23 (3), 2022, 854-871

Jurnal Pendidikan MIPA

e-ISSN: 2550-1313 | p-ISSN: 2087-9849

http://jurnal.fkip.unila.ac.id/index.php/jpmipa/

Development and Implementation of Interactive e-Module using Microsoft Sway to Improve Disaster Literacy Skills

Laurensia Trimeta Platini [1], Abdurrahman[2], Dewi Lengkana[2]

[1]Graduate School of Science Education, Universitas Lampung, Indonesia.

[2]Department of Science Education, Universitas Lampung, Indonesia

Abstract: Disaster literacy needs to be introduced to provide understanding to students and minimize disaster risk. The purpose of this study was to determine the use of an interactive e-module based on Microsoft Sway which is valid and effective in increasing students' literacy. The design of this study uses a 4D (four-D) Research dan Development (R&D) model. The research sample consisted of control and experimental classes with instruments in the form of test instruments, questionnaires, and interviews. Data analysis was based on n-gain data, effect size, and descriptive percentages of teacher and student responses. The percentages of construct, content, and language validation obtained were 84.68%,80.58%, and 86% respectively, with all valid criteria. The study findings indicate that the use of an interactive e-module based on Microsoft Sway is valid and highly effective in improving students' disaster literacy skills.

Keywords: Interactive e-module, disaster literacy skills, disaster literacy, Microsoft Sway.

Abstrak: *Literasi bencana perlu diperkenalkan untuk memberikan pemahaman kepada siswa dan meminimalisir risiko bencana. Tujuan penelitian ini untuk mengetahui penggunaan e-modul interaktif berbasis Microsoft Sway yang valid dan memiliki efektivitas untuk meningkatkan literasi kebencanaan siswa. Desain penelitian ini menggunakan desain Riset and Development (R & D) model 4D (four-D). Sampel penelitian terdiri dari kelas kontrol dan eksperimen dengan istrumen berupa instrumen tes, angket dan wawancara. Analisis data berdasarkan data n-gain, effect size dan persentase deskriptif tanggapan guru dan siswa. Persentase validasi konstruk, isi dan bahasa yang diperoleh secara berturut-turut adalah 84.68%, 80,58% and 86% dengan kriteria seluruhnya valid. Berdasarkan hasil pre-test and post-test didapatkan N-gain 0,66 dengan kriteria sedang untuk meningkatkan literasi kebencanaan siswa. Temuan penelitian menunjukkan bahwa penggunaan e-modul interaktif berbasis Microsoft Sway valid dan memiliki efektivitas tinggi untuk meningkatkan kemampuan literasi kebencanaan siswa*

Kata kunci: *e-modul interaktif, keterampilan literasi kebencanaan, literasi kebencanaan, Microsoft Sway.*

▪ INTRODUCTION

Disaster literacy needs to be introduced in Indonesia, especially in Lampung as an effort to provide understanding to students and the community about disasters to minimize disaster risk (Mufit, Asrizal, Hanum, & Fadhilah, 2020) because most natural disasters occur in Indonesia such as tsunamis, tornadoes, floods. , landslides, and volcanic eruptions (Sampurno, Sari, & Wijaya, 2015). According to BNPB, 2021, there have been 2,024 natural disasters 2021. Data shows that 20% of Indonesia's territory is flood-prone, 4% is a volcanic-prone area, and 49% is an earthquake-prone area (Kamil, Utaya, & Utomo, 2020). The Central Statistics Agency (2021) noted that in Lampung, for example, the most frequent disasters that occurred during 2021 were floods where 328 flood cases occurred. The disaster certainly has an impact such as damage, loss, to

Laurensia Trimeta Platini
*Email: laurensia.trimeta124@gmail.com

DOI: http://dx.doi.org/10.23960/jpmipa/v23i3.pp854-871
Received: 01 Agustus 2022
Accepted: 25 Agustus 2022
Published: 31 Agustus 2022

cause casualties. Minimize this impact, it can be done by increasing community preparedness by increasing disaster literacy skills (Asshiddiqi, Vitasari, Biru, 2021).

Disaster literacy is an individual's ability to read, understand and use disaster knowledge, understanding, and prevention information that will be used as an information policy by following instructions in the context of mitigation, preparedness, response, and recovery from disasters that occur (Brown, Haun, & Peterson, 2014; Asshiddiqi, Vitasari, Biru, 2021), both before the disaster, during the disaster and after the disaster (Mufit, Asrizal, Hanum, & Fadhilah, 2020). Disaster literacy information content built on community or personal experience, interpretation, and understanding of disasters in their environment (Babcicky, & Seebauer, 2017) can be a very valuable source of knowledge (Nadeak, 2015). Experience with hazards makes people uniquely aware of their vulnerability to the consequences of disasters (Terpstra, 2011), increasing perceptions of understanding of disaster risk (Weinstein, 1989). The experience of a disaster encourages people to feel at risk if the disaster happens again (Siegrist & Gutscher, 2006; Lindell & Hwang, 2008; Kellens, Zaalberg, Neutens, Vanneuville, & De Maeyer, 2011) because he will associate his emotions with the disaster that will occur.

Disaster literacy must be applied in the Indonesian curriculum (Ajar & Ronggowulan, 2022) considering that currently, the level of knowledge of the community including students in schools about disaster and disaster literacy is still low (Asshiddiqi, Vitasari, Biru, 2021). Although many school locations are located in disaster-prone areas, the level of awareness in terms of knowledge is not sufficient (Firaina, Apriani, Husniyah, Asrizal. 2019). If knowledge and information management of disaster literacy can be learned by students in the curriculum, they will better understand disaster mitigation (Kastolani, & Mainaki, 2018). Disaster literacy development is not only limited to increasing knowledge (Gaillard, Clave, Vibert, Azhari, Dedi, Denain, Efendi, Grancher, Liamzon, Sari, & Setiawan, 2008), perception and awareness of disaster risk but also must translate knowledge into action. or preparedness behavior (Ronan, Crellin, & Johnston, 2010). Studies have shown that schools that adopt topics or issues of disaster risk reduction can effectively increase knowledge, perception, and awareness of risk, but disaster preparedness actions or behaviors are still limited (Adiyoso, 2018).

Disaster literacy can be taught in science subjects at the 7th-grade junior high school level through basic competencies explaining risk reduction actions before, during, and post-disaster according to the threat of disaster in the region. This basic competency focuses on the threat of disaster in the areas where students live and school. Therefore, the disaster literacy taught must be adjusted to the student's background (age, education, school location, disaster, and the location of the student's residence as well as the potential for disasters that occur in the area). However, what has happened so far is that these basic competencies are only taught according to the disasters described in the learning resources used.

Based on the results of interviews conducted with 3 science teachers in Bandar Lampung, the three teachers stated that in teaching basic competencies about explaining risk reduction actions before, during, and after disasters in accordance with the threat of disasters in the region, three of them have not adjusted to potential disasters that may occur. happened in the area where he taught. Bandar Lampung, which is a densely

populated urban area, has the potential for flood disasters. However, when teachers teach these basic competencies, the topic of flood disasters is still very minimally taught. Due to the lack of material about flood disasters, students have not demonstrated mastery of disaster literacy, especially the topic of flooding.

From the questionnaires given to 35 teachers and 60 students from 10 Junior High Schools (SMP) located in the areas of Bandar Lampung, Gisting, Metro, and Pringsewu, Lampung Province, 60% of the teachers stated that they had adjusted the teaching materials with these basic competencies. 77% of the total teachers who were respondents stated that they had used disaster literacy in the basic competencies taught and 33% of students stated that they had understood the material about disaster threats in the area through the learning resources used by teachers. 40% of students and 69% of teachers stated that in the area where they live or are often threatened by disasters, 11% of teachers and 30% of students stated that floods have occurred or frequently occur in their areas of residence. 69% of teachers have provided insight and trained students in disaster mitigation, preparedness, response, and recovery. This is in line with the statement of 30% of students who stated that they had understood flood disaster literacy.

Learning about disaster literacy can be done using learning modules. Based on the preliminary questionnaire, it is known that 85% of teachers still use the print module as their teaching material. Even though the use of the print module is less effective and interactive, with static images it has a display that tends to be monotonous (Irwansyah, Lubab, Farida & Ramdhani, 2017), tend to be informative and less attractive because it cannot display sound, video, animation, and images that can provide explanations. better than the concept presented (Darmaji, Astalini, Kurniawan, Parasdila, Irdianti, Susbiyanto, Kuswanto, & Ikhlas, 2019). Therefore, it is necessary to modify the print module in the form of an e-module (Darmaji, Astalini, Kurniawan, Parasdila, Irdianti, Susbiyanto, Kuswanto, & Ikhlas, 2019). E - interactive modules can help students develop knowledge and improve students abilities independently in learning materials, both in class and distance learning (Sintawati & Margunayasa, 2021) because teachers act as facilitators and mediators (Aprilia & Suryadarma, 2020; Boyd, 2019). An e-module is useful for students because it contains clear objectives, subject matter, and activity sheets and can check students' understanding independently (Citrawathi, Adnyana, & Santiasa, 2016), can increase students' interest in learning (Neppala, Sherer, Larson, Bryant, Panjwani, Murphy & Gillespie, 2018), presenting material presented by multimedia such as videos, animations, simulations, and questions with direct feedback (Irwansyah, Lubab, Farida & Ramdhani, 2017), so that learning content becomes more dynamic, effective and fun. One of the online applications that can be used to create interactive e-modules is Microsoft Sway. This application was chosen because it has advantages (a) it has excellent design features to make it easier for teachers to upload various content such as videos from YouTube, images, tweets, and multimedia content such as videos, animations, simulations, and questions with direct feedback (Irwansyah, Lubab, Farida & Ramdhani, 2017) (b) can choose content such as photos and videos stored in the Cloud since the Sway App is connected to the Cloud App; (c) The Sway application will reformat the presentation slides when the presenter opens them via devices such as smartphones, tablets, or laptops or computers (Ferdiana, Eka, & Fauzan, 2013); (d) The Sway application is equipped with Apps that make it easier for teachers to collaborate with other teachers to create Sway projects (Istiqomah,

2016) so that they can be a solution for teachers who want to develop media with a few easy steps (Dwianto, 2016).

Currently, there is research on the use of compatible e-modules in blended learning in disaster management discourse, which affects student preparedness for disasters, especially with the topic of floods, earthquakes, and covid-19 (Bachri, Irawan, & Aliman, 2021). Hamid, Trihatmoko, Herlina, & Aroyandini (2021) developed a model of disaster education to improve students' disaster mitigation literacy by integrating it with school subjects and local wisdom owned by the local community. The development of a STEM-based disaster mitigation module for secondary schools can improve understanding and preparedness for the COVID-19 disaster (Septaria, Dewanti, & El Afidah, 2020).

Previous research on the use of e-modules stated that the use of compatible e-modules in blended learning in the discourse of disaster management has an effect on student preparedness for disasters, especially with the topic of floods, earthquakes, and covid-19 (Bachri, Irawan, & Aliman, 2021). Although the use of e-modules has been carried out in the discourse of disaster management, it is only limited to student preparedness for disasters. This research has not shown an increase in disaster literacy in the context of mitigation, preparedness, response, and recovery from disasters that occur. To be feasible to be used to improve disaster literacy, e-modules must go through validation tests from experts. Therefore, to show an increase in disaster literacy that does not yet exist, it is necessary to develop an interactive e-module based on Microsoft Sway that is valid and has the effectiveness to improve disaster literacy for junior high school students.

▪ METHOD

This research was conducted in February 2022. At the beginning of the study, a needs analysis was carried out by interviewing 3 (three) Integrated Science teachers and giving questionnaires to 60 7th grade students from SMPN 36 Bandar Lampung, SMPN 22 Bandar Lampung, SMPN 14 Bandar Lampung, SMPN 24 Bandar Lampung, SMP Xaverius 4 Bandar Lampung, SMP Xaverius 2 Bandar Lampung, Christian SMP 5 Bandar Lampung, SMP Muhammadiyah 1 Gisting, SMP Xaverius Metro, SMP Swadiri 1 Seputih Agung. During the product trial, three science teachers and 28 seventh-grade students of SMP Xaverius 4 Bandar Lampung were involved. The implementation phase, involved 25 7th grade students from SMP Xaverius 4 Bandar Lampung as subjects of the experimental class.

The research method used in this research is Research and Development (R&D), with the research design using a 4D (four-D) development model. The 4D development model consists of 4 stages, namely define, design, develop, and disseminate (Thiagarajan, Semmel, & Semmel, 1974). In the define stage, an activity is carried out to determine and determine the conditions needed in the development of interactive e-modules to improve disaster literacy. Then the student analysis, task analysis, concept analysis, and formulation of learning objectives were also carried out.

At the design stage, an interactive e-module was designed using the Microsoft Sway application. At this stage, test preparation, media selection, format selection, and initial design are carried out. The initial design in this stage refers to the e-module format according to Sintawati & Margunayasa (2021) which consists of a cover, introduction, table of contents, basic competence, achievement indicators, learning

objectives, instructions, content/material accompanied by pictures, audio, video, summaries, and exercises. At the development stage, it aims to produce development products, namely interactive e-modules based on Microsoft Sway to improve disaster literacy. At this stage, expert validation was carried out involving 2 validators and 3 practitioners. At the development stage, an interactive e-module product trial was also carried out as a result of the development. The assessment of experts and practitioners on interactive e-modules includes aspects of the characteristics of good e-modules according to the Directorate General of PMPTK (2008), namely (1) Self-instructional (independent instructions), (2) Self-contained, (3) Stand-alone, (3) Adaptive, (4) User friendly and includes aspects of conformity with disaster literacy indicators according to Chung & Yen (2016), namely (1) disaster prevention knowledge, consisting of disaster knowledge, preparedness knowledge, and response knowledge (2) disaster prevention attitudes, consisting of from awareness of prevention, the value of prevention and sense of responsibility towards prevention (3) disaster prevention skills, consisting of preparedness actions and response behavior. Validation questionnaires given to experts and practitioners include the suitability of the content with the characteristics of the e-module, and indicators of disaster literacy, construction, readability, and attractiveness to the use of interactive e-modules based on Microsoft Sway.

Disseminate stage is the final stage of this research. At this stage, validation testing is carried out. Products that have been revised at the development stage are then implemented on real goals. During the learning process, the assessment is carried out by direct observation of student performance using the developed interactive e-module. The implementation phase was carried out to determine the effectiveness of the use of interactive e-modules that were developed to improve disaster literacy by using the experimental class and the control class. Before learning begins, students in both classes are given a pretest and after the lesson is finished, they are given a posttest. The pretest and posttest questions are arranged based on disaster literacy indicators according to Chung & Yen (2016). The pre-test and post-test questions for disaster prevention knowledge indicators are found in questions number 1,2,3,4,5, 6, and 7, indicators of disaster prevention attitudes are found in questions number 8, 9,10,11,12, and 13, while the disaster skills indicators are found in questions number 14 and 15. The questions are presented using the google form application so that students can directly work on the application. The pretest and posttest questions given had previously been tested on 28 students of SMP Xaverius 4 Bandar Lampung who had studied disaster threat materials in the region and had their validity and reliability tested.

The instruments used in the define stage are interview guidelines and questionnaires containing questions related to disasters and students' mastery of disaster literacy. The sampling technique used was purposive sampling. The instrument used at the product trial stage is a questionnaire. The determination of the experimental class and the control class is based on the results of the equations of the two averages. The effectiveness of using interactive e-modules was analyzed to determine the increase in disaster literacy through the value of n-gain. The n-gain analysis begins with the prerequisite test, namely the normality test and parametric test, namely the independent sample t-test and paired sample t-test, and effect size. Tests were carried out with SPSS 17.00 software.

The data analysis technique uses a feasibility analysis / whether or not the product is valid as a result of the development obtained from the average results of experts and

practitioners on the validation sheet as well as an analysis of the responses of teachers and students referring to the Likert scale as shown in Table 1.

Table 1. Scoring on the questionnaire based on the Likert scale

No	Answer options	Score
1	Strongly agree	5
2	Agree	4
3	Neither Agree	3
4	Disagree	2
5	Strongly Disagree	1

The data is calculated using the following formula (Sudjana, 2015) where %Jin is the percentage of i answer choices, Ji is the number of respondents who answered the i-answer and N is the total number of respondents. The percentage that has been obtained, will then be interpreted based on the validation criteria for the percentage analysis using Arikunto's (2010) interpretation based in Table 2.

Table 2. Percentage analysis validation criteria

Percentage	Validation Level	Description
76 – 100	Valid	Eligible / does not need to be revised
51 – 75	Quite Valid	Fairly decent / Partial revision
26 – 50	Not valid	Inadequate / Partial revision
< 26	Invalid	Not worth it / total revision

The calculation data for learning outcomes are used in the calculation of n-Gain which is categorized by using classification according to Hake, 1999 based on Table 3. to determine the effectiveness of the interactive e-module development results in increasing student literacy.

Table 3. Category of n-Gain

n-Gain value	**category**
n-Gain ≥ 0.7	High
0.3 ≤ n-Gain <0.7	Medium
n-Gain < 0.3	Low

The effectiveness of the developed interactive e-module to improve disaster literacy is also measured based on the interpretation of effect size according to Cohen, Manion Morrison, 1988 based on Table 4.

Table 4. Interpretation of effect size

Cohen's Standard	***Effect size***
Large	0.6-2.0
Medium	0.3-0.5
Small	0.0-0.2

(Cohen, Manion, and Morrison,1988)

▪ RESULT AND DISSCUSSION

As a preliminary research, a preliminary questionnaire was given to 60 7th grade junior high school students in Lampung Province, especially from SMPN 36 Bandar Lampung, SMPN 22 Bandar Lampung, SMPN 14 Bandar Lampung, SMPN 24 Bandar Lampung, SMP Xaverius 4 Bandar Lampung, SMP Xaverius 2 Bandar Lampung, Christian Middle School 5 Bandar Lampung, Muhammadiyah 1 Gisting Junior High School, Xaverius Metro Junior High School, Swadiri 1 Junior High School Seputih Agung. This is done to find out what disasters have occurred in the respondent's area. Based on the results of the preliminary questionnaire, it is known that the types of disasters that have occurred are earthquakes, floods, covid-19, landslides, and tornadoes with the percentage of disasters shown in Figure 1. This fact was obtained from the answers of students who were respondents where 8 students stated that an earthquake has occurred in their area, 18 students stated that there had been a flood in their area, 4 students stated that they had experienced a Covid-19 disaster, 8 students stated that there had been a landslide in their area, 2 students stated that there had been a tornado disaster and 20 students stated that in their area there had been no disaster has occurred.

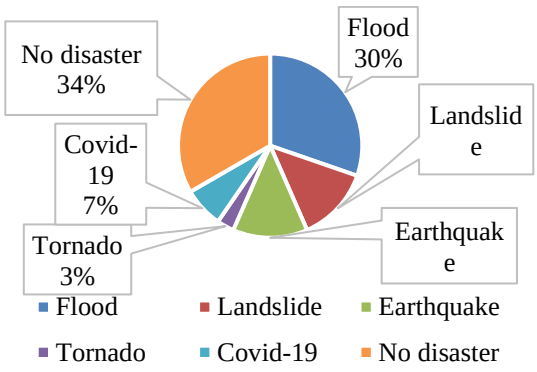

Figure 1. Percentage of disasters based on the initial questionnaire given to 8th-grade junior high school students in the areas of bandar lampung, gisting, metro and seputih agung.

Based on the questionnaire data, it is known that the most common disasters are floods. Of the 18 students who stated that in the area where they lived there had been a flood disaster, it was known that 12 students who stated this lived in the Bandar Lampung area. This is reinforced by the results of interviews with 5 (five) students who live in Bandar Lampung who stated that floods often occur in their area. The five students live near rivers and are in densely populated locations such as Peace, Sukarame, and Jagabaya. From the results of the interview, it is known that their disaster literacy skills come from their experience and are still limited to disaster mitigation and response. They revealed that when there was a flood in their house, what they had to do was move their belongings to a higher place, evacuate to a safer area, turn off the electricity, and repair the embankment.

Preliminary questionnaires are also used to determine the percentage of disaster literacy mastery of students who are respondents to several disasters that have occurred. From the questionnaire, it is known that students who have mastered mitigation,

preparedness, response, and recovery from disasters on the topic of earthquakes are 40%, floods are 30%, tornadoes are 3%, landslides are 7% and Covid-19 disaster is 20%. of the total students who became respondents. Based on these data, it is known that disaster literacy which is mostly controlled by students who become respondents is earthquakes. This is because the material presented by the learning resources used by the teacher discusses a lot about earthquakes while other disasters are still very minimal in the discussion. This is in line with the findings of the analysis of learning resources used by teachers in the form of a module entitled Aku dan Bumiku which was published by the Directorate of Junior High Schools, the Directorate General of Early Childhood Education, Basic Education, and Secondary Education of the Ministry of Education and Culture of the Republic of Indonesia where the topics that were widely discussed were earthquake disaster.

Although 30% of the students who became respondents have mastered disaster literacy on flood topics, in the learning resources used by teachers, flood disaster literacy topics have not been widely taught. This is reinforced by the results of interviews with 3 science teachers in Bandar Lampung who have taught basic competency material about explaining risk reduction actions before, during, and after disasters according to the threat of disaster in their area who stated that the disaster material taught was still limited to what was conveyed in the text. Learning Resources. The three teachers stated that they had not adjusted to the student's background (age, education, school location, disaster, and the location of the student's residence as well as the potential for disasters that occurred in the vicinity). Submission of the material in the basic competencies taught has not focused on threats in the area where students live, such as floods that often hit urban areas. In fact, according to the Ministry of Education and Culture, 2013, learning needs to be linked to the problems encountered around it so that learning becomes contextual. According to Abdurrahman (2020), learning needs to be adapted to local potential, including the potential for natural disasters that often hit certain areas, so that students not only have knowledge and skills of mitigation (literate) but also have an attitude of resilience to the adverse effects of natural disasters that often occur in Indonesia. around them.

In the task analysis at the defined stage, it is done by giving a test instrument to students who have received material on the threat of disasters in the region. The results are then analyzed into a more specific sub-skills framework and tested for validity and reliability to be used as a pre-test and post-test questions during the implementation stage. The test instrument consists of 15 questions that contain indicators of disaster literacy, especially the topic of flooding. The disaster literacy indicator in this study refers to the category of disaster knowledge dimensions according to Chung & Yen (2016) which is shown in Table 5.

Table 5. Disaster literacy indicators as the output of disaster education according to Chung & Yen (2016).

Dimensions	Category	Description
Knowledge	Disaster knowledge	a. Analyzing the causes of floods b. Explain the impacts and dangers of floods for humans and the environment

	Preparedness knowledge	a. Develop flood disaster mitigation procedures b. Create an action plan for flood disaster mitigation and preparedness
	Response knowledge	a. Deciding on response procedures in the event of a flood disaster b. Designing post-flood rescue measures and medical treatment
Attitude	Awareness Prevention	a. Evaluate the environment comprehensively and identify potential flood hazards b. Analyze information related to flood disasters proactively
	Prevention value	a. Promote the importance of flood prevention, disaster relief, and evacuation plans b. Explain the relationship between flood prevention and social costs
	Sense of responsibility toward prevention	a. Organizing the promotion and prevention of flood disasters in the community b. Planning the implementation of evacuation and shelter placement
Skills	Preparedness Action	a. Planning escape routes and locations in the event of a flood disaster b. Plan and participate in exercises and training for flood prevention and relief
	Response behavior	a. Ensuring personal safety and helping others to escape in the event of a flood disaster. b. Cooperate during evacuation and shelter placement.

Source : Chung & Yen, 2016

Testing the validity of the test instrument was carried out using the product moment correlation and instrument reliability testing was carried out using Cronbach's Alpha. The results of the validity and reliability test of student test instruments are shown in Table 6. Based on Table 6, information is obtained that all questions (test instruments) to measure students' disaster literacy skills are valid and reliable. The test instruments were declared reliable with a high level of reliability because the Cronbach Alpha value of 0.881 was greater than the r table.

Table 6. Test results validity and reliability of test instruments

Category Validity	Question item number
Height	1,2,5,7
Just	3,4,8,10,11,13,14,15
Low	6,9,12
Reliability = 0.881 (very high reliability)	

Design Format an interactive E-module to improve disaster literacy which was developed referring to the e-module format according to Sintawati & Margunayasa, 2021 which consists of cover, introduction, table of contents, basic competence, achievement indicators, learning objectives, instructions, content/materials accompanied by pictures, audio, video, summaries, and exercises. Interactive e-Modules are created

and assembled using Microsoft Sway and Canva applications. An example of one display form of an interactive e-Modul which was developed based on Microsoft Sway is presented in Figure 2.

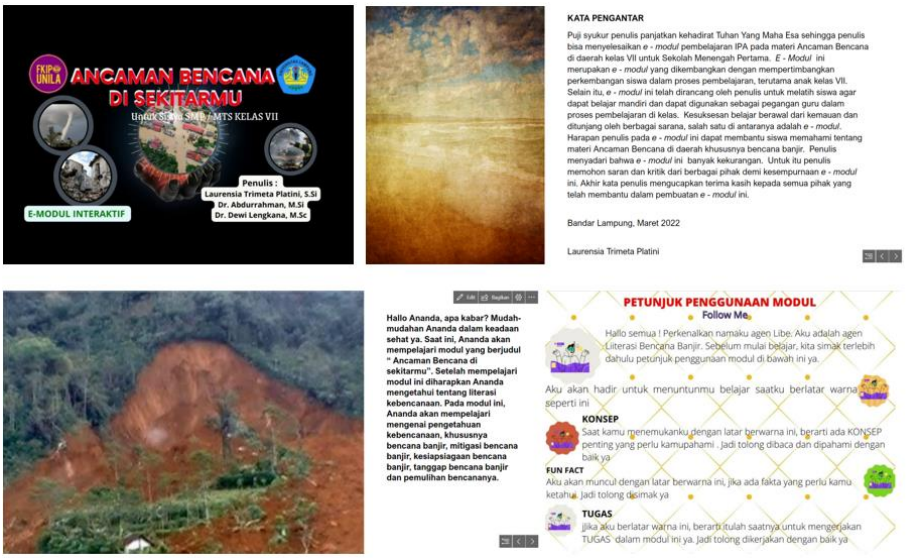

Figure 2. Example of the display of the interactive e-module developed

The development stage aims to produce a development product, namely an interactive e-module using a valid Microsoft Sway to improve disaster literacy. According to Flewitt (Setiyaningsih & Syamsudin, 2019), children's readiness to achieve literacy development requires various kinds of supporting media which before being used to achieve goals must go through a feasibility test. Therefore, so that the developed interactive e-module has these advantages, before using the interactive e-module it has been validated by experts and practitioners through a validation questionnaire. The assessment of the interactive e-module as a result of the development through a validation questionnaire was carried out by 2 lecturers as expert validators and 3 science teachers with the latest master's education as practitioner validators. The assessment includes aspects of the characteristics of a good e-module according to the Directorate General of PMPTK (2008), namely (1) Self-instructional (self-instruction), Self-contained, (3) Stand-alone, (3) Adaptive, (4) User friendly. The assessment of experts and practitioners also includes aspects of conformity with disaster literacy indicators according to Chung & Yen (2016). Validation questionnaires given to experts and practitioners include the suitability of the content with the characteristics of the e-module and indicators of disaster literacy, construction, readability, and attractiveness to the use of interactive e-modules based on Microsoft Sway. The results of the assessments of experts and practitioners can be seen in Table 7.

Table 7. Expert and Practitioner Validation Results on Microsoft Sway-based Interactive E-Modules

Aspect	Percentage (%)		Average Percentage (%)	Criteria
	Expert	Practitioner		
Language	86	86	86.00	Valid

Construction	83	86.36	84.68	Valid
Contents	73	88.15	80.58	Valid

Based on Table 7, it is found that the average percentage of validation experts and practitioners has valid criteria so that it is feasible to use with partial revision. Therefore, before being used, the developed e-module was revised based on the results of product improvement recommendations from expert validators which can be seen in Table 8.

Table 8. Results of product improvement recommendations based on expert validity test

Aspect	Expert Repair Recommendations
Language	1. The font size is enlarged in the description of the disaster
	2. The sentences in the module instructions are made more communicative
Contents	1. Indicators regarding the hydrological cycle are less relevant to KD
	2. Practice questions cannot be opened on cellphones
Construction	1. Enlarged font size on disaster description
	2. Evaluation of learning activities cannot be opened using cellphones
	3. Evaluation of learning activities cannot be opened using cellphones

The interactive e-module developed to improve students' literacy must also contain the characteristics of the module. Therefore, to find out the characteristics of the modules in the developed e-modules, in the expert and practitioner validation questionnaires, an assessment of these characteristics was also carried out. The results of the validation of experts and practitioners are in Table 9.

Table 9. Expert and practitioner validation results on the characteristics of e-modules

No	Statement	Percentage (%)		Average Percentage (%)	Criteria
		Expert	Practitioner		
1	The developed e-module contains self-instructional elements (self-instruction)	90	80	85	Valid
2	The developed E-module contains elements of Self contained (independence)	90	80	85	Valid
3	The developed E-module contains Stand alone elements (stand-alone)	90	80	85	Valid
4	The developed E-module contains Adaptive elements (adaptive)	90	80	85	Valid
5	The developed E-module contains elements of User friendly (easy to use)	90	80	85	Valid

Based on Table 9, it is found that the interactive E-module developed contained the characteristics of the module according to the Directorate General of PMPTK (2008). This can be seen from the results of expert and practitioner validation on the given statement by obtaining an average percentage of 85% for each of the stated module characteristics. Based on this, it can be concluded that the developed interactive

e-module has valid e-module characteristics to improve disaster literacy for junior high school students.

After going through the expert and practitioner validation stage, a product trial was conducted to determine the teacher and student responses to the interactive e-module using the developed Microsoft Sway. In the product trial, 28 students who had received similar material and 3 science teachers were asked to provide feedback regarding the attractiveness, readability, and usefulness aspects of using Microsoft Sway-based interactive e-modules by filling out questionnaires and responding to existing statements. Furthermore, revisions are made based on the results of teacher and student responses. The results of teacher and student responses can be seen in Table 10.

Table 10. Results of teacher and student responses at the product trial phase

Aspect	Response Presentation (%)		Validation Level	Information
	Teacher	Students		
attractiveness	88	83	Valid	Eligible / no revision needed
Legibility	100	81,43	Valid	Eligible / no revision needed
Usefulness	86,3	85,97	Valid	Eligible / no revision needed

Based on Table 10. which is interpreted using Arikunto's (2010) interpretation, information is obtained that the results of teacher and student responses from the aspects of attractiveness, readability, and usefulness to interactive e-modules developed at the trial stage have a valid validation level so that interactive e-modules are developed worth using.

To determine the effectiveness of the product, the product was implemented using a quasi-experimental research design, namely the matching only pretest-posttest control group design (Fraenkle et al., 2006) using an experimental class and a control class. At the implementation stage, learning in the experimental class uses an interactive e-module based on Microsoft Sway as a result of development and the control class uses an e-module published by the Ministry of Education and Culture in the teaching process. The form of learning using interactive e-modules as a result of the development is shown in Figure 3.

Figure 3. Learning using interactive e-modules based on microsoft sway to improve students' disaster literacy

To find out the increase in the pre-test and post-test scores on students' disaster literacy skills, an analysis of the normalized gain value (n-Gain) was carried out. The average value of the n-gain test results in the experimental class and control class is shown in Table 11

Table 11. Calculation results of n-gain of students' disaster literacy skills

Class	Average Value $(\bar{X} \pm \sigma)$		Average *n-gain*	criteria
	Pre-test	Post-test		
Experiment	39,60 ± 8,22	80,24 ± 9,04	0,66 ± 0,17	Medium
Control	40,39 ± 9,07	58,13 ± 11,27	0,30 ± 0,17	low

Based on Table 11, the average value of n-gain for disaster literacy skills of students in the experimental class ranges from 0.49 to 0.83 so it can be categorized as moderate. This shows that disaster literacy skills were successfully grown in the experimental class using an interactive e-Module based on Microsoft Sway. The comparison of the percentage results of the Disaster Literacy n-gain test in the experimental class and the control class is presented in the graph in Figure 4.

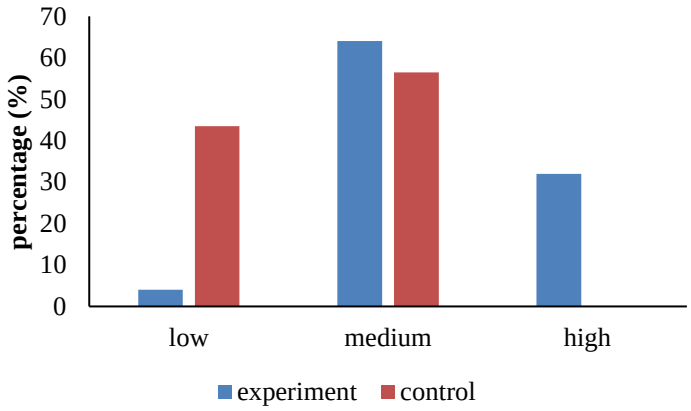

Figure 4. Comparison of the percentage of n-gain test results

Based on Figure 4, information is obtained that the comparison value of the n-gain of the disaster literacy skills of students in the control class with the disaster literacy skills of students in the experimental class has a significant difference. The control class is dominated by the n-gain value with low and medium criteria. Meanwhile, the experimental class is dominated by the n-gain value with medium and high criteria. For the experimental class has a low n-gain value of 4%, while in the control class the value of n-gain with high criteria is 0%. This proves that the increase in the pre-test and post-test scores for students' disaster literacy skills in the experimental class occurred significantly.

To find out the increase in the pre-test and post-test scores for each indicator of students' disaster literacy skills, an analysis of the normalized gain value (n-Gain) was carried out. To find out the pre-test and post-test scores for each indicator, value processing is carried out by separating the scores on the questions which are included in

the indicators of knowledge, attitudes, and skills of disaster prevention. The difference in the results of the n-gain test in the experimental class and control class for indicators of knowledge, attitudes, and skills of disaster prevention is shown in Figure 5 below.

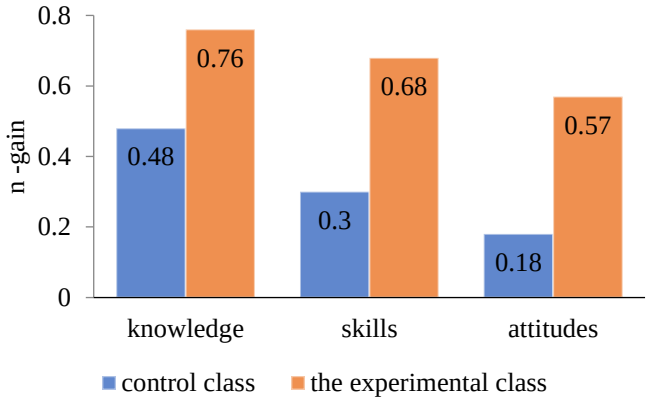

Figure 5. Differences in the results of the n-gain test for indicators of knowledge, skills, and attitudes in the control and experimental classes

Based on the classification of n-gain values stated by (Hake, 1999), the increase in knowledge indicators in the experimental class is in the high category, while the skills and attitudes indicators are in the medium category. This shows that the indicators of knowledge in disaster literacy have been achieved and mastered by students in the experimental class, while the indicators of skills and attitudes have been mastered by only some students.

The effect size test is used to determine how much influence the Microsoft Sway-based interactive e-Module has on students' disaster literacy skills. The result of the effect size test is 0.73 and has large criteria. Based on the value of the effect size, it can be seen that the effect of learning by using an interactive e-Module based on Microsoft Sway as a result of the development has a large effect on improving students' literacy skills.

Disaster literacy indicators refer to disaster indicators according to Chung & Yen (2016). The pre-test and post-test questions given to students contain the above indicators which include knowledge of disaster prevention, attitudes, and skills of disaster prevention. In the pre-test and post-test questions on disaster prevention knowledge are in questions number 1,2,3,4,5,6, and 7, disaster prevention attitudes are in questions number 8, 9,10,11, 1,2 and 13, while disaster skills are found in questions number 14 and 15. The questions are presented using the google form application so that students can work directly on the application. The examples of questions given to students are in Figure 6.

Figure 6. Examples of knowledge and skills indicator questions

Figure 6 on the left is an example of a skill indicator question and the one on the right is an example of a skill indicator question. For knowledge questions, students can directly work on the provided column, while for skills questions students can upload photos of their work on the google form application. An example of student work on skill indicators is shown in Figure 7.

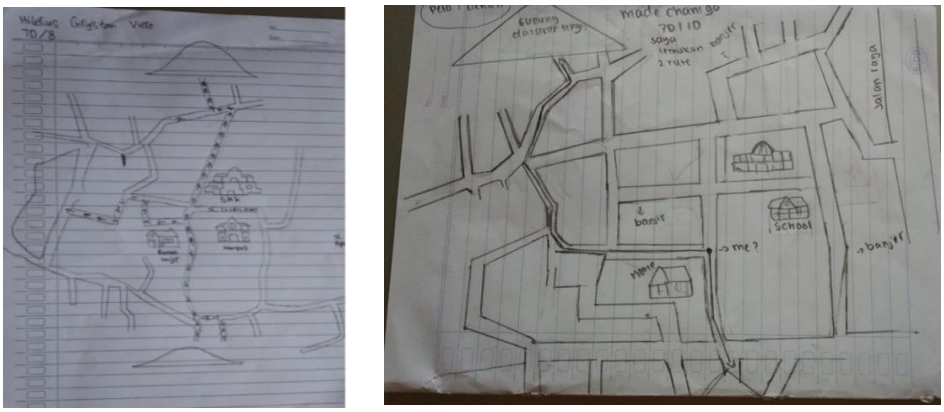

Figure 7. Examples of student work on disaster prevention skills indicators

▪ CONCLUSION

Learning using interactive e-modules based on Microsoft Sway to improve students' disaster literacy received good responses from teachers and students on the aspects of attractiveness, readability, and usefulness which had very high criteria. Sway-based interactive e-modules are valid and have high criteria for effectiveness to improve disaster literacy. The average n-gain for the knowledge indicator has high criteria and the average n-gain indicator for attitudes and skills of disaster prevention has moderate criteria. This shows that Sway-based interactive E-modules are feasible to use to improve disaster literacy for junior high school students.

Based on the findings of this study, the interactive e-module application based on Microsoft Sway cannot open properly if there are insufficient electronic devices and the internet. Students prefer to learn disaster literacy in the form of videos and interactive

quizzes. For further development, you can get an interactive e-module based on Microsoft Sway which is developed as a school-based community. So, disaster literacy is taught as a community, not as instruction in science learning, considering that disasters can happen anytime and to anyone.

▪ REFERENCES

Abdurrahman. Kadaryanto, B., Utaminingsih, D., & Tarmini, W.(2018). Learning community-based model in the context of teacher-parent partnerships: a novel model for preparing post-disaster recovery and resilience for students in risk disaster areas in Indonesia. Indian Journal of Science and Technology, 11(29), 1-9.

Adiyoso, W. (2018). Manajemen Bencana : Pengantar dan Isu-Isu Strategis, 1st ed. Jakarta: Bumi Aksara.

Ajar, S. B., Ronggowulan, L. (2022). Disaster literacy level of teachers and students in secondary school case study in Surakarta City, Indonesia. IOP Conference Series: Earth and Environmental Science.

Aprilia, I., Suryadarma, I. G. P. (2020). E-module of mangrove ecosystem (emme): development, validation and effectiveness in improving students' self-regulated. Biosfer: Jurnal Pendidikan Biologi, 13(1), 114-129.

Arikunto, S. (2013). Prosedur Penelitian Suatu Pendekatan Praktik. [Research Procedure A Practical Approach Jakarta]. Rienka Cipta.

Arikunto. (2010). Dasar-dasar evaluasi pendidikan edisi revisi [Fundamentals of educational evaluation revised edition] Jakarta. Bumi Aksara.

Asshiddiqi, M. R., Vitasari, M., & Biru, L. T. (2021). Validity Of Disaster e-book To Improve Disaster Literacy Skills At Junior High School. Jurnal Pena Sains, 8(2).

Babcicky, P., Seebauer, S. (2017). The two faces of social capital in private flood mitigation: Opposing effects on risk perception, self-efficacy and coping capacity. Journal of Risk Research, 20(8), 1017-1037.

Bachri, S., Irawan, L. Y., & Aliman, M. (2021). E-Module in Blended Learning: Its Impact on Students' Disaster Preparedness and Innovation in Developing Learning Media. International Journal of Instruction, 14(4), 187-208.

Boyd, L. (2019). Using technology-enabled learning networks to drive module improvements in the UK Open University. Journal of Interactive Media in Education.

Brown, L. M., Haun, J. N., & Peterson, L. (2014). A proposed disaster literacy model. Disaster medicine and public health preparedness, 8(3), 267-275.

Chung, S. C., & Yen, C. J. (2016). Disaster prevention literacy among school administrators and teachers: a study on the plan for disaster prevention and campus network deployment and experiment in Taiwan. Journal of Life Sciences, 10, 203-214.

Citrawathi, D. M., Adnyana, P. B., & Santiasa, M. P. A. (2016). Analisis Kebutuhan untuk Pengembangan Modul Inkuiri Berbasis Pertanyaan (Mibp) di SMP Needs Analysis for Development of Question-Based Inquiry Module (Mibp) in SMP]. Indonesian Journal of Education, 5(1), 1-11.

Cohen, L., Manion, L., and Morrison, K. (1988). Research Methods in Education, Sixth Edition. New York: Routledge.

Darmaji, D., Astalini, A., Kurniawan, D., Parasdila, H., Irdianti, I., Susbiyanto, S., Kuswanto, K. and Ikhlas, M. (2019). E-Module Based Problem Solving in Basic Physics Practicum for Science Process Skills. International Association of Online Engineering. 15(15).

Dwianto, A. (2016). Pengembangan Media Pembelajaran Online Berbasis Sway Terintegrasi Potensi Lokal Gula Jawa [Development of Integrated Sway-Based Online Learning Media with Local Potential of Javanese Sugar]. Wonogiri : SMP Negeri 2 Paranggupito.

Ferdiana, R., Eka, R., & Fauzan, I. (2013). Petunjuk praktis microsoft office 365 bagi institusi pendidikan dan organisasi [Microsoft office 365 practical guide for educational institutions and organizations.]. Yogyakarta: Lulu Publisher.

Firaina, R., & Asrizal, A. (2019). Analisis e-book IPA kelas IX SMP berdasarkan pada aspek literasi bencana. *Pillar of Physics Education*, 12(3).

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). How to design and evaluate research in education. 7(1). p 429.

Gaillard, J. C. , Clave, E., Vibert, O., Azhari, Dedi, Denain, J. C. , Efendi, Y. , Grancher, D. , Liamzon, C. C. , Sari, D. R. and Setiawan, R. (2008). "Ethnic groups' response to the 26 December 2004 earthquake and tsunami in Aceh, Indonesia," Natural Hazards, 47, pp. 17-38

Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. American Journal of Physics, 66(1), 64-74.

Hamid,N., Trihatmoko,E., Herlina,M., & Aroyandini, E. N. (2021). Developing a Model for Disaster Education to Improve Students' Disaster Mitigation Literacy. Journal of Disaster Research, 16(8).

Irwansyah, F. S., Lubab, I., Farida, I., & Ramdhani, M. A. (2017, September). Designing interactive electronic module in chemistry lessons. In Journal of Physics: Conference Series 895(1).

Istiqomah, S. P. (2016). The development of learning material: Explanation text based on multimodal by using sway app in 11th grade of sman 1 Batu. International Journal of Education and Research, 4(9), 313-322.

Kamil, P. A., Utaya, S., & Utomo, D. H. (2020). Improving disaster knowledge within high school students through geographic literacy. International journal of disaster risk reduction, 43(2).

Kastolani, W., & Mainaki, R. (2018). Does educational disaster mitigation need to be introduced In school?. In SHS Web of Conferences, 42.

Kellens, W., Zaalberg, R., Neutens, T., Vanneuville, W., & De Maeyer, P. (2011). An analysis of the public perception of flood risk on the Belgian coast. Risk Analysis: An International Journal, 31(7).

Kemendikbud. (2013). Peraturan Menteri Pendidikan dan Kebudayaan Nomor 67 Tahun 2013 Tentang Kerangka Dasar dan Struktur Kurikulum Sekolah Dasar/Madsrasah Ibtidaiyah. Jakarta: Kementrian Pendidikan dan Kebudayaan RI [Regulation of the Minister of Education and Culture Number 67 of 2013 concerning the Basic Framework and Curriculum Structure of Elementary Schools/Ibtidaiyah Madrasas. Jakarta: Ministry of Education and Culture of the Republic of Indonesia].

Lindell, M. K., & Hwang, S. N. (2008). Households' perceived personal risk and responses in a multi-hazard environment. Risk Analysis: An International Journal, 28(2), 539-556.

Mufit, F., Hanum, S. A., & Fadhilah, A. (2020). Preliminary research in the development of physics teaching materials that integrate new literacy and disaster literacy. In Journal of Physics: Conference Series 1481(1).

Nadeak, B. (2015). Correlation between knowledge, experience, and common sense, with critical thinking capability of medical faculty's students at Indonesia Christian University. Journal of Education and Practice, 6(32), 45-55.

Neppala, P., Sherer, M. V., Larson, G., Bryant, A. K., Panjwani, N., Murphy, J. D., & Gillespie, E. F. (2018). An Interactive Contouring Module Improves Engagement and Interest in Radiation Oncology Among Preclinical Medical Students: Results of a Randomized Trial. Practical Radiation Oncology, 8(4), 190-198.

PMPTK, D. T. (2008). Penulisan Modul [capital writing]

Ronan, K. R., Crellin, K., & Johnston, D. (2010). Correlates of hazards education for youth: a replication study. Natural hazards, 53(3), 503-526.

Sampurno, P. J., Sari, Y. A., & Wijaya, A. D. (2015). Integrating STEM (Science, Technology, Engineering, Mathematics) and Disaster (STEM-D) education for building students' disaster literacy. International Journal of Learning and Teaching, 1(1), 73-76.

Septaria, K., Dewanti, B. A., & El Afidah, M. I. (2020). Development Of Module Disaster Mitigation Based On Stem For Secondary Schools. Jurnal Penelitian Pendidikan IPA, 5(2), 61-68.

Setiyaningsih, G., Syamsudin, A. (2019). Pengembangan Media Big Book Untuk meningkatkan kemampuan Literasi Anak Usia 5-6 Tahun. [Development of Big Book Media To Improve Literacy Skills for Children aged 5-6 Years]. Journal of Education and Culture, 9(1), 19–28.

Siegrist, M., & Gutscher, H. (2006). Flooding risks: A comparison of lay people's perceptions and expert's assessments in Switzerland. Risk analysis, 26(4), 971-979.

Sintawati, N. P., Margunayasa, I. G. (2021). Interactive E-Module for Science Learning Content: Validity and Feasibility. International Journal of Elementary Education, 5(1), 19-29.

Sudjana. (2005). Metode Statistika [Statistical Method]. Bandung. Tarsito

Terpstra, T. (2011). Emotions, trust, and perceived risk: Affective and cognitive routes to flood preparedness behavior. Risk Analysis: An International Journal, 31(10).

Thiagarajan, S. (1974). Instructional development for training teachers of exceptional children: A sourcebook.

Weinstein, N. D. (1989). Effects of personal experience on self-protective behavior . Psychological bulletin, 105(1), 31.