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Research paper

Development of Construction Occupational Health Safety Teaching Module for Students of the Department of Civil Engineering and Planning Education, Universitas Negeri Yogyakarta

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ABSTRACT

Background: This research aims to: (1) develop a construction occupational health safety teaching module for students of the Department of Civil Engineering and Planning Education, Universitas Negeri Yogyakarta. (2 Assessing the feasibility of the learning media through assessments from material experts and media experts from the Department of Civil Engineering and Planning Education, Universitas Negeri Yogyakarta.
Methods: The research method employed is Research and Development, utilizing a 4D (Four-D) development model. This model comprises four stages of development: Define, which represents the definition stage; Design, referring to the planning stage; Development, denoting the development stage; and Disseminate, which leads to the dissemination stage. Data collection uses questionnaires, and the analysis method applied is descriptive techniques.
Results: The results of the development of the K3 Construction module are (1) The development process follows 4 stages, namely define, design, develop, and disseminate. In the definition stage, it was found that there was a problem that learning media were not available for the construction occupational health safety teaching module for students of the Department of Civil Engineering and Planning Education UNY. At the design stage, the design of the module script is done with Microsoft Word with A4 paper size (21 cm x 29.7 cm). The development stage includes validation by material experts and media experts. (2) The results of validation from material experts resulted in a score of 90.66%, categorized as "very feasible", while validation from media experts received a percentage of 90.21%, also categorized as "very feasible".
Conclusion: Media for the K3 Construction module that is suitable for use in the K3 Construction course, Department of Civil Engineering and Planning Education, Universitas Negeri Yogyakarta.

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process that allows students to actively develop their potential. The main goal of education is for students to have spiritual strength, self-control, personality, intelligence, noble morals, and skills needed by themselves, society, nation, and state. This concept is stated in Article 1 of Law No. 20 of 2003 concerning the implementation of education, which must meet several educational standards called National Education Standards. The standard covers eight aspects, namely content standards, processes, graduate competencies, education personnel, infrastructure, management, financing, and educational assessment, that must be improved in a planned and periodic manner. National education standards are used as guidelines for curriculum development, education personnel, infrastructure, management, and financing. One of the ways education is carried out is through learning, which is an effort made by educators to introduce knowledge to students to develop their potential. The learning process is designed in such a way that students can gain knowledge effectively and efficiently with optimal results.

Quality education requires a quality learning process as well. To realize a quality learning process, of course, complete educational facilities are needed. The educational unit must be equipped with complete educational facilities and in accordance with standards. One of the educational means that supports the learning process is learning media. According to Danim (2010:7), educational media is a collection of tools or complements used by teachers or educators to communicate with students. With the media used in learning, the delivery of knowledge by educators to students will be carried out effectively and efficiently.

K3 Construction, as a course held at the Department of Civil Engineering and Planning Education, is a form of UNY's efforts to support the preparation for the implementation of K3. With the K3 course, students can find out the attitude and work culture that must be followed so that after graduation, they will be ready to enter the world of work. The K3 course certainly discusses matters related to occupational safety and health such as K3 management regulations and systems, personal protective equipment, RK3K Construction, sources and potential hazards and risks in the implementation of civil engineering projects, environmental management systems, K3 in construction work, scaffolding, mechanical and electrical work, K3 firefighting, construction K3 inspection, and analysis of work accidents. The K3 Construction course is optional in the Civil Engineering and Planning Education study program, which has a weight of 2 credits. Meanwhile, in the Civil Engineering study program, the K3 course is a compulsory course with a weight of 2 credits.

Based on interviews with lecturers in charge of the K3 Construction course, there is no learning media that is used as a reference in the implementation of learning K3 Construction courses in the Civil Engineering, Civil Engineering and Planning Education study programs. This is one of the obstacles in the learning process that needs to be fixed immediately. In addition to conducting interviews, an analysis was also carried out related to RPS and learning outcomes of K3 courses in three study programs at the Department of Civil Engineering and Planning Education. Based on a comparison of the learning outcomes of K3 courses in the three study programs, all three have learning outcomes that are not much different. The competencies and materials listed in the RPS are almost similar.

The emphasis in the K3 course is that students can have knowledge related to efforts to control K3 problems and first aid in accidents that can support safety and work productivity. In the implementation of teaching and learning activities for the K3 Construction course of the Department of Civil Engineering and Planning Education, there is no complete learning media used, and still uses media in the form of PowerPoint made by the teaching lecturer. According to Sumardjo et al. (2020:106-116), the lack of learning resources in the subject of Construction Cost Estimation makes students only focus on the material delivered by the teacher. This tendency results in a teacher-centered teaching and learning process. This makes the lack of critical thinking skills in students due to the teacher-centered learning approach. So that students only depend on the teacher to receive the material and do not look for learning resources independently.

The approach through the media as a supporting component in learning activities can provide high effectiveness in the education process (Shalsabilla, T. P., & Hidayat, N., 2023:128-136). The development of learning media is needed that can help deliver material more effectively and help students to be able to actively learn independently. One type of learning media that can be used is teaching modules. Modules are one of the media that can support the learning process. According to Hanafi (2024:45-52), modules are considered teaching materials that can be produced using the ADDIE model, and they must be structured so that they can be used in a structured, systematic, and supportive manner of self-learning. The advantage of the module is that it is designed so that it can be used by students to learn both with the direction of the teacher and through independent learning. The existence of modules can be used by students as a guideline for practical lecture activities. Because in the learning module, there are already materials that are in accordance with the curriculum, material summaries, job sheets, practice questions, and assignments in each sub-chapter (Syamsudin et al., 2022:83-93).

To improve the quality of learning modules to play a role in effective learning, it is necessary to pay attention to several elements that must be present in the design and development of modules. Arsyad (2017:87-90) put forward six elements that need to be considered when compiling modules as teaching materials, namely: consistency, format, organization, attractiveness, font size, and the use of empty spaces.

Based on this description, this researcher aims to create a construction K3 learning module using the 4D method and assess the feasibility of learning media made based on the assessment of material experts and media experts from the Department of Civil Engineering and Planning Education, Universitas Negeri Yogyakarta. As for the existence of learning modules, it is hoped that they can be a tool for educators in delivering material to students and also as a guide for students in K3 Construction lectures. This learning module is also expected to increase students' enthusiasm and independence in learning.

METHODS

This research is a Research and Development (R&D) research. Sugiyono (2009), research and development is a research method used to produce certain products (e.g. media, strategies, learning materials, evaluation instruments) and test the effectiveness of these products in learning. The implementation procedure can refer to the development model, one of which is a 4D model consisting of Define, Design, Develop, and Disseminate stages.

The 4D development model consists of 4 stages. The first stage is defining, which is the stage of observation or analysis to find problems that exist in students of the architecture study program. In other words, at this stage, it starts with analyzing the needs of teachers and students for learning activities, student characteristics towards learning media, curriculum analysis, and learning concepts and objectives (Wijaya et al, 2024:1-14). The second stage is the design stage, after knowing the existing problems, at this stage, it is to start making lesson plans and syllabus, then making module frameworks and drafting learning modules. Third, the development stage, namely the stage of testing and assessing the developed product, namely after the draft of the construction K3 module is completed, a feasibility test is carried out on one media expert and a material expert, all of whom come from lecturers from the Department of Civil Engineering and Planning Education, Faculty of Engineering, Yogyakarta State University. At this stage, in addition to the feasibility assessment, there are also inputs and suggestions for improving the construction K3 learning module. Fourth, the dissemination stage, which is the stage where the product will be disseminated to users.

The data analysis technique used in this study is quantitative descriptive. Data was collected through interviews and questionnaires. Interviews are used to obtain information related to learning problems that occur. Meanwhile, a questionnaire is used to assess the feasibility level of the developed product. The assessment of the developed products is carried out by material experts and media experts. The questionnaire used is designed with an assessment scale that refers to the Likert scale.

The data collected was measured using the Likert scale with a score range of 1-5 in the validation assessment sheet. This method is often used to gather assessments from experts regarding the quality of a research product. The Likert scale can be used to assess various aspects of a research product, such as the product's feasibility in the learning process. The answer options in the questionnaire are shown in Table 1.

Table 1.
Questionnaire Answer Options

Score	Category
5	Very eligible
4	eligible
3	Quite eligible
2	Less eligible
1	Not eligible

After obtaining the assessment from the questionnaire, calculate the average score of each question item contained in the questionnaire. The goal is to find out the level of product eligibility based on the average score obtained from the assessment. Based on Widoyoko (2012), the calculation of the average score can be done by summing the total score obtained from the respondents, then dividing by the number of questions on the questionnaire. The following is a formula for calculating the average score:

$$X = \frac{Score\ obtained}{Number\ of\ Question} \quad (1)$$

Based on the results of the score analysis, data was obtained that showed the average score level. Then the results of each of these eligibilitys are analyzed in the percentage of the eligibility score with the following formula:

$$Module\ Eligibility = \frac{\sum Total\ Score\ Obtained}{maximum\ value} \times 100\% \quad (2)$$

The results of the calculation of the feasibility of the module in accordance with the above formula are then converted into five categories of score percentage. The classification of the percentage score is as follows:

Table 2.
Category Score Percentage

Skor	Category
80% - 100%	Very eligible
60% - 79%	eligible
40% - 59%	Quite eligible
20% - 39%	Less eligible
0% - 19%	Not eligible

The eligibility categories in the table above serve as an interpretation of the level of feasibility of the product that has been developed. The level of product feasibility is classified based on the percentage of feasibility according to the score obtained from the results of the respondent's assessment. By using these categories, the products that have been developed can be classified in terms of eligibility.

RESULTS AND DISCUSSION

This development research was carried out with a 4D development model, which includes four stages. At the definition stage, the following were carried out: 1) Initial Analysis: it was found that there was no complete learning media used for the K3 Construction course at the Department of Civil Engineering and Planning Education UNY; 2) Task Analysis: achieving Learning Outcomes and based on RPS and the learning achievements of K3 Construction courses from the three study programs in the Department of Civil Engineering Education and Planning; 3) Concept Analysis: the concept of K3 Construction materials according to RPS; 5) Learning Objectives: Prepare learning objectives that are adjusted to the RPS of the K3 Construction course.

At the design stage, a number of activities are carried out, starting from compiling an initial description of the material to be presented, and then collecting material from various learning sources. Next, prepare the initial concept of the teaching module. This stage resulted in the initial design of the K3 Construction teaching module.

At the development stage, validation testing was carried out involving respondents, namely material experts and media experts, as validators. Validation testing was carried out to obtain the feasibility value of the initial design of the teaching module. In addition, from the validation test stage, responses, inputs, criticisms, and suggestions from validators will be obtained. Comments from the validators can be used as material to improve the product to achieve the perfection of the teaching module. The results of this validation process showed that the teaching module developed by the researcher still has several shortcomings, so it is necessary to revise or improve it so that the product can meet the criteria and can be declared suitable for use as a learning medium.

At the dissemination level, modules that have been declared eligible to be used as learning media will be disseminated to users. The dissemination of the K3 Construction teaching module was carried out to lecturers teaching the K3 Construction course of the Department of Civil Engineering and Planning Education, Universitas Negeri Yogyakarta.

The feasibility level of the developed teaching module can be determined based on data analysis from the results of validation testing. Validation testing is carried out by subject matter experts and media experts. The validation of the material was carried out by Retna Hidayah, a lecturer from the Department of Civil Engineering Education and Planning, Universitas Negeri Yogyakarta. The score obtained by the subject matter expert is as follows.

Table 3.
Material Validation Results Data

No.	Aspects	Scores obtained	Maximum score
1	Knowledge	50	55
2	Skills	13	15
3	Organizing the material	14	15
4	Material presentation support	22	25
5	Presentation of learning	12	15
6	Presentation support	25	25
	Total	**136**	**150**

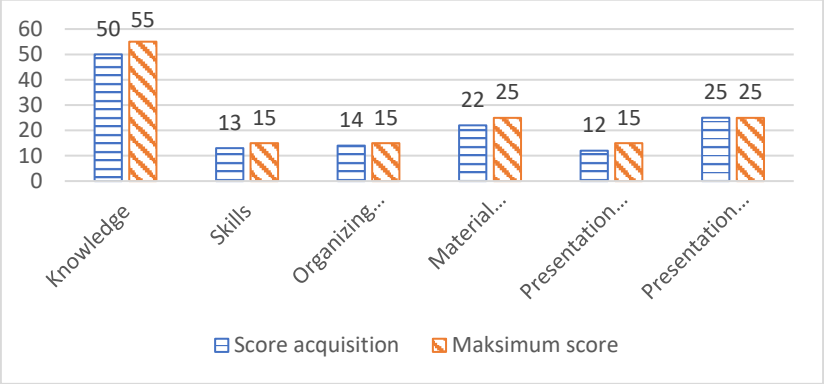

Figure 1. Graph of the Distribution of Material Expert Values

The data from the material validation above shows that the assessment in the knowledge aspect received a score of 50 out of a maximum score of 55 for 11 statements. In the skill aspect, a score of 13 out of a maximum score of 15 was obtained for 3 questions. The assessment for the aspect of organizing the material, with 3 questions, received a score of 14 out of a maximum score of 15. In the supporting aspect, the presentation of the material received a score of 22 out of a maximum score of 25 for 5 questions. Then, from the aspect of learning presentation, a score of 12 was obtained from the largest score of 15. Meanwhile, from the supporting aspect of the presentation, it received a score of 25 out of a possible 25 for 5 questions. The total score obtained from the subject matter expert is 136. Furthermore, the calculation of the percentage of eligibility is carried out as follows.

$$Module\ Eligibility = \frac{136}{150} \times 100\% = 90.66\%$$

The teaching modules developed received a feasibility percentage from material experts of 90.66% which, when converted based on the qualification table, was included in the Very eligible category.

The media validation was carried out by Indah Wahyuni, a lecturer from the Department of Civil Engineering and Planning Education, Yogyakarta State University. The score obtained by the media experts is as follows.

Table 4.
Media Validation Results Data

No	Aspects	Scores obtained	Scores max
1	Size	4	5
2	Layout cover	16	20
3	Typography cover	22	25
4	Ilustration	18	20
5	Layout of the contents	74	80
6	Typography of the contents	48	55
7	Content illustration	30	30
Total		**212**	**235**

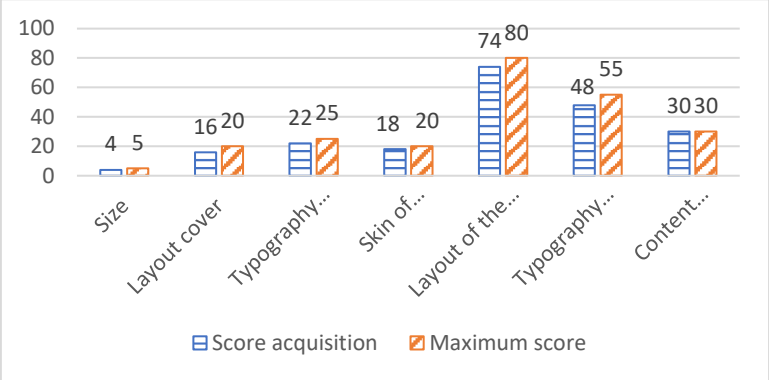

Figure 2. Graph of Media Experts' Value Distribution

The data from the material validation results above shows that the assessment in the aspect of size gets a score of 4 out of a maximum score of 5. For the aspect of the cover layout, a score of 16 was obtained from a maximum score of 20. The assessment on the aspect of cover typography, consisting of 5 questions, achieved a score of 22 out of the highest score of 25. The illustration aspect of the module's skin gets a score of 18 out of a total of 20, while the content layout gets a score of 74 out of a maximum of 80. The typography aspect of the content achieved a score of 48 out of a maximum score of 55, and the aspect of content illustration obtained a perfect score of 30 out of 30. The total score obtained from the subject matter expert is 212. Furthermore, the calculation of the percentage of eligibility is carried out as follows:

$$Module\ Eligibility = \frac{212}{235} \times 100\% = 90.21\%$$

The teaching module developed received an eligibility percentage from media experts of 90.21% which, when converted based on the qualification table, was included in the Very eligible category.

CONCLUSION

From the results and discussions that have been submitted previously, several things can be concluded, including: (1) The development process of teaching modules is carried out with the 4D Model as follows: 1) The definition stage, at this stage finds a problem, namely the lack of learning modules in the K3 Construction course for students of the Department of Civil Engineering and Planning Education, Faculty of Engineering, Universitas Negeri Yogyakarta. 2) At the design stage, this process provides a physical overview of the modules designed for students in the Department of Civil Engineering and Planning Education, Faculty of Engineering, Universitas Negeri Yogyakarta. This stage includes the preparation of tests, the selection of media in the form of modules, the selection of formats, and the initial design of the modules. The content of the material is adjusted to the RPS obtained from the lecturer in charge of the K3 Construction course. 3) At the development stage, module validation is carried out to obtain input from experts. The feedback provided by the expert will be used as a basis for improving and perfecting the module to meet the eligibility requirements as a learning medium. Overall, the validation results show that the module is categorized as very suitable for use as teaching material in the K3 Construction course. 4) In the disseminate stage, the learning modules are printed (packaging) and then disseminated so that they can be absorbed (diffusion) or can be used during classroom learning (adoption). However, due to the limited time and costs faced by researchers, this module will only be given to lecturers who teach K3 Construction courses.

The eligibility level of K3 Construction can be determined through the results of data analysis based on the results of tests from material experts and media experts. The results of the validation of the material experts obtained an average percentage of 90.66% in the overall aspect, with the category "very eligible". The results of the validation of media experts obtained an overall average percentage of 90.21% with the category of "very eligible".

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