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Interactive Excel E-Module for Grade VII Informatics Learning

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This research aims to develop e-modules for seventh grade Informatics subject on Excel introduction material and evaluate teacher and learner responses using the 4D development model. The defining stage includes initial analysis, learner analysis, and preparation of learning objectives, which show the need for e-modules because there are no special modules available and only rely on online materials. The e-module design is organized according to the learning outcomes of Merdeka Curriculum and packaged in an attractive format using Word, Canva, and Flip PDF Corporate, complete with text, videos, and quizzes. Validation by three media experts and one material expert resulted in an average score of 80.58% ("Valid"), so the product was fully developed and published electronically. Responses to the e-module were collected from one teacher and 74 students, with results of 92.5% for teachers and 83% for learners-both rated "Excellent". The e-module was further disseminated through links and QR codes. Although the technical use of the free Flip PDF to bring up watermarks and coordination during response collection was difficult, this product proved to be effective, innovative, and feasible to use in informatics learning. life.

Keywords: E-Module Development, Informatics Learning, Merdeka Curriculum, Flip PDF, Student Engagement

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INTRODUCTION

Pendidikan Technological advancements have significantly influenced human life and are unavoidable, as Science and Technology (IPTEK) offer numerous advantages and simplify various tasks. IPTEK represents a continuous process of innovation that fosters modernization by driving economic growth, enhancing social mobility, and broadening cultural horizons. Within the education sector, technology serves as a vital tool for accessing learning materials, retrieving information, and supporting educational development (Mulyani & Haliza, 2021). The evolution of modern technology plays a crucial role in helping to achieve educational objectives. As a result, instructional materials are essential in both teaching and learning activities, making them a fundamental component of the educational system (Hikmah & Hamid, 2021). The purpose of this module is to stimulate students' creativity through productive thinking and to foster learning experiences that are active, engaging, and effective. Utilizing electronic modules promotes more dynamic student participation compared to traditional print-based resources. To accommodate the diverse learning needs of students, the application of a differentiated instructional approach is necessary (Septyana et al., 2023).

Modules, as instructional tools, are designed to support the presentation of learning materials, address challenges within the learning process, and boost students' motivation and independence (Narsa, n.d.). Furthermore, they enable learners to study in alignment with their individual abilities and interests, while also allowing them to assess their own progress. The use of modules in education offers several advantages, such as delivering targeted feedback, promoting mastery learning, guiding students toward specific learning objectives, and fostering learning experiences that accommodate diverse learner needs (Ricu Sidiq & Najuah, 2020). Additionally, modules contribute to a collaborative learning environment and provide opportunities for improvement through remedial efforts. In essence, modules are intended to help achieve educational outcomes in an effective and efficient manner by promoting a self-directed, adaptable, and well-organized learning process.

Flip PDF Corporate is an application to create animated e-modules in flip book format that is compatible with desktop and mobile devices. This application has the advantages of an interactive book-like display, support for animation, video, audio, and active links, and is compatible with Windows and Mac operating systems. The registration process is easy, ads are minimal, and it provides a variety of templates that can be customized according to user needs. The output formats also vary, such as HTML, ZIP, EXE, APP, and FBR (Nur Fadilah & Sulistyowati, 2022). However, the drawback of this application is that it requires a stable internet connection and a device with high specifications to function optimally (Nisa et al., 2024).

The study of Nisa et al. (2024) also shows the advantages of Flip PDF Corporate in multimedia presentation, but it has not been specifically applied to technical materials such as Microsoft Excel and junior high school level. This research comes to fill the gap by developing an interactive Android-based e-module that can be accessed via mobile devices, using the Flip PDF Corporate application for Microsoft Excel learning in grade VII SMP. By combining video media, interactive quizzes, and animations, and adjusting to the Merdeka Curriculum and the needs of students in the field, this research makes a contribution that is more contextual, applicable, and in accordance with the latest technological developments.

During the KKN-PLP program at SMP Negeri 5 Samarinda, the researcher observed that the teaching materials still relied on textbooks and PowerPoint presentations provided by the teacher. It was also discovered that seventh-grade students had not yet been introduced to Microsoft Excel; they were unfamiliar with its interface, usage, and formulas. Unlike previous studies that developed e-modules using basic platforms such as Canva or standard Flipbook tools, this study introduces a novel approach by developing an Android-based e-module using the Flip PDF Corporate application, specifically for teaching Microsoft Excel to grade VII students. Flip PDF Corporate enhances interactivity through multimedia integration, including instructional videos, interactive quizzes, and engaging visual elements. Moreover, focusing on Excel material at the junior high school level adds a unique contribution, as this subject is often considered challenging and is rarely packaged in e-modules tailored to the needs of younger learners. This research was carried out within the framework of the independent curriculum, incorporating a differentiated learning approach to address the diverse needs of students.

The primary objective of this study is to design and evaluate an Android-based e-module using the Flip PDF Corporate application, tailored specifically for teaching Microsoft Excel to grade VII junior high school students. Additionally, the study aims to assess the module's feasibility through expert validation and to explore the feedback of both teachers and students regarding its employ in the learning process.

In response to the identified field problems and gaps in previous research, there has been no research that specifically develops Android-based e-modules using the Flip PDF Corporate application for Microsoft Excel learning at the junior high school level, even though this material is important and often considered difficult by novice students. Previous research mostly only utilizes visual platforms such as Canva or conventional Flipbooks that lack interactivity and have not been designed for mobile devices.

This research uses the 4D model (Define, Design, Develop, Disseminate) which has been adjusted. The Define stage begins with initial analysis, analysis of learner characteristics, and formulation of learning objectives to identify the needs and direction of development. The Design stage includes test preparation, material development, media and format selection, and storyboard preparation as outlined in the initial e-module design. Furthermore, the Develop stage includes the process of validation by experts, product revision based on input, and making the final product which is then tested through taking responses from teachers and students. If the response obtained is qualified as "good", then the module continues to the Disseminate stage, which is the packaging, adoption, and dissemination of e-modules. This process

illustrates a systematic, gradual, and evaluation-based approach in producing learning e-modules that are feasible, attractive, and in accordance with student needs.

METHOD

This research is a type of research and development (Research and Development) using the 4D model which is composed of four fundamental stages, namely Define, Design, Develop, and Disseminate. The choice of this model is based on its suitability in designing and developing learning tools systematically, effectively, and flexibly. The 4D model is considered more appropriate than other models such as ADDIE because it is specifically designed for the development of educational products, not just as a general instructional planning model. The advantage of the 4D model lies in the Define stage which is more detailed in exploring the needs and characteristics of users, and the Develop stage which emphasizes the process of validation and revision of products through limited trials before being disseminated. This makes the 4D model more applicable in the context of developing Android-based e-modules that require gradual product quality testing before being widely used in the school environment.

[Figure 1 about here]

The subjects of this study were 278 seventh grade students of SMP Negeri 5 Samarinda. To determine the sample size, the Slovin formula was used with a margin of error (e) of 10%:

$$n = \frac{N}{1 + N\,(e)^2} = \frac{278}{1 + 278\,(0{,}1)^2} = \frac{278}{1 + 2{,}78} \approx \frac{278}{3{,}78} \approx 74$$

Thus, a sample of 74 students was obtained who became users of the developed Android-based e-module. The selection of a margin of error of 10% is based on conditions in the field, where many seventh grade students get dispensation from school for participating in competitions, and some students do not have an Android cellphone device that is sufficient to access the e-module. In addition, this study also involved informatics engineering subject teachers as respondents in the trial as well as three media expert validators and one material expert validator in the product validation procedure.

In this investigation, the data collection tools consisted of expert validation documents and teacher and student response questionnaires, as well as interview and observation guidelines. Data collection techniques were carried out through initial interviews with informatics teachers, observation of the learning process, and distribution of validation questionnaires and response questionnaires to product users. Examples of questionnaire items on the media expert validation sheet include statements such as “The e-module interface is attractive and in accordance with the characteristics of students”. While in the student response questionnaire, there are statements such as “I feel easier to understand the material after using this e-module”. The data obtained were analyzed descriptively quantitatively using a percentage calculation based on a Likert scale. To test the reliability of the questionnaire instrument, Cronbach's Alpha (α) analysis was used, where an instrument is declared reliable if the α value ≥ 0.7. The validity of the product was determined based on the percentage range criteria, namely “very valid” if the percentage ≥ 85%, and the product was declared suitable for use if it did not require revision.

The percentage calculation stages in this study use a 4-point Likert scale, namely 1 = Strongly Disagree (STS), 2 = Disagree (TS), 3 = Agree (S), and 4 = Strongly Agree (SS). The first step is to add up all the actual scores obtained by respondents for each statement item. Then, the score is compared with the ideal maximum score, which is calculated from the number of respondents multiplied by the number of statements and the maximum score (4). The percentage of feasibility is calculated by the formula:

$$Presentase = \left(\frac{Total\ actual\ score}{Maximum\ ideal\ score}\right) n \times 100\%$$

The results of this calculation were then categorized into the level of validity or feasibility with the criteria: ≥ 85% = Very Valid/Good, 70%-84.99% = Valid/Good, 55%-69.99% = Fairly Valid/Sufficient, and < 55% = Invalid/Lacking. In addition to percentage calculations, descriptive statistical analysis was also used to strengthen data interpretation.

[Table 1 about here]

In conducting research on the development of Android-based e-modules using the Flip PDF Corporate application on Excel Introduction material for grade VII students at SMPN 5 Samarinda, researchers pay attention to the ethical aspects of research as a whole. This research was conducted after obtaining official permission from the school, including approval from the principal and informatics subject teacher as partners in the product trial process. In addition, because the research subjects involved underage students, the researcher also prioritized the consent of the students' parents/guardians as a form of protection of the rights and comfort of the participants. The entire data collection process was carried out by guaranteeing the confidentiality of the respondent's identity and without any element of coercion, and was only used for academic purposes and the development of learning products that were beneficial to the student learning process.

RESULT AND DISCUSSION

A. Result

1. The Result of E-Module Development

a) The Define Stage

The define stage begins with an initial analysis through interviews with informatics teachers, which shows that learning is still dominantly using lectures, students are more interested if interspersed with practice and quizzes, and are not familiar with Excel. The teacher expressed the need for e-modules as an innovative solution to increase student interest and understanding. Furthermore, learner analysis was conducted by interviewing students regarding motivation, understanding, and the need for teaching materials. The results showed that students need teaching materials that are interesting, easy to understand, and varied. Based on these findings, researchers formulated learning objectives according to the Merdeka Curriculum and compiled e-module content with the support of material sources from books and journals, images from copyright-free sites, and videos from the YouTube platform relevant to Excel introduction material.

b) The Design Stage

The design stage includes the preparation of materials and evaluation questions that are tailored to the learning outcomes and the results of the analysis of the needs of students. Researchers chose development media using Microsoft Word 2019, Canva, and Flip PDF Corporate, taking into account themes, colors, paper types, and typography. The e-module format was designed with portrait-oriented A4 paper, using TT Lakes Neue and Open Sans typefaces, and varied font sizes: title (30), subtitle (44), content (20), and image caption (13) to ensure readability and aesthetics of the module.

[Figure 2 about here]

c) The Develop Stage

The develop stage includes the process of expert validation, final product development, and response taking. Validation was conducted by three media experts and one material expert, all of whom were lecturers from Mulawarman University. The media validators consisted of Fahmi Romisa, S.Kom., M.Kom.; Galih Yudha Saputra, S.Kom., M.Kom.; and I Wayan Sugianta Nirawana, S.Pd., M.Kom., while the material validation was conducted by a computer education lecturer. This validation aims to ensure the feasibility of the content and appearance of the e-module before it is used by users.

d) The Disseminate Stage

The disseminate stage is carried out through the packaging process as well as the adoption and distribution of e-modules. Packaging is done by converting e-module links into bitly and QR code formats for easy user access. Furthermore, the e-modules that have been packaged are submitted to informatics teachers, who then distribute them to students both in printed and digital form so that they can be used in learning activities.

2. Results of E-Module Validation

a) Material Expert Validation

Research This produce an e- module Android based using Flip PDF Corporate application developed For Microsoft Excel material on the subject lesson Informatics class VII at SMP Negeri 5 Samarinda . Development process done through four 4D model stages , namely Define, Design, Develop, and Disseminate. The resulting module has through validation tests by experts , as well as tested to teachers and participants educate For know its feasibility and effectiveness.

[Table 2 about here]

[Table 3 about here]

The validation results by material experts showed an average score of 80% , which was categorized as “valid”.

[Figure 3 about here]

In figure 3 shows, the percentage of feasibility of e-module content is 77.50% with “valid” criteria, based on ten aspects of assessment such as the suitability of the material with learning outcomes, clarity of objectives, and completeness of supporting media such as images, videos, and quizzes which all support students' understanding and achievement of learning objectives.

The percentage of e-module language is 87.50% with “very valid” criteria, based on aspects of readability, clarity of information, conformity with PUEBI, and the use of language that is effective and easy for students to understand.

The percentage of presentation is 75% with the criteria of “valid”. The data obtained is based on three aspects, namely systematic presentation, completeness of information, and providing motivation.

b) Media expert validation

These results indicate that the content in the e-module is in accordance with the basic competencies, indicators, and learning objectives. Validation from media experts obtained a value of 81.15% , indicating that the design of the display, navigation, and interactive elements in the e-module are very good.

[Figure 4 about here]

In figure 4 shows, the percentage of feasibility of screen design display is 82.14% with "valid" criteria, based on five indicators such as color composition, layout, suitability of illustrations and text, clarity of titles, and attractiveness of designs that support the visual appearance of e-modules attractively and according to the theme.

The percentage of user-friendliness aspect is 81% with "valid" criteria, based on the systematic presentation and ease of operation. The e-module is organized coherently according to the order of the material and can be accessed at any time through the available links.

The consistency percentage is 80.56% with "valid" criteria, based on the consistency of words, fonts, and layouts that are adjusted to the level of students and are designed to be attractive and uniform on each page.

The percentage of usefulness is 81.25% with "valid" criteria, based on aspects of attractiveness, ease of interaction, and support for learning activities. E-modules are equipped with apperception videos, interactive quizzes, and flexible displays that are easily accessible at any time to support students' learning independence.

The percentage of the graphical aspect is 81.25% with "valid" criteria, based on the use of fonts, illustrations, and colors. The font selection of TT Lakes Neue and Open Sans and soft colors are designed to be attractive, easy to read, and comfortable to look at, with illustrations that support the understanding of the material.

It is known that the validity value of the class VII informatics e-module obtained an average percentage of 80.58 % with a validity category level of " Valid ". This assessment confirms that Flip PDF Corporate is able to present content visually, attractively, and easily accessible via Android devices, which is in line with the principles of visual learning according to the multimedia learning theory by Mayer (2009), that the integration of text, images, and interactivity can improve understanding of concepts.

c) Teacher and student response results

The response from teachers to the e-module reached 92.50% , categorized as "very good". Teachers stated that the e-module facilitated the process of delivering materials and encouraged students to be more active.

[Figure 5 about here]

In figure 5 shows, the overall percentage of teacher responses of 92.50% with "Very Good" criteria indicates that the developed e-module is considered very feasible and effective for use in learning. High scores on the e-module aspect (100%), presentation (100%), and graphics (100%) reflect that teachers highly appreciate the structure, visual appearance, and ease of use of the e-module. The content aspect scored 87.50%, which means the material is considered quite complete and in accordance with the learning outcomes. Meanwhile, the linguistic score (75%) is slightly lower, because there are some parts that need to be improved in terms of readability or conformity with Indonesian language rules.

Meanwhile, the students' response to the use of e-modules was 83% , also in the "very good" category.

[Figure 6 about here]

In figure 6 shows, the overall percentage of learner responses of 83% with the criteria of "Very Good" indicates that the e-module is considered effective and interesting from the point of view of direct users, namely students. The highest score is in the linguistic aspect (85%), which indicates that the language in the e-module is easy to understand, communicative, and appropriate for the level of students. The e-module and presentation aspects both scored 84%, reflecting that students found the e-module easy to use and organized coherently and interesting to follow. The content aspect (82%) indicates that the material is quite appropriate and understandable, although there may be some parts that are considered to be further developed. The graphical aspect (82%) was also rated well, indicating that the visual appearance was attractive, but it is possible that some students wanted a variety of colors, illustrations, or a more dynamic design. In general, all aspects showed a positive response from learners, indicating that the e-module has successfully attracted attention, is easy to use, and supports understanding of the material.

B. Discussion

The results of the e-module validation show a content validity score of 80%, which falls into the "valid" category but has not reached the level of "very valid". This score reflects that although the material in the e-module is in accordance with the learning outcomes and supported by learning media such as images, videos, and quizzes, there are still some aspects that need to be improved. One possible reason for the score not being maximized is the lack of depth or breadth of material in certain sections, for example, it has not touched on all variations of Microsoft Excel usage that are relevant for junior high school level, or the presentation of quizzes that have not fully challenged and measured overall understanding. In addition, material enrichment such as case studies, mini projects, or

integration with local contexts may also not have been maximized and should be noted for further development.

When compared to similar studies, for example, research by Sari et al. (2022) who developed interactive math e-modules using Canva for junior high school students, their content validity reached 86.25%. This is possible because Canva's focus as a visual medium allows for the reinforcement of visualization of abstract mathematical concepts. However, the study did not integrate interactive elements such as videos and digital-based quizzes, so in the aspect of interactive media Flip PDF has the advantage. Another study by Pratiwi and Ramadhan (2023) developed Articulate Storyline-based science e-modules and obtained a content validity score of 88.5%. Their advantages lie in the navigation and responsiveness of the module, but require high-powered devices and intensive training for teachers. In this context, Flip PDF Corporate is an intermediate option that is easier to use but still able to present interactivity.

Regarding limitations, the use of Flip PDF Corporate has obstacles such as the need for a stable internet connection and devices with medium to high specifications to run the module optimally. In addition, the unpaid version of Flip PDF provides a watermark that can interfere with the professional appearance of the module. This is a challenge for teachers in areas with limited facilities. In practice, teachers may need to print the module in physical form or provide a lightweight version (static PDF) for students who have difficulty accessing the internet or do not have adequate devices. Therefore, although the e-module is effective, its implementation should be adapted to local conditions and available facilities.

As a recommendation for further research, it is necessary to test the impact of using e-modules on student learning outcomes through a quasi-experiment design. The research can be conducted by comparing the experimental group (who use e-modules) and the control group (who use conventional textbooks), so as to obtain quantitative data on the effectiveness of the module in improving students' understanding and learning outcomes. In addition, it is also necessary to develop adaptive e-modules that can adjust the appearance and content based on students' initial abilities, as well as explore the integration of e-modules with LMS platforms such as Google Classroom or Moodle to increase flexibility in distance learning implementation.

CONCLUSION

This study aims to (1) design an Android-based e-module using the Flip PDF Corporate application for Microsoft Excel learning for grade VII junior high school students, (2) evaluate the feasibility of the module through expert validation, and (3) find out the responses of teachers and students to the implementation of the e-module. Based on the research results, all of these objectives were successfully achieved.

First, the design process succeeded in producing an Android-based interactive e-module that contains Microsoft Excel introduction material in accordance with Merdeka Curriculum. This module is systematically designed through the stages of Define, Design, Develop, and Disseminate, and is tailored to the characteristics and needs of students in the field.

Second, the results of validation by material and media experts show that the e-module is in the valid to very valid category, with an average material validation score of 80% and media of 81.15%. This indicates that the developed e-module is feasible to use in learning. Interactive features in the form of videos, quizzes, and animations integrated in the module are added values that are rarely found in conventional e-modules.

Thirdly, the responses from teachers scored 92.5% (very good), while from students it was 83% (very good), which indicates that this e-module is not only effective and interesting from the educator's point of view, but also from the direct users, namely students. The communicative linguistic and visual aspects as well as the coherent presentation of the material are the main reasons for this positive reception.

The main novelty of this research lies in the development of an interactive Android-based e-module using Flip PDF Corporate - an approach that is still rarely used for technical materials such as Microsoft Excel at the junior high school level. This module is not only compatible with mobile devices but also complies with the principle of differentiation in Merdeka Curriculum, supporting flexible and adaptive learning.

As a follow-up, researchers recommend developing advanced versions of this e-module, for example by adding learning analytics features to monitor student progress in real time. In addition, integration with LMS platforms such as Google Classroom or Moodle can expand the range and flexibility of its use, especially in the context of online and hybrid learning.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

LIST FIGURE

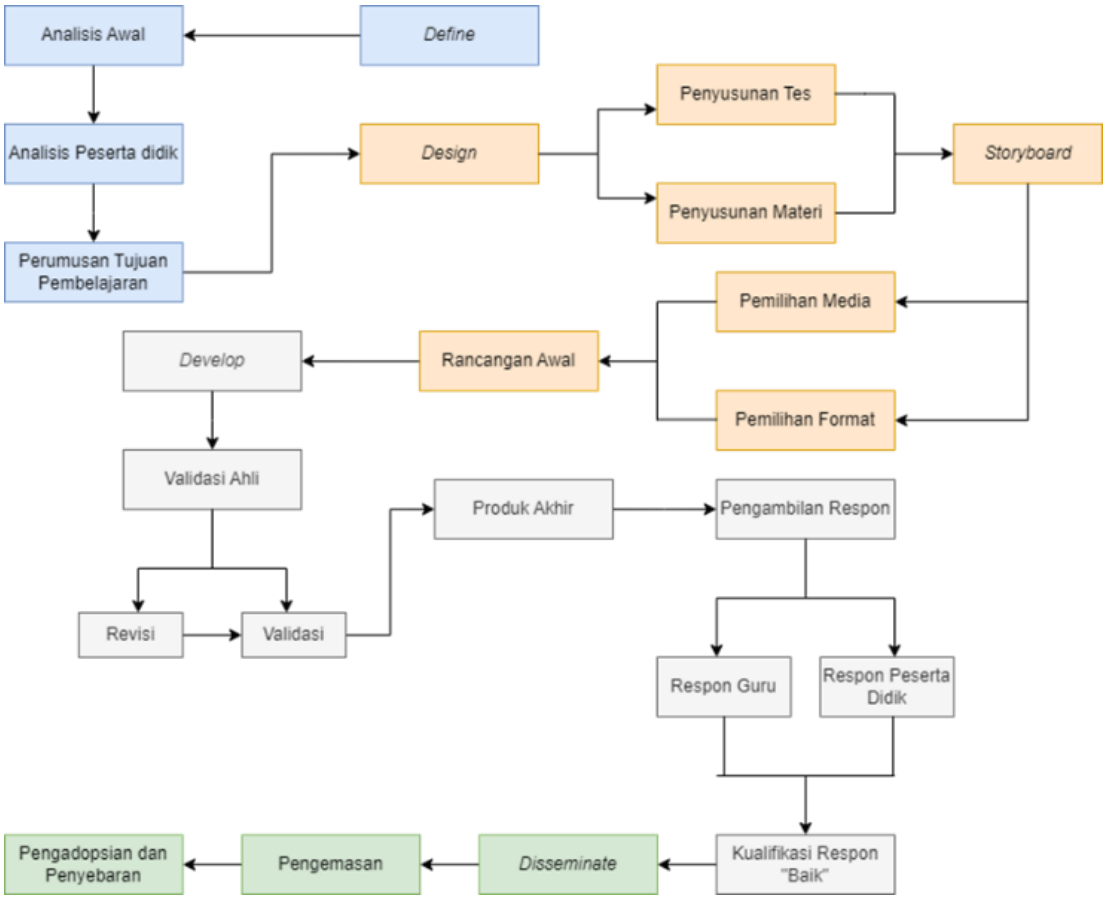

Figure 1 / Design of the Research Process

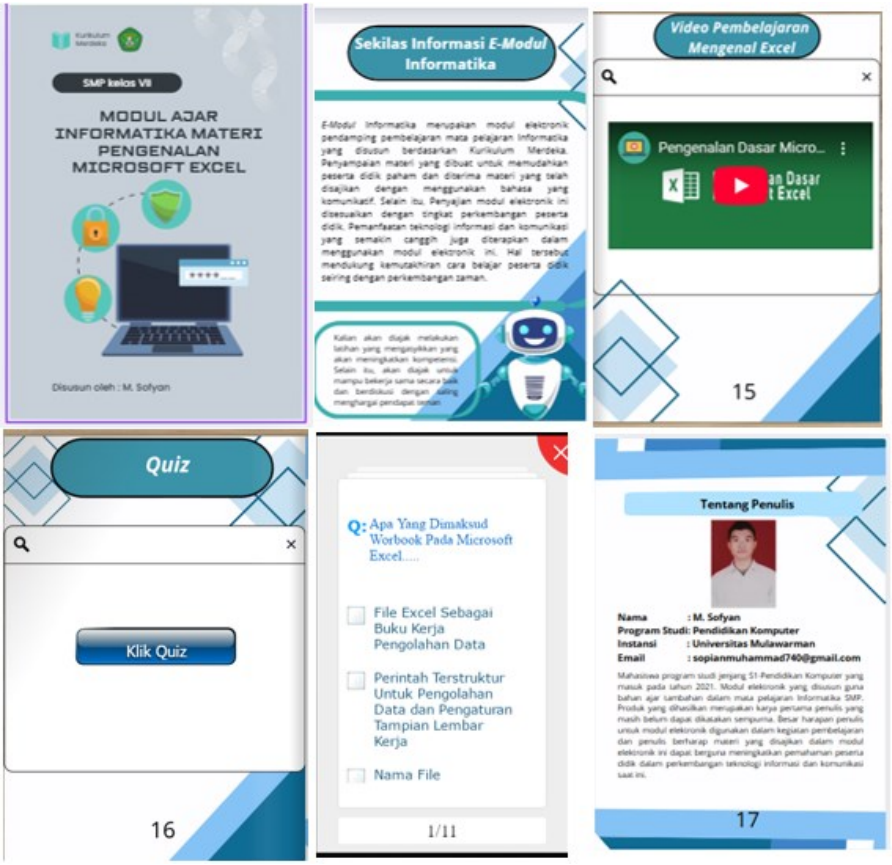

Figure 2 / E-Module

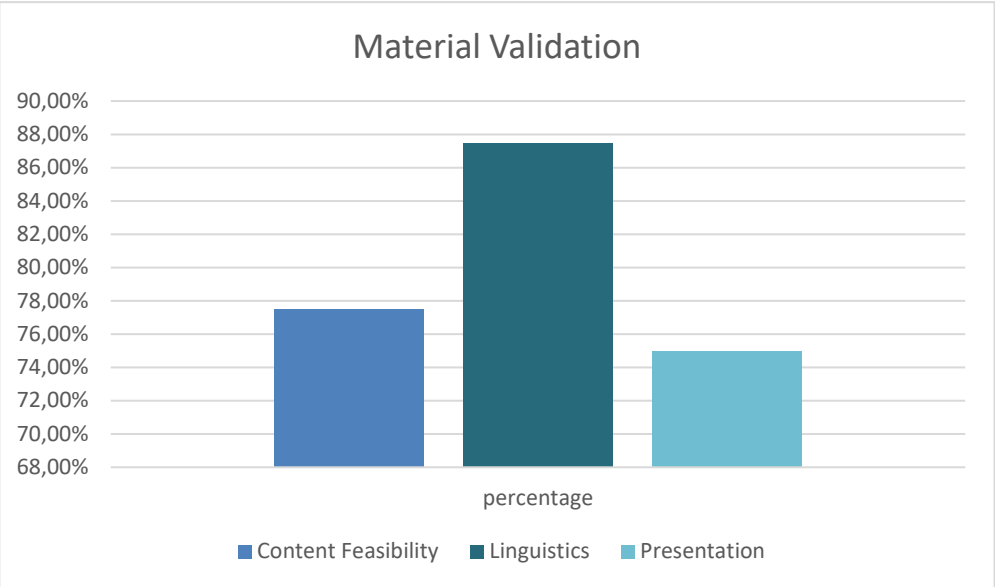

Figure 3 / Material expert validation

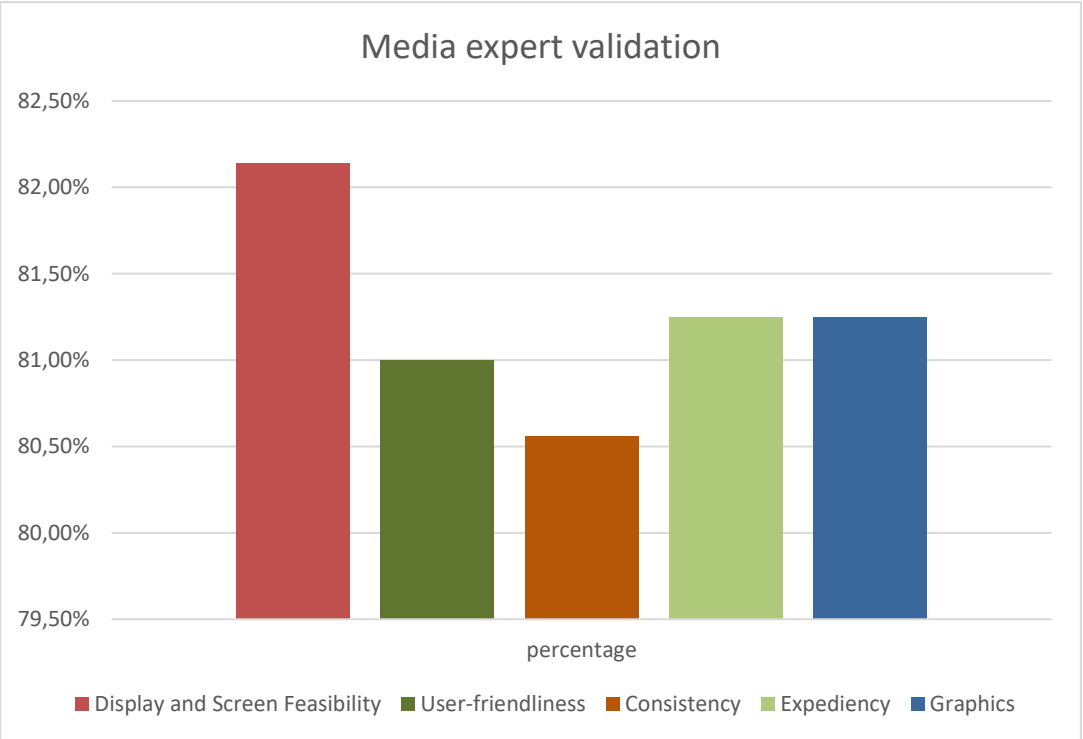

Figure 4 / Media expert validation

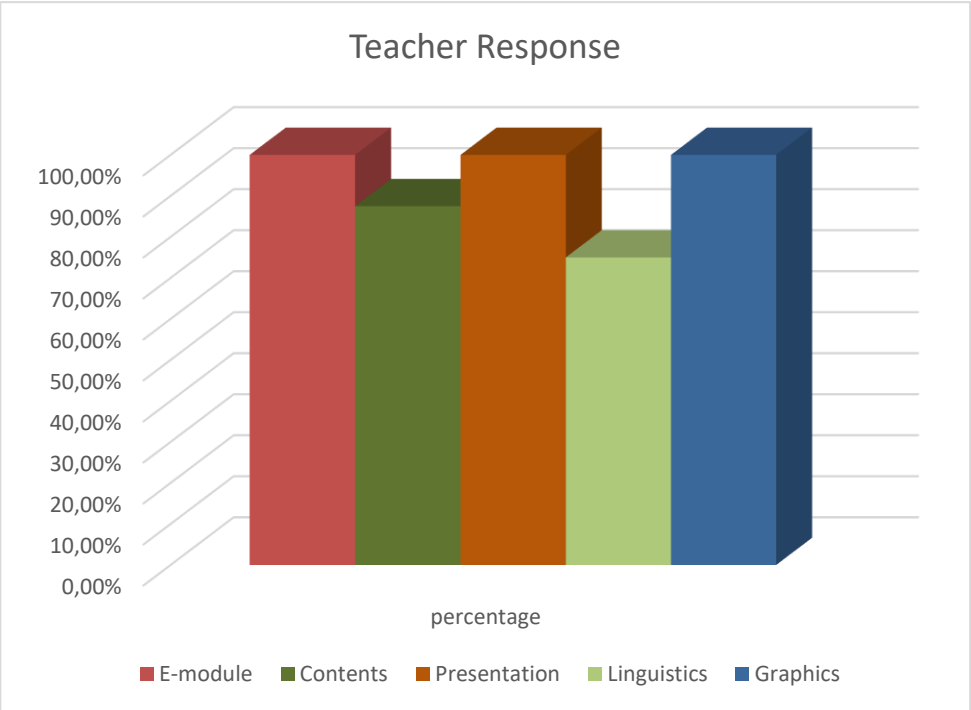

Figure 5 / Teacher response

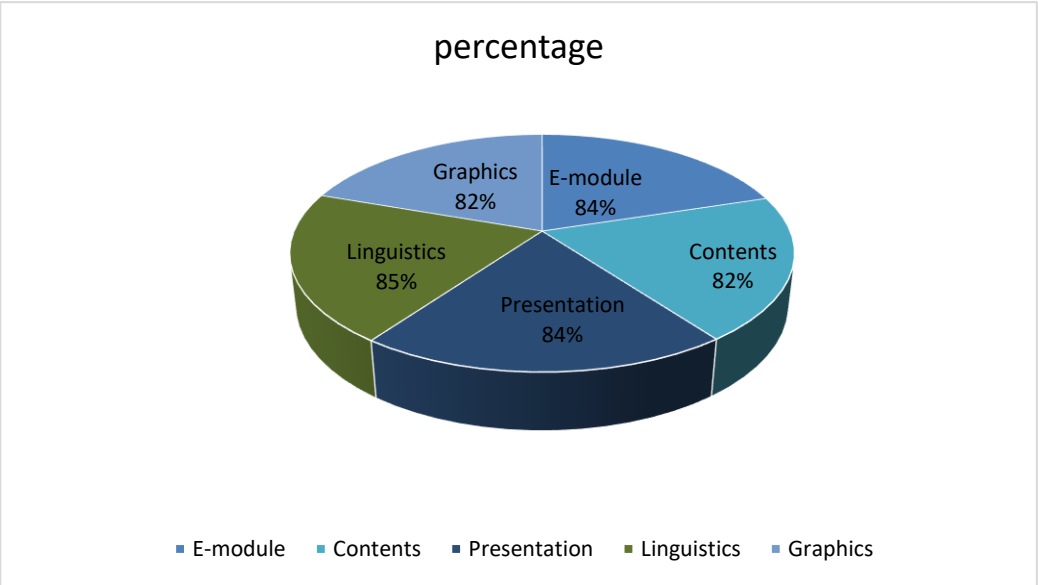

Figure 6 / Student Response

LIST TABLE

Table 1 / Scale Likert

Evaluation	Information	Score
SS	Strongly agree	4
S	Agree	3
TS	Don't agree	2
STS	Strongly Disagree	1

Table 2 / Criteria Validity

> 85.01%	Very Valid
70.01% – 85.00%	Valid
50.01%– 70.00%	Invalid
01.00%– %0.00%	Totally Invalid

Table 3 / Qualifications Response

> 81%	Very good
61% – 80%	Good
41%– 60%	Pretty good
21%– 40%	Not good
0%-20%	Very Poor