



Development of Integrated E-module Teaching Materials for Generic Skills in Thermochemical Materials

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Abstract: Development of Integrated E-module Teaching Materials for Generic Skills in Thermochemical Materials. This study aims to determine 1) the development of e-module teaching materials integrated with generic science skills in thermochemistry material. 2) the feasibility of e-module teaching materials integrated with generic science skills according to the National Education Standards Agency (BSNP) category. 3) the reaction of educators and understudies to the created instructing materials. materials. This research was conducted using innovative work techniques (Research and Development). The subject of this assessment is a planned e-module of nonexclusive science capacities. While the object of this research is thermochemical material which will be validated by 2 material master validators, and 2 media master validators, 2 science instructor reactions and 10 XI MIPA 3 students. The steps for developing this e-module are 1) Exploration and information assortment starting. 2) Item arranging. 3) Introductory item advancement. 4) Starting field preliminaries. 5) Amendment of preliminary outcomes. The conclusion of this study is that the e-module integrated with generic science skills on thermochemistry material that has been developed meets the BSNP eligibility criteria, with feasible/interesting criteria and can be used in learning. This is in accordance with the evaluation of media specialists obtaining an assessment with an average percentage of 91.6% and material experts obtaining an assessment with a typical level of 82% with exceptionally high/meriting measures not needing to be revised. The level of attractiveness 2 of the chemistry teacher's responses was obtained with a typical level of 91.3% with exceptionally appealing standards and the degree of engaging quality in view of the responses of XI MIPA 3 students obtained an assessment with an average percentage of 92.9%. This value indicates that the developed e-module is very attractive to students.

Keywords: Research and development, teaching materials in the form of e-modules, generic science skills, thermochemistry.

Abstrak: Pengembangan Bahan Ajar E-modul Terintegrasi Keterampilan Generik Sains Pada Materi Termokimia. Penelitian ini bertujuan untuk mengetahui 1) pengembangan bahan ajar e-modul yang terintegrasi dengan keterampilan generik sains pada materi termokimia. 2) kelayakan bahan ajar e-modul terintegrasi keterampilan generik sains menurut kategori Badan Standar Nasional Pendidikan (BSNP). 3) reaksi pendidik dan siswa terhadap bahan ajar yang dibuat. bahan. Penelitian ini dilakukan dengan menggunakan teknik kerja inovatif (Research and Development). Subjek penilaian ini adalah e-modul terencana kapasitas sains noneksklusif.

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Sedangkan obyek penelitian ini adalah materi termokimia yang akan divalidasi oleh 2 validator master materi, dan 2 validator master media, 2 instruktur reaksi IPA dan 10 siswa XI MIPA 3. Langkah-langkah untuk mengembangkan e-modul ini adalah 1) Awal eksplorasi dan pengumpulan informasi. 2) Penataan barang. 3) Kemajuan item pengantar. 4) Memulai penyisihan lapangan. 5) Amandemen hasil awal. Kesimpulan dari penelitian ini adalah e-modul terintegrasi keterampilan generik sains pada materi termokimia yang dikembangkan memenuhi kriteria kelayakan BSNP, dengan kriteria layak/menarik dan dapat digunakan dalam pembelajaran. Hal ini sesuai dengan penilaian ahli media memperoleh penilaian dengan persentase rata-rata 91,6% dan ahli materi memperoleh penilaian dengan taraf tipikal 82% dengan ukuran sangat tinggi/berjasa tidak perlu direvisi. Tingkat kemenarikan 2 respon guru kimia diperoleh dengan tingkat tipikal 91,3% dengan standar sangat menarik dan kualitas derajat keaktifan dilihat dari respon siswa kelas XI MIPA 3 memperoleh penilaian dengan persentase rata-rata 92,9%. Nilai tersebut menunjukkan bahwa e-modul yang dikembangkan sangat menarik bagi siswa.

Kata Kunci : Penelitian dan pengembangan, Bahan ajar berupa e-module, Keterampilan generik sains, Termokimia.

INTRODUCTION

Training is quite possibly of the main expertise that people have. With education being a very important element for creating knowledge, skills, and attitudes (Septiwi, 2018). Education also plays a role in the development of a country for of working on the nature of (HR). If the quality of education is low, then the quality of Human Resources (HR) is also considered low. Therefore, from these efforts, there is no evidence of mutual education of improvements and solutions.

The curriculum currently used is the 2013 curriculum which is a curriculum to guide students to master three competencies, namely; attitudes, knowledge, skills (affective, cognitive, and psychomotor). In the 2013 educational program, learning material is focused on the arrangement of understudies' abilities and character through logical abilities, this is made sense of so understudies can comprehend the ideas advanced straightforwardly (Leady, 2022). The 2013 curriculum is a curriculum that aims to direct students to master and have attitude competence, knowledge and skills. Execution stage the 2013 educational program centers around dynamic exercises understudies through a logical cycle with the objective so that learning isn't simply make understudies who have information capability just, yet in addition ready to deliver great understudies in perspectives and abilities (Ratu, E, 2020).

Based on the findings of observations made at Laksamana Martadinata Private High School, most high school chemistry teachers in class XI are currently still using teaching materials in the form of printed books according to the 2013 curriculum as learning media, and teachers only study school materials. The ability to develop teaching materials in practice has not been well mastered by teachers. So that there are still many teachers who carry out conventional learning processes using printed books. This makes the teacher's activity more dominant, while students are more listeners which makes students lazy and silent when the learning mechanism takes place. Therefore, the lack of chemistry book facilities in schools makes it challenging for students to teach, and many still don't have books to study.

From the description of the problem above, the researcher sees the importance of teachers having competence to increase students' prior knowledge. Article 8 of the 2005

Teacher and Lecturer Law states that a teacher must be responsible for core competencies, namely; To start with, Foster an educational program connected with the field of picking up being instructed; second, Arranging instructive learning exercises third, Foster learning materials that are educated imaginatively and inventively fourth, Use data and correspondence innovation to impart and foster oneself. In view of the prerequisites and commitments, educators should have the option to make imaginative and inventive instructing materials that follow the educational plan, the necessities of understudies who create with innovation (Ina, 2020).

Science and technology are developing rapidly. Humans get information every day as a basic need. Moreover, today's humans are influenced by gadgets and sophisticated digital technology. The industrial revolution 4.0 has an impact on the flow of information which is very easy to accept.

In the 21st century, the schooling world is developing rapidly and must be prepared to face the world's difficulties, especially in science training. One effort to increase these challenges, one of which is to improve the quality of education by changing the teacher-centered learning system to student-centered learning (Risna, 2017).

The results of an international study by the Program for Global Understudy Appraisal (PISA) demonstrate that understanding proficiency, numerical education, and logical proficiency accomplished by Indonesian understudies are exceptionally low and simply ready to involve the main 10 base out of 65 country (Freddy, 2021). In 2015, PISA measured scientific literacy with a sample of 70 countries and Indonesia was at the bottom with an average score of 403. Of course this score is stillthe Program for Global Understudy Appraisal (PISA) demonstrate that understanding proficiency, numerical education, and logical proficiency accomplished by Indonesian understudies are exceptionally low and simply ready to involve the main 10 base out of 65 country far from achieving the international scientific literacy average score of 493. Based on the results of literacy measurements, it can be concluded that scientific literacy (including chemistry) of students in our country is still relatively low. This is an indicator that learning chemistry in schools has not accommodated efforts to improve students' chemical literacy skills. (Rendy, 2020).

Nonexclusive science abilities are one of the answers for defeat the above issues. Nonexclusive science abilities are abilities that make it conceivable to learn different ideas and tackle different logical issues. Conventional science abilities can be utilized as mental techniques connected with mental, full of feeling and psychomotor angles in the field of science that can be learned by students (Komang, 2019).

According to Prastowo (2013) states that modules are learning materials that are arranged systematically based on a certain curriculum and are summarized as the littlest unit of study and permit it to be concentrated on freely in a specific time unit so that students can learn the skills being taught. The availability of teaching materials is very important for teachers to increase academic success

Nowadays, human life has been influenced by technological developments. The rapid development of technology makes it easier for people to find information and increase knowledge. Increasingly advanced technological developments encourage the replacement of printing technology with computer technology. Educational media that is still widely used in schools is printed learning media. Therefore, researchers use learning media teaching materials that are in accordance with today's developments. Teaching materials that are in accordance with advances in E-module technology will

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be made by researchers. Displaying the materials used must comply with the National Education Standards Agency (BSNP) and the applicable curriculum.

Several previous studies that support this research, namely research by Nuraini stated that the quality of pocket book development is suitable for educational purposes that are oriented towards increasing generic science skills. The results obtained experienced an increase of 55% and had a real influence on increasing student learning interest (Nuraini, 2019).

Based on the validation test by material experts, the results were obtained in the very good category of 84.29%, with the good category of 97.50%, the validation test by the SMA Chemistry teacher obtained the results in the very good category of 89.32% and 84.50% very well obtained from students (Farahita, 2018). The 4-D model was used in this development research, and the design expert's data validation value was 94.5 percent "very good" or 89.7 percent "very good" material validation results. The translator got a score of 98.2 percent in the "very good" category, and a small group trial with a score of 85.4 percent in the "very good" category showed that the module could be used in learning activities.

Based on the description above, the use of learning resources in the form of integrated e-modules of generic science skills is expected to increase students' knowledge abilities. As a result, the authors are interested and plan to investigate.

• METHOD

Innovative work strategies or (innovative work are research techniques used to create specific items and test the viability of these items (Sugiyono, 2011).

This research was conducted at the Department of Chemistry, FMIPA, Medan State University, North Sumatra and was tested at the Laksamana Martadinata Private High School, Medan. The research was conducted from November 2022 to February 2023.

The subject of this research is the lecturer as the validator who will validate the Emodule. The object of this study is Teaching Materials in the form of E-modules integrated with generic science skills.

This research was conducted using innovative work techniques (Innovative work). Innovative work techniques are research strategies used to create specific items and test the viability of these items (Sugiyono, 2011).

This development model is related to the 4-D (four-D) research model. The 4-D research and development model is divided into four main stages, namely; define, design, develop, and disseminate. Meanwhile, according to Triyanto (2010), the 4D development model can be divided into 4D, namely: definition, design, development, and deployment. By following this research and development design, teaching materials integrated with generic science skills in thermochemistry material are produced and it is hoped that the developed teaching materials can be used in the learning process.

Data collection techniques used in this study are as follows:

1. Literature Study

The literature study was carried out by analyzing thermochemical material which included: Core Competencies (KI), Basic Competencies (KD), syllabus analysis, concept analysis, and theoretical studies of e-modules and related research products in the form of research documents and evaluation results. The results of this

study will be a benchmark for developing general scientific skills in an integrated manner in thermochemical material.

2. Questionnaire (questionnaire)

Questionnaire (questionnaire) is a data collection technique that is applied by presenting questions or written statements to respondents and used in evaluating and testing educational materials in the form of e-modules. The e-module was assessed by media expert validators, material expert validators, and language expert validators.

RESULT AND DISCUSSION

Based on the results of this research, it has been carried out in several stages, namely; book analysis by researchers, book analysis by lecturers, book analysis by teachers, teaching material development design, teaching material standardization by lecturers and teachers, and dissemination of teaching materials that have been developed. The result of this study is an integrated e-module of generic science skills on thermochemistry material at Laksamana Martadinata Private High School. Based on the research that has been carried out by the following researchers, the data obtained from the research results are presented.

In the analysis phase of chemistry textbooks by researchers based on the 2013 curriculum syllabus, the next step in this research is to analyze or review three high school chemistry books. There is a list of books analyzed in Table 4.1 below:

No.	Book Title	Author	Publisher	Publication Year
1.	Kimia SMA/MA	Unggul Sudarmo	Erlangga	2013
	Kelas XI			
2.	Buku Kimia untuk	Erfan Priyambodo	Intan Pariwara	2016
	SMA/MA Kelas XI			
3.	Kimia Untuk	Unggul Sudarmo	Erlangga	2016
	SMA/MA Kelas XI	dan Nanik Mitayani		

 Table 4.1 List of Books Analyzed

Other results were obtained from the feasibility analysis of the integrated generic science skills module by means of expert validation carried out by 2 media expert validators and 2 subject matter expert validators who are chemistry lecturers at Fmipa Unimed. In addition, the chemistry teacher's response to the integrated module of generic science skills on thermochemistry material was also seen with the responses of 2 chemistry teachers at the Laksamana Martadinata Private High School in Medan. The validation instrument and the teacher's response use a Likert scale. The percentage results of media expert validation and material expert validation D can be seen in the media expert validation DIAGRAM in Figure 4.1 and the material expert validation diagram in Figure 4.2 below:



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Figure 4.1 Media Expert Validation Results

Based on Figure 4.1 it can be seen that the average percentage of media validation results is 91.6%. This shows that the media contained in the e-module integrates generic science skills on "Appropriate" thermochemical material based on BSNP criteria.



Figure 4.2 Material Expert Validation Results

Based on Figure 4.2 above which is the material expert validation results, it can be seen that the average percentage obtained is 82.2%. This shows that the material in the e-module is integrated with generic science skills on thermochemical material "Decent" based on BSNP criteria.

The other results obtained from the teacher's response analysis and student response analysis are the percentage of answers to all aspects of the assessment in a statement. The results of the chemistry teacher's response analysis and student response analysis can be seen in Figure 4.3 and Figure 4.4.



Figure 4.3 Teacher Respon Analysis

Based on Figure 4.3, it can be seen that the average percentage of teacher response analysis results is 91.3%. This shows that the response of chemistry teachers to the integrated e-module of generic science skills on thermochemistry material is "Very Interesting".



Figure 4.4 Analysis of Students responses

In Figure 4.4 it can be seen that the results of the analysis of students' responses to the integrated e-module of generic science skills on thermochemistry material had a positive response from class XI IPA students as shown in the average percentage rate of 92.9%. Therefore the results of these presentations are included in the "Very Interesting" category.

- CONCLUSION

Based on the results of the analysis and research that has been done, the following conclusions can be drawn:

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1. The e-module integrates generic science skills on thermochemistry material, produced and developed in relation to research and development methods or Research and Development (R&D). This study focuses on design, feasibility, teacher and student responses to the development of an integrated module of generic science skills. Module integrated generic science skills on thermochemistry material. The author divides the research and development stages into five parts, to be specific the exploration and data gathering stage, the item arranging stage, the item improvement stage, the underlying field preliminary stage, and the preliminary outcomes modification stage, where the features provided are used to determine whether or not e - developed modules. acceptable and attractive.

2. The e-module teaching material is integrated with generic science skills on thermochemistry material which was developed to meet the eligibility criteria of the National Education Standards Agency (BSNP), with the criteria of being eligible and not needing to be revised. The test instrument used by the researcher to look at the content, language, and presentation of high school chemistry textbooks uses a penalty that meets the BSNP eligibility criteria, and graphics.

3. From the research that has been done and based on existing data processing, the chemistry teacher's response to the e-module integrated generic science skills on thermochemistry material "Very Interesting" is obtained with an average percentage of teacher response results of 91.3%. And the students' responses to the integrated e-module of generic science skills in chemistry are also "Very Interesting" with an average percentage of 92.9%. Both teacher and student responses were very good towards the e-modules that had been developed. Then the developed e-module is suitable for use as a learning medium in schools.

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