

Development of Professional Flip PDF Application-Based E-Module Learning Media In Improving Students' Creative Thinking Skills At SMAN 6 Palu

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ABSTRACT

Keywords:

E-module; flip pdf
professional; creative
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The purpose of this research is to develop interactive E-module learning media based on flip pdf professional that can improve students' thinking skills. The method used in this research is research and development (Research and Development) with a 4D development model consisting of 4 stages, namely define, planning, developing, and disseminating). The study was conducted on grade XI students of SMAN 6 Palu. The validity test in this study was carried out by validator lecturers and the practice test was carried out by biology teachers of SMAN 6 Palu. The analysis is carried out in a qualitative and quantitative descriptive way to determine the validity, practicality and effectiveness of the e-modules developed. The results showed that: (1) The professional pdf flip-based interactive E-module product developed obtained a percentage of 86% and can be categorized as valid for use in biology learning, (2) The practicality of the professional pdf flip-based interactive E-module that was developed obtained a percentage of 96% and is categorized as very practical to use in biology learning, and (3) The effectiveness of the interactive E-module based Flip PDF Professional which is developed is quite effective in improving students' creative thinking skills with N-gain medium category, interactive E-module based on flip pdf professional can be a teaching material that can improve students' creative thinking skills and collaboration skills in biology learning.



Introduction

In the current era of disruption, the world of education is required to produce students who have 21st century skills and abilities. Student skills and innovations can be extracted from improving the quality of learning provided by teachers by providing interactive learning resources. One form of innovative learning resources by utilizing technology is e-modules that are systematically designed so as to encourage learning skills. According to E-module (Zulaiha & Kusuma, 2020) (Pujiati, Fanni Rahmawati,

Rahmawati, & Albet Maydiantoro, 2022) (Hermansyah et al., 2023) utilizing information and communication technology that can be used by students independently so that it can support the digital literacy movement as one of the needs of the 21st century.

E-modules can be developed using a professional flip pdf application that can help learning effectiveness and make learning more interactive so that it can not only improve academic skills but also improve 21st century skills. said the 21st century abilities that must be possessed by today's learners include critical thinking skills, problem solving, communication and collaboration skills, creativity and innovation (Rama, Putra, Huda, & Lapisa, 2022) (Zainudin & Istiyono, 2019).

The ability to think creatively is one of the most important abilities of the 21st century in school and life in the future. Creative thinking skills can be measured from students' ability to produce varied and different answers or interesting alternative solutions to a problem (Ramdani & Susilo, 2022) (Winarso & Haqq, 2020).

The lack of learning media that supports the improvement of creative thinking skills is one of the factors of the low creative thinking ability of students in Indonesia. This is reinforced by the opinion of (Hartati, Fahrudin, & Azmin, 2021), who explained that until now there are still many teachers who do conventional learning in schools and tend to use books and LKS in printed form more often which does not support improving students' thinking skills (Hasanah, Supeno, & Wahyuni, 2023).

The results of observations that have been carried out at SMAN 6 Palu on August 15, 2023, the obstacles faced in biology learning are the lack of knowledge of biology teachers on the use and development of digital-based learning media, especially e-modules. The problems faced in the learning process of teaching teachers still use lecture methods and learning media in print that are less interactive, causing student boredom caused by the non-variation of learning media and having an impact on students' thinking processes in biology learning. Biology is a natural science that needs to study the symptoms and facts contained in nature and the surrounding environment, so it requires an understanding of in-depth concepts and students' scientific process abilities (Heryana & Yasa, 2020).

Based on the problems that have been described, students need interactive learning media to be able to attract students' interest in learning biology and can improve students' creative thinking skills, explained that (Hasanah et al., 2023) the Flip PDF Professional based e-module can improve students' creative thinking skills and can be an innovative reference source for teachers in the learning process and support independent learning in schools. So that this research will develop an interactive e-module based on flip pdf professional that is valid, practical and effective to improve students' creative thinking skills in biology learning at SMAN 6 Palu.

Research Methods

This research is a type of research and development (Research and Development). The development model used in this study is a 4D development model consisting of 4 stages, namely the stages of defining (define), planning (design), development (develop), and dissemination (disseminate) (Tegeh, Simamora, & Dwipayana, 2019).

This research was carried out at SMAN 6 Palu, Central Sulawesi Province. The types of data obtained are quantitative and qualitative data. Quantitative data in the form of validity questionnaires, practicality questionnaires, and creative thinking skills. While qualitative data in the form of observation sheets and improvement notes provided by validators on the e-module learning media developed. The trial analysis technique in this

study uses quantitative data analysis, namely validity analysis, practicality analysis, and effectiveness analysis of the professional pdf flip-based e-module developed.

1. Product Validity Analysis

Validity analysis is used to calculate the average product validity test assessed by validators against the targeted aspects with the validity formula according to (Haking & Soepriyanto, 2019):

$$P = \frac{\Sigma X}{\Sigma X_i} \times 100 \%$$

Information:

P = percentage

ΣX = total score achieved

ΣX_i = maximum total score

The percentage score obtained will be interpreted based on Table.1 below for further decisions will be made regarding the validity of the product developed.

Table 1. Validity Test Percentage Category

Percentage (%)	Category
86-100	Valid
66-85	Quite Valid
46-65	Less Valid
25-45	Invalid

2. Product Practicality Analysis

Practicality analysis is obtained through the teacher's assessment questionnaire sheet on the practicality of using e-module products in the biology learning process. The results of the teacher's assessment were then analyzed using a practicality formula according to (Akbar, 2013):

$$P = \frac{TSe}{TSh} \times 100 \%$$

Information:

P = percentage

TSe = total score achieved

Tsh = maximum total score

The score categories that have been obtained are interpreted based on the practicality category in Table 2.

3. Product Effectiveness Analysis

Analysis of students' creative thinking skills is obtained through tests, namely pre-test and post-test. The results obtained are then calculated by the N-gain formula according to (Hake, 1998):

$$\langle g \rangle = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}}$$

Information:

$\langle g \rangle$ = average gain score
S_{post} = posttest score
S_{pre} = pretest score
S_{max} = maximum score

The N-gain values that have been obtained are then classified and percentaged based on Table 3.

Results and Discussion

a. Define

Based on the observations that have been carried out at SMAN 6 Palu that the learning resources and learning media used in biology learning at the school are still in the form of printed student textbooks, the facilities and infrastructure provided at SMAN 6 Palu are in the form of infocus, but biology subject teachers still rarely use infocus because the method used in learning biology still uses the lecture method and the teacher has not applied the media learning in digital form. The average student of SMAN 6 Palu already has a smartphone which makes it easier for researchers to develop digital teaching materials. While the curriculum analysis used as a learning reference is the 2013 curriculum.

b. Design

At the design stage, concept design was carried out for interactive e-module products based on flip pdf professional and preparation of research instruments. The e-module product developed consists of a cover containing the title, school level and author's name, an introduction containing a table of contents, a foreword, concept maps and guidelines for using e-modules, learning materials, material summaries, evaluation questions, glossaries containing word definitions that tend to be difficult to understand to support students' deeper understanding and the last page on the e-module is a bibliography containing references used. The cover of the e-module can be seen in Figure 2 which is the initial display when you first open the e-module.

Table 2. Practicality Test Percentage Category

Percentage (%)	Category
86-100	Very Practical
66-85	Practical
46-65	Less Practical
25-45	Impractical

Source: Akbar (2013)



Figure 2. Interactive E-module Based Cover Design Flip PDF Professional

c. Development

The development stage is carried out with a process of validity testing by experts and product revision and product practicality tests assessed by biology subject teachers at SMAN 6 Palu. In addition, validity tests were also carried out on research instruments in the form of collaborative skill questionnaires and students' creative thinking skills.

1. Test Validity

Professional pdf flip-based e-modules are tested for validity to produce valid products. The results of validators' assessment of the development of interactive e-modules based (Triwoelandari, Handayani, & Arif, 2023) explained, the developed product must pass the validation stage by experts which is intended to provide an assessment of the development product and suggestions for improvement before being tested on students. on flip pdf professional can be seen in Table 4.

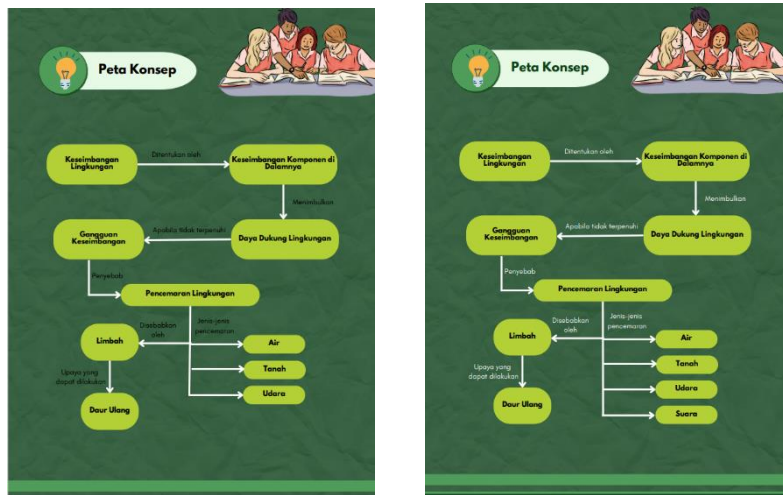
Table 4. Validity Test Results of Flip PDF Professional Based Interactive E-module

No	Assessed aspects	Score		Percentage (%)	Category
		Validator 1	Validator 2		
1	Material suitability	3.0	3.7	83.8	Quite valid
2	Accuracy of the material	3.5	3.75	90.6	Valid
3	Learning support materials	3.3	3.3	82.5	Quite valid
4	Compliance with the level of understanding	3.5	3.5	87.5	Valid
5	Communicative	3.5	3	81.3	Quite valid
6	Compliance with the correct Indonesian	3	4	87.5	Valid
7	Use of terms	3	4	87.5	Valid
8	Display aspect	3.4	3.4	85.0	Quite valid

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9	Expediency aspect	3	4	87.5	Valid
Average total validation scores				86.0	Valid

Figure 3. Text Font Color Before and After Revision



(b) Before Revision

(a) After Revision

Figure 4. Evaluation Display Before and After Revision

(b) Before Revision

(a) After Revision

Based on the assessment of validator lecturers in Table 4. The above shows that the interactive e-module is based Flip PDF Professional Obtained a percentage result of 86.0% with a valid category, as evidenced by the suitability and accuracy of the material in the e-module, e-modules developed according to the level of student understanding, the appearance of attractive e-modules, the use of language in accordance with good and correct Indonesian and aspects of the usefulness of interactive-based e-modules Flip PDF Professional can help the biology learning process and train students' creative thinking skills. According to (Haking & Soepriyanto, 2019), A product is said to be valid if it obtains a percentage of $\geq 66\%$. Researchers also revised the validators to improve the

quality of the e-modules produced. Revisions are made based on suggestions and comments by validators on the e-modules that have been developed which include font usage size, font color and appearance in the evaluation section.

2. Practicality Test

Practical result data of e-module-based products Flip PDF Professional obtained from a practicality questionnaire assessed by biology subject teachers at SMAN 6 Palu. The practicality test aims to determine the level of ease of content of the e-module and the suitability of the e-module that has been developed if implemented in biology learning. Practicality test results E-module based interactive Flip PDF Professional To improve students' creative thinking skills in biology learning at SMAN 6 Palu obtained a percentage of 96% and was categorized as very practical. In the developed e-module product is easy to use in biological learning, Can foster students' creative thinking skills, can be learned by students independently or in groups, can be used repeatedly, easily accessible to students and can help students to be active in the learning process. The results are in accordance with the opinion (Sembiring & Riyadi, 2018) which states A good e-module is an e-module that can be used repeatedly and when applied in the learning process at school is able to create a pleasant learning atmosphere for students so that it can facilitate the process of transferring knowledge at school.

d. Dissemination

The dissemination stage is carried out by spreading the e-module link that has been developed and testing the effectiveness of the professional pdf flip-based interactive e-module on students' creative thinking skills in biology learning.

Data on students' creative thinking skills were obtained from the results of the pre-test and post-test as many as 4 questions given to 27 students in class XI Science 1 to determine the improvement of students' creative thinking skills after the implementation of interactive e-modules based on flip pdf professional in biology learning, especially on environmental change material. The test scores of creative thinking skills are analyzed by the N-gain formula Z_{nd} can be observed in Table 5.

Table 5. N-gain results in students' creative thinking ability

The value of students' creative thinking ability has increased, namely the average pre-test obtained a value of 1.40 and post-test 2.96 with moderate category N-gain results. This shows an e-module based flip PDF professional What is developed can train and improve students' creative thinking skills. This is in line with research conducted by (Fauziah, Rahayu, & Asri, 2023) who stated that e-modules developed with the use of the environment can improve students' creative thinking skills. The same is stated by (Ramdani & Susilo, 2022), e-modules are efficient in improving students' creative thinking skills and can be used as an independent learning resource for students in achieving learning goals, so that meaningful learning is realized, and the formation of

Test	Average	Max Score	N-gain	Category
Pre-test	1,40	4	0,618	Keep
Post-test	2,96			

students who are able to compete with the latest advances in knowledge and technology.

Test the effectiveness of professional flip pdf-based interactive e-module on creative thinking skills showing good and effective categories. This is in line with research conducted by (Annam, Makhrus, Jamaluddin, Ramdani, & Gunawan, 2023), explaining that e-modules developed with professional flip pdf applications are able to improve students' problem-solving abilities. Flip pdf professional is a flipbook maker

application that has a page edit function and can create interactive book pages by inserting images, videos from YouTube, audio videos, quizzes, etc (Seruni, Munawaroh, Kurniadewi, & Nurjayadi, 2020). With the development of digital learning media, it is able to improve students' creative thinking skills as learning abilities in the 21st century. This is in line with the opinion of (Zakiyah & Sudarmin, 2022), which states that e-modules can be a source of learning media that can improve the ability to think and skills of the 21st century.

Conclusion

Based on research and discussion on the development of professional pdf flip-based e-modules in high school biology lessons that have been described, conclusions were obtained. (1) The professional pdf flip-based interactive E-module product developed is valid for use in high school biology learning; (2) Professional pdf flip-based interactive e-module developed is very practical to use in biology learning in high school with an average percentage value of 96%; (3) The professional pdf flip-based interactive e-module developed is quite effective in improving the creative thinking ability of students with medium category N-gain.

The suggestion that researchers can give is that the professional flip pdf based interactive e-module that has been developed can be used by teachers and students as one of the digital learning resources in biology learning and researchers can then conduct more extensive research to determine the effectiveness of professional flip pdf-based interactive e-modules in other 21st century capabilities.

Bibliography

- Akbar, Sa'dun. (2013). *Instrumen perangkat pembelajaran*.
- Annam, Syarful, Makhrus, Muh, Jamaluddin, Jamaluddin, Ramdani, Agus, & Gunawan, Gunawan. (2023). E-Module by Flip PDF Professional Based on Problem Based Learning (PBL) Integrated Local Wisdom to improve students' Problem Solving Ability. *Journal of Science and Science Education*, 4(2), 138–144.
- Fauziah, Siti Isnaini, Rahayu, Yuni Sri, & Asri, Mahanani Tri. (2023). The Validity E-modules of Riau Local Wisdom Based to Enhance Students' Creative Thinking through Research. *International Journal of Social Science And Human Research*, 6(2), 1134–1142.
- Hake, Richard 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.
- Haking, Deo Dedika, & Soepriyanto, Yerry. (2019). Pengembangan media video pembelajaran renang pada mata pelajaran PJOK untuk siswa kelas V SD. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 2(4), 320–328.
- Hartati, Hartati, Fahrudin, Fahrudin, & Azmin, Nikman. (2021). Penerapan pembelajaran berbasis masalah mata pelajaran IPA terhadap kemampuan berpikir kreatif dan hasil belajar siswa. *JISIP (Jurnal Ilmu Sosial dan Pendidikan)*, 5(4).
- Hasanah, Maulidah, Supeno, Supeno, & Wahyuni, Diah. (2023). Pengembangan e-modul berbasis flip pdf professional untuk meningkatkan keterampilan berpikir kreatif siswa pada pembelajaran IPA. *Tarbiyah Wa Ta'lim: Jurnal Penelitian Pendidikan dan Pembelajaran*, 10(1), 44–58.
- Hermansyah, Sam, Nasmilah, Nasmilah, Pammu, Abidin, Saleh, Noer Jihad, Huazheng, Han, & Congzhao, Huang. (2023). Socialization Making Media Learning Interactive E-Module based Flippbook in Elementary School 4 Maiwa. *Pengabdian: Jurnal Abdimas*, 1(1), 1–7.
- Heryana, Dwi Kadek, & Yasa, Ni Nyoman Kerti. (2020). Effect of electronic word of mouth on repurchase intention mediated by brand attitude. *International Research Journal of Management, IT and Social Sciences*, 7(2), 9–20.
- Pujiati, Pujiati, Fanni Rahmawati, Fanni, Rahmawati, Rahmawati, & Albet Maydiantoro, Albet. (2022). Effectiveness of Using Hypercontent Based E-Module to Improve College Students' Critical Thinking Skills. *WSEAS Transactions on Advances in Engineering Education*, 19, 80–86.
- Rama, Alzet, Putra, Rusnardi Rahmat, Huda, Yasdinul, & Lapisa, Remon. (2022). Pengembangan e-modul menggunakan aplikasi flip pdf professional pada mata kuliah analisis kurikulum pendidikan dasar. *JRTI (Jurnal Riset Tindakan Indonesia)*, 7(1), 42–47.
- Ramdani, Dani, & Susilo, Herawati. (2022). The Effectiveness of Collaborative Learning on Critical Thinking, Creative Thinking, and Metacognitive Skill Ability: Meta-Analysis on Biological Learning. *European Journal of Educational Research*, 11(3), 1607–1628.
- Sembiring, Julius, & Riyadi, Rakhmat. (2018). *Dampak Pembangunan Jalan Lingkar Utara Terhadap Eksistensi Tanah Ulayat di Kota Solok Provinsi Sumatera Barat*.
- Seruni, R., Munawaroh, S., Kurniadewi, F., & Nurjayadi, M. (2020). Implementation of e-module flip PDF professional to improve students' critical thinking skills through problem based learning. *Journal of Physics: Conference Series*, 1521(4), 42085. IOP

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Publishing.

- Tegeh, I. Made, Simamora, Alexander Hamonangan, & Dwipayana, Kadek. (2019). Pengembangan media video pembelajaran dengan model pengembangan 4D pada mata pelajaran Agama Hindu. *Mimbar Ilmu*, 24(2), 158–166.
- Triwoelandari, Retno, Handayani, Ega Widya, & Arif, Suyud. (2023). DEVELOPMENT OF PROJECT-BASED LEARNING SCIENCE E-MODULE TO IMPROVE COLLABORATION SKILLS OF ELEMENTARY SCHOOL STUDENTS. *Jurnal Cakrawala Pendas*, 9(4), 762–774.
- Winarso, Widodo, & Haqq, Arif Abdul. (2020). Where Exactly for Enhance Critical and Creative Thinking: The Use of Problem Posing or Contextual Learning. *European Journal of Educational Research*, 9(2), 877–887.
- Zainudin, M., & Istiyono, Edi. (2019). Scientific Approach to Promote Response Fluency Viewed from Social Intelligence: Is It Effective? *European Journal of Educational Research*, 8(3), 801–808.
- Zakiah, Nikmatul Azmi, & Sudarmin, Sudarmin. (2022). Development of e-module STEM integrated ethnosience to increase 21st century skills. *International Journal of Active Learning*, 7(1), 49–58.
- Zulaiha, F., & Kusuma, D. (2020). Development of STEM-Based Modules for Junior High School Students. *Journal of Physics and Technology Education*, 6(2), 246–255.