Validation of E-Module Based on Argument-Driven Inquiry using 3D Page Flip Professional to Improve Students' Generic Science, Critical Thinking and Scientific Argumentation Abilities

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Abstract: The development of E-module based on Argument-Driven Inquiry using 3D Pageflip Professional has been carried out to improve the generic science skills, critical thinking and scientific argumentation of students. This development aims to describe the validation of e-module teaching materials that are suitable for use in learning activities. The development model design used is 4D which consists of definition, design, development and dissemination stages. This research is limited to the development stage. Validation activities have been completed in the development process. The validity of the e-module was assessed by 3 competent experts who are competent at Mataram University. In addition to the validity of the e-module, there are several learning tools that are assessed for validity to support the quality of the e-module developed. Some of these learning tools include syllabus, lesson plans, worksheets, test instruments for science generic ability, critical thinking and scientific argumentation. The results show that e-module based on Argument-Driven Inquiry assisted by 3D Pageflip professional can be used in science learning activities at school.

Keywords: Validity; E-module; Argument-Driven Inquiry; 21st Century Competence

Introduction

The 21st century has given rapid changes in this era. The field of education is one that has been significantly affected by developments in this century (Doyan et al., 2023). In the field of education, skills and literacy related to information and communication technology, creativity, innovation and cooperation need to be emphasized and carried out in various ways (Barta et al., 2022; Kaçar & Balim, 2021).

Natural Science is a science that is studied to gain an understanding of nature (Songsil et al., 2019). Concepts and theories in science are obtained based on experimental activities carried out based on scientific procedures (Susilawati et al., 2020). In order to gain a deeper understanding of the natural surroundings, an inquiry process should be carried out in learning. By using the inquiry process, you can develop thinking, working and communicating skills (Lismawati et al., 2021; Marudut et al., 2020).

Through science learning, students' generic science abilities can be trained. Students must have scientific generic abilities to be able to think analytically and think at a higher level (Izetbigovic et al., 2019). One of the abilities in higher order thinking is critical thinking. Students' critical thinking skills will affect students' generic science (Noviandayati & Shofiyah, 2021) Critical thinking skills are able to assess an argument by providing evidence to accept or reject a statement (Marudut et al., 2020). Critical thinking skills can be

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How to Cite:
Syuzita, A., Susilawati, S., & Sukarso, A. (2023). Validation of E-Module Based on Argument-Driven Inquiry using 3D Page Flip Professional to Improve Students' Generic Science, Critical Thinking and Scientific Argumentation Abilities. *Jurnal Penelitian Pendidikan IPA*, *9*(8), 6272–6277. https://doi.org/10.29303/jppipa.v9i8.4947

developed through scientific argumentation. Arguments can be developed through inquiry activities, students are actively involved in investigating a fact to support their arguments (Hardini & Alberida, 2022).

Based on the observations, in the field shows that learning activities are still teacher-centered so that students' reasoning abilities are low. Teacher-centered learning will lead to a lack of student participation in the process or behavior of the science concepts acquired so that students only focus on aspects of knowledge but are less required to apply, reason and use the knowledge they gain from the learning process (Erni Mariana et al., 2023; Karlina & Alberida, 2021). The learning resources used only depend on textbooks so that learning seems monotonous. Learning resources that depend on textbooks cause students to tend to get bored the use of module or e-module in learning has never been used. The learning model used has not been able to support students' generic science abilities, critical thinking and scientific argumentation. The selection of learning models is an important thing to consider. So that to facilitate the ability of these students, interesting teaching materials are needed for students.

E-Module is a form of innovation that is carried out to support learning activities. E-module are packaged electronically by not removing the elements and components on the module (Yanarti et al., 2022). E-module can be accessed using electronic devices (Computer, Pc or android) (Malika et al., 2022) E-module have the advantage of being able to stand alone so that they can improve the quality of learning (Marnah et al., 2022). E-module should be facilitated by appropriate learning models. One of the learning model that can be used is Argument-Driven Inquiry (ADI). The ADI model can assist students in developing generic science skills, critical thinking and scientific argumentation (Salsabila et al., 2019; Siahaan et al., 2019). ADI can improve the ability to understand students' scientific concepts and arguments (Arfiany et al., 2021; Ping & Osman, 2019). Implementation of this learning model can improve the investigative abilities and self-confidence of students (Eymur, 2018). So that the e-module facilitated by the ADI model to be used as a solution to improve students' Generic Science, Critical Thinking and Scientific Argumentation Abilities.

Based on the problems found during the observation, it is necessary to develop a science electronic module (e-module) with 3D Pageflip Professional as a teaching material or an alternative used to support learning activities in class to improve generic science skills, critical thinking and scientific argumentation of students.

Method

This research is development research that will produce a product in the form of an E-Module with the Argument-Driven Inquiry model using 3D Pageflip Professional. This study uses a 4D models which consists of the definition, design, develop and dissemination stages (Sugiyono, 2014). This research is limited to the development stage (develop). The define stage is carried out to find out the problems and needs of students in the learning process. This stage consists of a front-end analysis. The design stage aims to design a product according to what is required at the define stage.

The develop stage aims to analyze the validity of draft 1 that was made in the previous stage. The validity test was carried out by three expert validators. Validity data was obtained from the results of reviews and evaluations of content aspects and learning activities. The main product developed is an e-module based on Argument-Driven Inquiry using 3D Page flip Professional. To support the developed e-module, syllabus, Lesson Plans, Student Worksheets and Evaluation Test Instruments were also developed. The data obtained in this study were analyzed using the equation 1. The level of validity will be determined based on the criteria in the table 1.

$$SV = \frac{\text{the average value of expert validity}}{\text{max score}} \times 100\% \qquad (1)$$

Table 1. Instrument Validation Criteria

Validation Percentage Value Range (%)	Validation Level
0-20	Invalid
21-40	Less Valid
41-60	Valid Enough
61-80	Valid
81-100	Very Valid

(Arikunto, 2010)

Result and Discussion

This research is development research using a 4D model design. The 4D development model consists of 4 stages namely define, design, develop and disseminate. This research is limited to the development stage, namely the validity test. This study aims to produce a product in the form of an Argument-Driven Inquiry (ADI)-based electronic module (e-module).

The define stage aims to identify and define the problems students in learning Susilawati et al. (2023), so that the basic need arises to develop e-module which are facilitated by appropriate learning models. The define stage carried out several activities to see the needs and problems in learning activities. This stage consists of an initial and final analysis which includes an analysis of

student needs, material and concept analysis, task analysis and curriculum analysis (Doyan et al., 2022).

The results of the analysis students show that the use of e-module in learning is needed as an alternative source of learning. This is because the learning resources used in schools still depend on textbooks. Curriculum analysis produces a basic competency that is suitable for development into an E-module based on Argument-Driven Inquiry. The basic competencies used include basic competencies in aspects of knowledge and skills (Lestari et al., 2023). The basic competencies used are basic competencies 3.7 and 4.7 material on Substance Pressure and Its Application in class VIII at Junior High School level. The determination of the material is seen from the suitability of the material and the inquiry-based learning process.

The next stage is design. At this stage, the researcher designed teaching materials in the form of e-module based on Argument-Driven Inquiry. The arrangement of the e-module is systematically designed which consists of; cover page, e-module identity, preface, table of contents, introduction, learning activities, learning assignments, summary, practice questions, reflective sheet, glossary, answer key and bibliography. The e-module was designed using Ms. Word and Canva are then exported to PDF format. Module in PDF format will be inputted into 3D Pageflip Professional software then converted into flipbooks. E-module was designed using Microsoft Word by adding learning animations found on the Canva, Pinterest and Google websites. After the e-module was designed using Mr. word then it will be converted in PDF format. The e-module in PDF format will be imported into the 3D Pageflip Professional software to be re-edited by adding videos related to the lessons being carried out and adding links for practice questions packaged in game form. E-modules that have been edited using 3D pageflip professional will have an output like a flippable book with 3D effects (Sholichin et al., 2022). E-modules that have been designed can be accessed online and offline.

The display of the e-module that has been designed is shown in Figure 1. The e-module is equipped with an Argument-driven Inquiry learning model, there is an "let's argue" activity to train students' scientific argumentation abilities. Other activities outlined in the e-module are observation and investigation. The e-module is structured based on the Argument-driven Inquiry syntax which is able to support students' generic science abilities, critical thinking and scientific argumentation. Argument-Driven Inquiry (ADI) is very effective in training students' generic science abilities (Siahaan et al., 2019). Indirectly, the implementation of this learning model can hone students' generic science abilities, so that they can understand their abilities and weaknesses in solving a problem based on the abilities they have (Belga, 2022). ADI can be used as an alternative by teachers to train students' argumentation and critical thinking skills (Ayuningtyas Fatmawati et al., 2019).

Figure 1. The display of the E-Module Based on Argument-Driven Inquiry using 3D Pageflip Professional

The next stage is developed. This development stage aims to develop teaching materials that are valid based on the assessment results of three expert validators. At the development stage, the e-module product validity test was carried out. To see the validity of the e-module, there are several learning tools that need to be validated as well as supporting the quality of the e-module being developed. These tools include Syllabus, Lesson Plans, Student Worksheets, Generic Science, Critical Thinking and Scientific Argumentation ability Instruments. The results of the validity of the learning device based on table 2. show that the validity based on the expert validator's assessment is in the percentage range ≥ 80 with the criteria of "very valid".

Table 2. Learning Device Validity Analysis Results

Validator	Syllabus	Lesson Plans	Student Worksheets	Generic Science Instrument	Critical Thinking Instrument	Scientific Argumentation Instrument
1	86.67	85.52	90.00	86.00	87.50	81.33
2	89.33	83.45	86.36	80.00	80.00	80.00
3	85.33	87.59	88.18	89.00	90.00	82.67
Average	87.11	85.52	88.18	85.00	85.83	81.33
Criteria	Very Valid	Very Valid	Very Valid	Very Valid	Very Valid	Very Valid

E-module based on Argument-Driven Inquiry are analyzed based on content, presentation and language aspects. Presentation of material is considered very important in developing a product, in this case the product is an electronic module. So that the results of the validity analysis for the electronic module from the three expert validators can be seen in table 3.

Table 3. Results of E-Module Validity Analysis

Validator	E-Modul		
	Content	Presentation	Language
1	86.67	92.00	80.00
2	89.33	80.00	80.00
3	85.33	92.00	80.00
Average	87.11	88.00	80.00
Criteria	Very Valid	Very Valid	Valid

The results of the validity test for the developed e-module show that the content, presentation and language aspects have an average value of ≥ 80 with very valid criteria. The validity of the e-module was obtained from three expert validators. Each validator provides an assessment of the content, presentation and language aspects. The following is a validity analysis diagram based on the aspects of content, presentation and language based on each validator which can be seen in Figure 2.
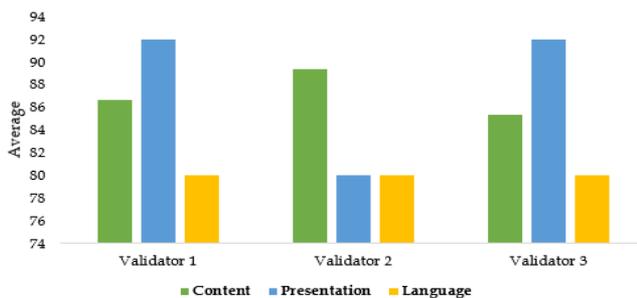

Figure 2. E-Module Validity Diagram

The results of the validity analysis of the e-module on the presentation aspect have the highest range, then followed by the material aspect because the assessment of these two aspects is in good criteria. The language aspect has a lower value than the other two aspects, this is because there are still improvements in the writing of the learning activity section.

Good teaching materials can facilitate students to get to know the natural surroundings better (Chen & Xiao, 2021). Therefore, the presentation of the material is said to be good if the teaching materials used are valid and feasible to use. This is suitable with research (Mimin Ninawati et al., 2021) developing an e-module based on software I spring 9 with very good eligibility criteria in the material aspect. Thus, it is hoped that the e-module in this study can be utilized to optimize learning activities that support students' generic science abilities, critical thinking and scientific argumentation.

Conclusion

E- Module based on Argument-Driven Inquiry using 3D Pageflip Professional which was developed and met very valid criteria in terms of content, presentation and language by three expert validators. Thus, it can be concluded that the E- Module based on Argument-Driven Inquiry using 3D Pageflip Professional can be used in science learning activities in schools.

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