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Development of Integrated Electronic Module with Instructional Videos

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Abstract

This research conducted to develop a teaching material product for teaching mathematics in high education. The product developed is an electronic module containing instructional videos aimed at addressing common issues in online learning. The research method used was Research and Development (R&D) which stages included analyzing field needs, designing the concept of the developed product, designing the product itself, and validating the product with three experts: Content Experts, Media Experts, and Language Experts. Based on the questionnaire validation from the experts on the e-module development, the findings are as follows: Content validation scored 73.5 out of 75 in total, or 4.9 out of 5 on a scale of 5. The score interval obtained was 98%, indicating that the content validity criteria are highly valid. Language validation aspect indicated that the language used is highly valid, scoring 50 out of 50 in total, or 5 out of 5 on a scale of 5, meeting the 100% validity criteria. Media validation scored 65.33 out of 75, or 4.35 out of 5 on a scale of 5. The score interval obtained was 87%, indicating that the media validity criteria are very valid.

Keywords: Electronic Module, Video, Development, Mathematics

1. Introduction

Learning is closely linked to various activities and endeavors organized and undertaken by teachers to achieve educational goals. One of the efforts of educators to achieve educational objectives is through the development of learning resources. Learning resources encompass various sources such as data, individuals, methods, media, and locations or places of learning that are used and utilized by learners to facilitate learning. According to Sudjana (S, 2019) Some learning resources include printed learning teaching material, non-printed learning teaching material, teaching material or resources in the form of activities, and learning material in the form of environments. Teaching materials can increase students' interest, motivation, and attention, leading to an improvement in the quality of learning, the use of teaching materials will influence the learning process (Hendri, et.al., 2021; Syahrial,et.al.,2019).

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There are various types of teaching materials, one of which is modules that can enhance understanding of the subject matter and the learning abilities of students. Modules serve as a learning resource that learners can use as printed media for both conventional and modern learning methods, enabling independent learning (Safithri & Saputri, 2022). The ability to learn independently affects students' academic achievement, Mulyasa (Merona, 2019) adding that learning success is determined by internal factors and efforts made. One effort that students can undertake is self-study through teaching materials such as modules. Modules function as independent learning tools, allowing students to learn not only at school but also independently at home (Prayogo, 2021); (Mardiyah, Johar, & Mailizar, 2020). E-Modules are equipped with self-study instructions, allowing students to learn according to their abilities and meet all the competencies they need to master (Salfia, 2021).

With the advancement of technology, modules now come in electronic form containing various learning media such as animations, videos, and others. Media that can enhance the quality of learning includes the use of audio-visual media (Fitri & Ardipal, 2021). Educational videos present learning materials in audio-visual format, encompassing concepts, principles, procedures, theories, and real-life examples of knowledge, allowing students to comprehend the entire content effectively. Videos can be online-based and accessed directly by students to find various information and materials (Rahmawati & Atmojo, 2021). The implementation of developed educational video media influences the capabilities achieved by students. Learning through video media is effective in understanding mathematical concepts (Gusmania & Wulandari, 2018).

E-modules represent a transformation of teaching materials from print to digital form. The e-module teaching material system becomes an alternative that will make learning more effective, efficient, and relevant (Pohan, 2023). The advantages of e-modules include the incorporation of videos, audio, animations, and other interactive features (Rismayanti,et.al.,2022). Several steps are necessary to develop teaching materials integrated with video, such as creating electronic module products accessible to students. Interactive media can take various forms, including interactive computer software, computer simulations, mobile applications, educational games, interactive videos, and various forms of digital content that engage users in an active learning experience (Jafnihirda,et.al., 2023).

According to Robert Maribe Branch (Mulyani,et.al.,2016), the R&D method involves four approach steps abbreviated as ADDIE: Analysis, Design, Develop, Implement, Evaluate. Furthermore, Sugiyono defines research and development methods as a scientific way to research, design, produce, and test the validity of produced products (Sugiyono, 2013). Additionally, Borg and Gall (Rohmaini,et.al., 2020) outline ten steps in development research, starting from potential, data collection, product design, design validation, revision, product testing, revised the product, usage testing, revision, and then to mass production.

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2. Methods

The research method in this research is Research and Development usually called it R&D, a research approach to produce a new product or improve an existing product (Ariawan,et.al.,2022). R&D is a method employed to develop or refine a product then to test the validity of the produced product. The steps in developing e-modules are as follows: 1) Identifying Potential and Problems, 2) The Data Collection, 3) Design the Product, 4) Product Validation, and 5) Product Revision (Elvarita,at.al.,2020). The analysis of product validation is conducted based on data obtained from validators using questionnaire instruments with the following score criteria:

Table 1. Score Criteria

Criteria	Score
Worst	1
Bad	2
Average	3
Good	4
Very good	5

a. Calculating the percentage for each aspect. The formula used is:

$$K = \frac{F}{N \times I} \times 100\%$$

K : The percentage of criteria feasibility
F : The total number of respondents' answers
N : The highest score in the questionnaire
I : Number of questions in the questionnaire

b. The results of percentage calculations for each aspect are converted using a conversion table referenced as follows:

Table 2.Classification of feasibility

Interval	**Criteria of Feasibility**
0% - 20%	Very not valid and requires overall imrovement
21% - 40%	Less Valid and requires major improvement
41% - 60%	Valid with minor improvements
61% - 80%	Valid with improvements and can be used
81% - 100%	Very Valid and can be used for learning without improvements

Source: (Lumbantoruan & Ditasona, 2024)

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3. Result and Discussion

The analysis of potential issues can help identify obstacles or challenges that have arisen, necessitating the development of integrated Mathematics and Chemistry e-modules with instructional videos. Alongside the increasingly modern era, education inevitably must keep pace with these developments. One form of adaptation by academic programs is the development of curricula that align with current and future needs. The current curriculum development incorporates the National Curriculum Framework usually called KKNI, in conjunction with *Merdeka Belajar* (Freedom of Learning).

This evolution in national educational curriculum aligns with the requirements for suitable teaching materials and appropriate learning processes. The use of internet-based instructional media has become commonplace. The digitalization of learning is now closely integrated with educational processes, notably evident during the pandemic with the widespread adoption of online learning. Post-pandemic, digitalization and online learning continue to be implemented and can complement face-to-face instruction, optimizing the overall learning experience.

Accessible learning anytime and anywhere has become a critical educational necessity. Learning no longer solely relies on face-to-face interaction between lecturers and students but also involves internet-based access to various necessary materials. Several potential issues prompting the need for this product development include: Technological limitations, Alignment with curriculum and subject matter, Validity and Quality of instructional videos aligned with curriculum objectives and student outcomes, Language and communication clarity in instructional materials that students find challenging to comprehend, Structured evaluation and feedback tailored to educational needs.

By identifying these potential issues, researchers plan appropriate mitigation strategies through the development of electronic modules integrated with instructional videos. The mitigation strategies include: 1) Designing teaching materials aligned with the KKNI curriculum and based on the Semester Learning Plan (RPS) in place; 2) Writing instructional materials in student-friendly language that meets educational needs; 3) Providing various examples and learning activities using student-centered learning so that students can use the modules independently; 4) Designing learning assessments by developing various practice exercises and quizzes that can be accessed anytime, anywhere due to their online nature; 5) Developing instructional videos featuring lecturer explanations for each topic, enabling students to revisit content as needed and access it from anywhere via YouTube connectivity.

Based on these strategies, researchers proceed with developing and designing the product, followed by validation by experts. The product design involves creating an interactive electronic module integrated with instructional videos. The module is formatted in JIS B5 size (18.19 cm x 25.69 cm),

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designed using Microsoft Word, converted into PDF, and further developed into a flipbook application. The components of the e-module design include: 1) Cover, 2) Foreword, 3) Table of Contents, 4) List of Tables, 5) List of Figures, 6) Concept Maps, 7) Learning Materials, 8) Exercises, 9) Quizzes, 10) Instructional Videos, 11) References.

Based on the questionnaire results from experts, validity and feasibility testing of the product design were conducted with two content experts, one language expert, and three media experts, as shown below in the following table :

Tabel 3.Validation of Content, Media and Language by experts

Validation	1st Expert	2nd Expert	3rd Expert	Average	Percentage
Content	4.8	5		4.9	98%
Media	4.9	4.3	3.9	4.4	87%
Language	5			5	100%

Based on the table above, the validation of content/materials achieved a score of 73.5 out of 75 total points, or 4.9 out of 5 on a 5-point scale. The score interval obtained was 98%, indicating a criterion of very valid feasibility. Regarding language feasibility, it can be concluded that the language used is highly valid, with a validation score of 50 out of 50 total points, or 5 out of 5 on a 5-point scale, meeting 100% validity criteria. Media validation scored 65.33 out of 75, or 4.35 out of 5 on a 5-point scale. The score interval obtained was 87%, with the feasibility criteria being Very Valid. The developed module is valid and ready to be field-tested. This electronic module is expected to enhance students' abilities and meet the teaching material needs in the classroom.

In conclusion, the developed electronic module is highly valid and suitable for use, with some suggestions for improvement from the validators. Some recommendations for the developed product include:

1. Addition of concept maps as follows

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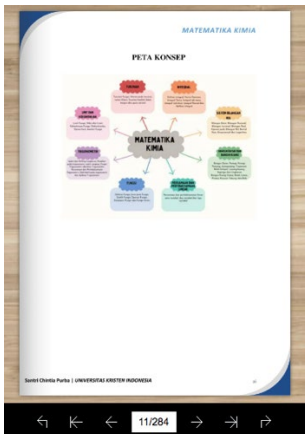

Figure 1: Revision 1

2. The instructional videos need editing to trim the first few seconds, allowing them to start directly with the explanation of the content, as follow:

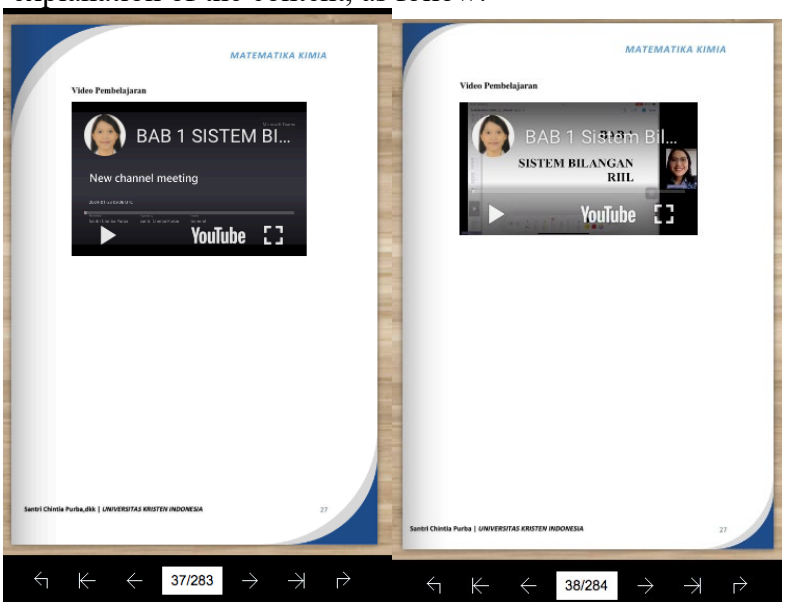

Figure 2: Revision 2

3. Some typos in the words used, as follow:

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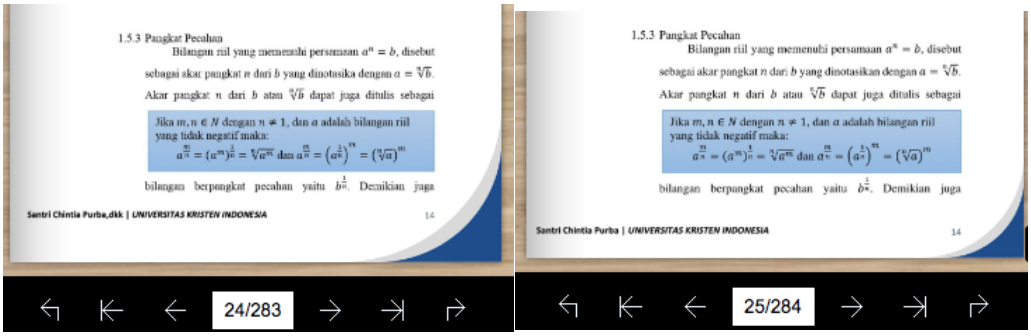

Figure 3: Revision 3

4. Proof of changes in trigonometric formulas in quadrants 2, 3, and 4 based on angles 90 and 270 degrees, as follow:

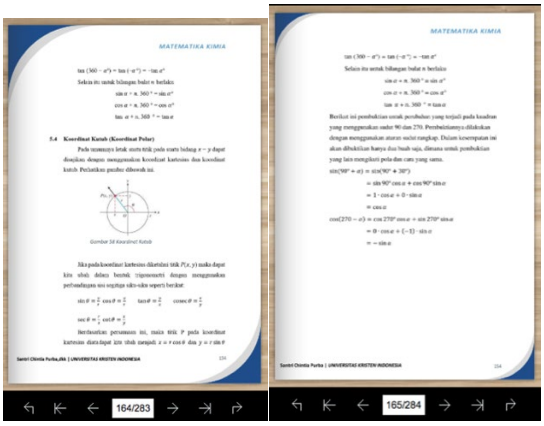

Figure 4: Revision 4

5. In Chapters 3 and 6, the images are not quite aligned with the material, as following figure:

Figure 5: Revision 5

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Based on all the revisions that have been made, the developed electronic module can now be used and progressed to the next stage of research. In this regard, based on expert feedback, the module has been validated and deemed suitable for use.

4. Conclusion

Development product conducted by the researcher on the integrated mathematics and chemistry e-module with instructional videos, it can be concluded that the developed product is valid and suitable for use. This conclusion is drawn from validation by experts in the fields of content, language, and media, who affirmed that the developed e-module meets the criteria of validity and suitability for use. The percentages of validity obtained are as follows: content aspect 98% with highly valid criteria, language aspect 100% with highly valid criteria, and media aspect 87% with highly valid criteria.

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