. The expected result of developing this e-module is that the module can be accessed easily, and can be used by the various levels of society, so that learning can be accepted by public society. The scheme of environmental health module is shown in Fig. 1.

3. Result and Discussion

The main contents of the e-module is an interactive learning materials, which are arranged in order to attract the attention of community to learn the contents.

3.1. Clipping of Material Content

This module consists of four contents, i.e., (1) theory; (2) video; and (3) evaluation. The theory explained in this module consist of: (a) humans as social beings, (b) a healthy environment, (c) maintaining of personal hygiene and the environment. The content is shown in Fig. 2.
3.2. Validation and Implementation of E-Modules

The initial data collection in this process is done by validating of e-modules by media experts, material experts, and users. The instruments of questionnaire is developed as shown in Table 1. The data were used here is quantitative data, which is obtained from the questionnaire given to the expert assessment materials, media experts, and students. The technique for analyzing data is adopted from Akbar, where the validation criteria can be adjusted to the number of instruments and the value of the item scores[6].

The scale between classes of the validation instrument is determined using Linkert scale with the validation categories of the modules are represented as “very valid”, “valid”, “not enough valid”, and “invalid”. Where the percentage of validity is calculate using question 2.

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Table 1. Instruments Indicators

| No. | Validator | Characteristic |
|-----|-----------|----------------|
| 1.  | The Expert Media | E-Module compliance with user characteristic |
|     |            | Clarity of content or message that include in E-Module |
|     |            | E-Module compatibility with hardware |
|     |            | Ease for understanding the interface design of E-Module |
|     |            | Ease navigation in the E-Module |
| 2.  | The Expert Material | E-Module compatibility with learning goal achievement |
|     |            | Clarity of materials content with competency standard |
|     |            | E-module can be used for learning independently |
|     |            | E-Module compatibility with evaluation of learning materials |
|     |            | The effectiveness of E-Module can be used as a supplement for learning activities |
| 3.  | User       | Ease for understanding the learning material in the E-Module |
|     |            | The pictures are clarity and compatible with the text content |
|     |            | User of E-Module could increase their learning motivation |
|     |            | User of E Module can use it for more flexibility to study |
|     |            | The questions of the quiz compatibility with the learning material |
|     |            | Ease in use of E-Module |

\[
PV = \frac{SIA}{SMaks} \times 100\% \quad (2)
\]

Where, PV represents the percentage of validation, SIA represents the interval score between classes, and SMaks represents the maximum score. When the validation result is valid, the e-module can be used without revision. While the result is quite valid, then e-module can be used with minor revisions. On the other hand, e-module can not be used if it is expressed as ‘not enough valid’, and ‘invalid’.

The successful rate of e-module is measured in the implementation, which is done in several steps as follows: (1) Users in a small group are given a pre-test / interview regarding their understanding of environmental health. (2) The users are given instructions on how to access and install the e-modules of environmental health. (3) The users are also given a post-test on the understanding of environmental health. (4) The results of the pre-test and post-test are analyzed to see the successfulness of users’ awareness in environmental health.

Based on the percentage of the overall items, it was obtained that the validation of e-module is 84.91%, which means that the module can be used as a learning module.
4. Conclusion
Based on the results of e-module environmental health, then some conclusions can be drawn as follows: The e-module of environmental health was developed using Sadiman development model. The validation results of the media experts, material experts, and implementation in the small group of students showed the results as, 85.42% (valid), 83.33 (valid), and 84.91% (very valid), respectively. Based on the results, the module can be justified that this module is appropriate to be used as a learning module.

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