Teaching Materials in Port Operations and Facilities Courses

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Abstract. This study aims to develop teaching materials for Port Operations and Facilities courses that are suitable for Sea Transportation DIV cadets at the Surabaya Shipping Polytechnic. This development follows the structured ADDIE Model. The resulting module aims to help students understand the subject material. Upon completion of designing the module, researchers gather feedback from subject matter experts and media experts, resulting in a highly valid module with no need for further revision. Recommendation: This module may require further improvement and assessment of effectiveness in the future. Development Limitations: The study had several limitations, including a focus on feedback from cadets and constraints related to time and resources.
Keywords. ADDIE model, Development, Teaching Materials, Operations and port facilities

1. Introduction

Indonesia, as a vast archipelagic country, relies heavily on the sea transportation sector [1] This also applies to all Indonesian people, who live in islands separated by vast oceans [2] In global trade, sea transportation plays a key role in the transportation of world trade commodities [3]. Therefore, the sea transportation sector is a vital part of the global logistics chain that supports national, regional, and international trade flows [4]

To support the importance of this marine transportation sector, the Politeknik Pelayaran Surabaya introduced the Marine Transportation DIV study program in 2019. This step was taken with the aim of producing competent professionals in the field of sea transportation, who are ready to meet the needs of industry and the job market (IDUKA)[5]. In an effort to achieve these goals, it is very important to improve learning methods by improving the quality of learning resources. One aspect that can be improved is teaching materials[6]. Teaching materials act as tools used by lecturers in the learning process, both in written and unwritten form. Examples of written teaching materials include textbooks, modules, worksheets, and presentations[7].

The use of teaching materials in learning allows students to understand the material systematically and gradually, so that they can master all the necessary competencies. One form of effective teaching material is modules [8]. Modules allow students to learn independently, with lecturers acting as learning facilitators who help them achieve learning objectives, organize materials, conduct evaluations, and provide guidance [9]

Based on the results of interviews and observations of researchers regarding the learning process of port operations and facilities at the Politeknik Pelayaran Surabaya, especially in the Marine Transportation DIV study program, deficiencies in teaching materials needed for the development of port operations and facilities courses were identified[10]. With the teaching materials that can be a guide or reference for students, it is hoped that it can have a positive impact so that they are more independent in learning and have a deeper understanding of port terminal operations.

Based on the explanation above, the research entitled "Development of teaching materials for operational courses and port facilities in the Marine Transportation DIV Study Program of Politeknik Pelayaran Surabaya becomes very relevant.

2. Methodology

This research uses a development research method that aims to produce learning media in the form of pop ups on multiplication material and division of decimal fractions for grade 5 elementary schools[11]. The main purpose of developing this learning media is to help students who have difficulty in understanding multiplication material and division of decimal fractions at the elementary level.

In this study, the development method mentioned [10] was used as the method used to create special products, in this case, learning media. The development model used is the ADDIE model which consists of five stages, namely analysis, design, development, implementation, and evaluation [12]

The ADDIE model was chosen because it is dynamic, effective, and supports the performance of development programs. This model provides a systematic structure and allows evaluation to take place at each stage of development, which contributes positively to the quality of the development product. The ADDIE model has five closely related stages and must be lived sequentially[12]. These stages include analysis, design, development, implementation, and evaluation [13].

The use of this ADDIE model provides an opportunity to examine and evaluate development activities at every step of the way, which is important to ensure the development product achieves the desired learning objectives. This model is also known as a simple and easy-to-understand approach, making it easier to implement. Thus,this research follows the ADDIE development model which consists of five stages, namely analysis, design, development, implementation, and evaluation [13].

At the validation stage, three types of validation are carried out, namely validation by material experts, linguists, and cadets: Material Expert Validation: This stage involves an assessment from material experts who focus on product feasibility in terms of material content, in accordance with Competency Standards (SK) and Basic Competencies (KD). In addition, aspects of presentation and material presentation techniques are also evaluated. Validation by material experts is carried out by lecturers of the Politeknik Pelayaran Surabaya who have expertise in the field of operational materials and port facilities[14]. The data obtained from this validation is then analyzed to revise the development of module-based learning media[15].

Media Expert Validation At this stage, validation of the media design aspects of the module is carried out by a media expert. This media expert is a lecturer from the Surabaya Aviation Polytechnic. The results of validation by media experts are used to revise the module learning media development product. After revision, this product will then be re-validated to assess whether it is feasible or even very feasible to be used in learning by students in schools.

Validation by Cadets At this stage, validation is carried out by cadets who use modules

as learning media[16]. Cadets provide assessment and input regarding the feasibility of modules

in understanding operational materials and port facilities. The results of validation by cadets are used to make improvements to the product so that this module becomes suitable for use as a learning medium. These three types of validation aim to ensure that the learning media development product of this module is in accordance with standards, has the right content, good design, and can provide optimal benefits in the learning process[17].

In this study, data collection techniques in the form of questionnaires or questionnaires were used. A questionnaire is a set of questions or written statements given to respondents to be answered [18] Questionnaires are used to assess the feasibility of the learning modules developed.

Material Expert Questionnaire Grid: The questionnaire instrument grid for material expert validation covers various aspects such as feasibility, language, presentation, and graphics. Respondents will provide an assessment using a rating scale from 1 to 5 for each indicator. Media Expert Questionnaire Grid: The questionnaire instrument grid for media expert validation covers aspects of design display, ease of use, consistency, format, usefulness, and graphics. Respondents will provide an assessment using a rating scale from 1 to 5 for each indicator[14].

Cadet Questionnaire Grid: The questionnaire instrument grid for cadet validation includes aspects of material presentation, language, graphics, and benefits[19]. Respondents will provide an assessment using a rating scale from 1 to 5 for each indicator. Technical Data Analysis: The data analysis technique used is quantitative descriptive analysis.[20] The data collected from the questionnaire will be converted into qualitative value. The Likert scale is used in measurement, where the highest score is 5 (Strongly Agree) and the lowest score is 1 (Strongly Disagree)[21].

Once the data is collected, an average score for each aspect of the module is calculated. This average will then be converted into a qualitative value based on ideal assessment criteria. These ideal assessment criteria will determine the overall module eligibility category. In data analysis, average scores from different aspects of the module will be used to assess the overall feasibility of the module. Thus, it can be known to what extent the learning modules developed can be considered suitable for use in the learning process[21].

3. Result and Discussion

In producing a module product, several stages of validation were carried out by material expert Dr. Agus Dwi Santoso in table 1 as follows.

Tablel 1. Material Expert Validation

No	Indicators	Sub Indicators	Rating Scale					Percentage
			1	2	3	4	5	
1.	Feasibility	Freshness of Information				√		80 %
		Novelty of the material					√	100 %
		Its relation to the learning needs of students					√	100 %
		Sum						**280%**
2.	Language	use of clear, precise, and communicative language				√		80 %

	The language used is in accordance with the level of understanding of students	√	80 %

		Good sentence structure	√	100 %
		Use of standard words	√	100 %
		Sum		**360%**
3.	Serving	The presentation of material in modules involves a clear structure	√	100 %
		Well-ordered steps	√	100 %
		emphasis on the main points	√	100 %
		Sum		**300 %**
4.	Graphics	Use of images	√	100 %
		Use of Diagrams	√	100 %
		Use of Graphics	√	100 %
		Use of Illustrations	√	100 %
		Sum		**400 %**
		Average		**95,71%**

Material expert assessment data from Surabaya Aviation Polytechnic lecturers This assessment is intended to find out how the material expert assessment on various matters concerning several aspects of modules for operational subjects and port facilities including (1) Feasibility Aspects, (2) Language Aspects, (3) Presentation Aspects, and (4) Graphic Aspects. With these assessment guidelines, developers will know whether revisions are necessary. The average results of the complete assessment of learning media for operational modules and facilities can be seen in the table in the appendix. Here is the calculation:

1) Eligibility Aspect
   The total number of scores for competency aspects is 280 with a maximum score of 300, so the average score is obtained:
   Average score = (Total score)/(Total Max score) = $\frac{280}{300}$ x100%= 93.33 %
2) Linguistic Aspects
   The total number of scores for linguistic aspects is 360 with a maximum score of 400, so the average score is obtained:
   Average score = (Total score)/(Total Max score) = $\frac{360}{400}$ x100% = 90%/
3) Presentation Aspect
   The total number of scores for the presentation aspect is 300 with a maximum score of 300, so the average score is obtained:
   Average score = (Total score)/(Total Max score) = $\frac{300}{300}$ x100% = 100%
4) Graphical Aspect
   The total number of scores for the graphical aspect is 300 with a maximum score of 300, so the average score is obtained:
   Average score = (Total score)/(Total Max score) = $\frac{300}{300}$ x100% = 100%

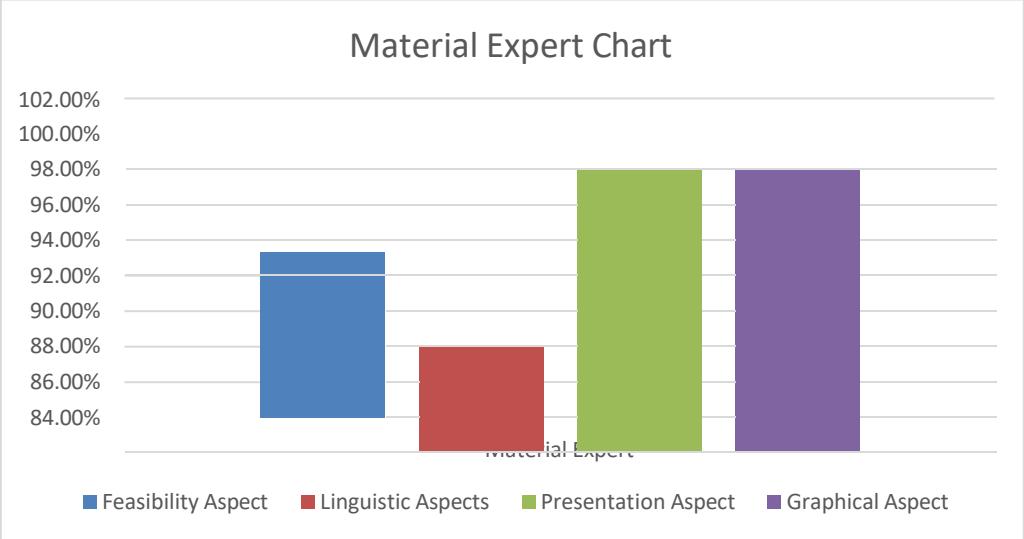

Figure 1 Material Expert Assessment Graph

From table 1. It is known that the percentage of results shows a percentage of 95.71% for teaching materials in the form of modules, the percentage is in the very good category. There are several suggestions from material experts so that the Module needs to add an explanation of the facilities in the port.

Media Validity

In producing a module product, several stages of validation are carried out by media experts as follows:

Table 2. Media Expert Validation

No	Indicators	Sub Indicators	Rating Scale					Percentage
			1	2	3	4	5	
1.	Design View	Attractive Design Display					√	100 %
		use of a soft and coherent color palette					√	100 %
		Structured layout				√		80 %
		Illustration of the corresponding supporting image				√		80 %
	Sum							360 %
2.	Ease of Use	Easy-to-read font selection					√	100 %
		Subheadings and key points are clearly highlighted					√	100 %
		Simple and communicative language					√	100 %
	Sum							**300%**
3.	Consistency	Use of elements such as color				√		80 %
		Font					√	100 %

		Uniform text formatting across modules	√		80 %
		Consistent content structure from section to section		√	100 %
	Sum				**360 %**
4.	Format	Characteristics of target learners	√		80 %
		In digital form		√	100 %
		comfortable size to hold		√	100 %
	Sum				**280 %**
5	Benefits	Relevant to the learning objectives that have been set		√	100 %
		According to the level of understanding of Didi participants		√	100 %
	Sum				**200 %**
6	Graphics	Use of images	√		80 %
		Use of Diagrams		√	100 %
		Use of Graphics		√	100 %
		Use of Illustrations	√		80 %
		Sum			**360 %**
		Average			**96.6%**

1) Design Display Aspect
The total score for the Design View aspect is 360 with a maximum score of 400, resulting in an average score:
Average score = (Total score)/(Total Max score) = $\frac{360}{400}$ x100%= 90 %
2) Ease of Use Aspect
The total score for the Ease of Use aspect is 360 with a maximum score of 400, resulting in an average score:
Average score = (Total score)/(Total Max score) = $\frac{300}{300}$ x100% = 100%
3) Consistency Aspect
The total score for the Consistency aspect is 300 with a maximum score of 300, so the average score is obtained:
Average score = (Total score)/(Total Max score) = $\frac{360}{400}$ x100%= 90 %
4) Format Aspect
The total number of scores for the graphic aspect is 280 with a maximum score of 300, so the average score is obtained:
Average score = (Total score)/(Total Max score) = $\frac{280}{300}$ x100%= 93.33 %
5) (5) Expediency Aspect
The total number of scores for the graphic aspect is 280 with a maximum score of 300, so the average score is obtained:
Average score = (Total score)/(Total Max score) = $\frac{200}{200}$ x100%= 100 %

6) Graphic Aspect

The total number of scores for the graphic aspect is 280 with a maximum score of 300, so the average score is obtained:

Average score = (Total score)/(Total Max score) = $\frac{360}{400}$ x100%= 90 %

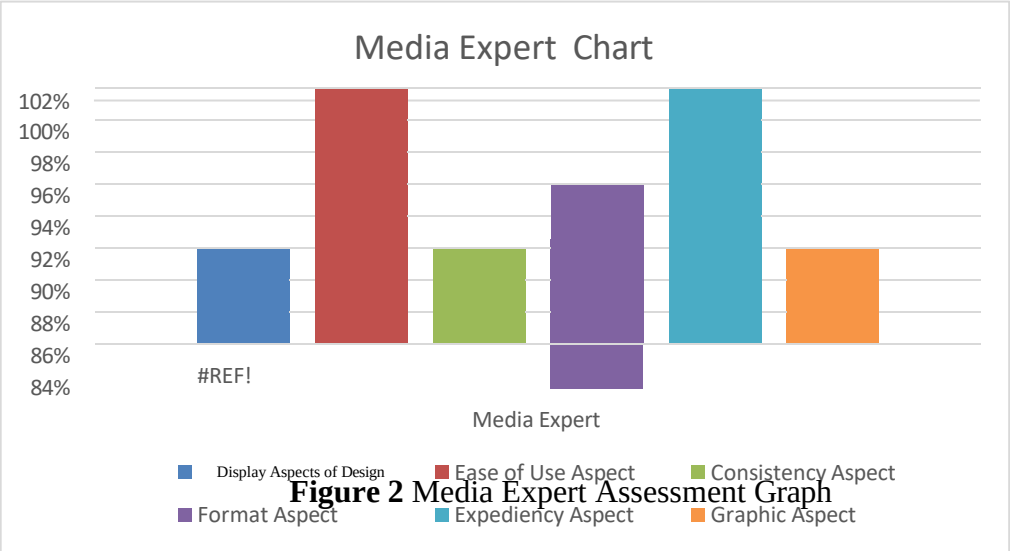

Figure 2 Media Expert Assessment Graph

From table 2. It is known that the percentage of results shows a percentage of 96.6% for teaching materials in the form of modules, this percentage is included in the very good category. However, there are some suggestions from media experts so that the module needs to be added instructions for use.

Based on the results of expert validation and some suggestions, several revisions need to be made before the implementation stage, where operational modules and port facilities are suitable for use in learning in the Marine Transportation DIV study program of Surabaya Shipping Polytechnic.

Implementation

The pre-test stage before the implementation of the learning module is a very important step in the learning development and planning process. By conducting a pre-test, educators can measure students' initial understanding of the material to be taught and identify areas that need improvement in the learning module. The results of the pre-test test provide valuable insight into the level of knowledge and initial understanding of learners, so that learning modules can be tailored to their needs.

In addition, the pre-test test can also be used as an evaluation tool to measure the progress of students during the learning process. By comparing pre-test results with post-test results after using modules, educators can assess the extent to which learners have improved their understanding of the learning material (Guskey, 2003). This can assist educators in evaluating the effectiveness of learning modules and making improvements if needed. In this evaluation stage, we will know the effectiveness of the operational modules and port facilities carried out by cadets of the Surabaya Shipping Polytechnic.

Tablel 3. Cadet questionnaire

No	Indicators	Sub Indicators	Rating Scale					Percentage
			1	2	3	4	5	
1.	Presentation of Material	methodical					24	100 %
		Use of logical sequences				2	22	98.33 %
		Preparation of key points					24	100 %
		Flow of thinking clearly					24	100 %
	Sum							**398.33%**
2.	Language	according to the student's level of understanding					24	100 %
		clear, concise, and communicative					24	100 %
		understand information better				2	22	98.33 %
	Sum							**298.33%**
3.	Graphics	visualize concepts that are difficult to understand with just text				6	18	95 %
		Proper graphics are used to clarify concept relationships					24	100 %
		Proper diagrams are used to clarify concept relationships					24	100 %
		Proper illustrations are used to clarify concept relationships					24	100 %
		Proper tables are used to clarify concept relationships				6	18	95 %
	Sum							**490 %**
4.	Benefit	Relevant to learning objectives					24	100 %
		applied in real situations				6	18	95 %
	Sum							**195 %**

Average score	**95,71 %**

1) Aspects of Material Presentation

The total score for the Material Presentation aspect is 398.33 with a maximum score of 400, so the average score is obtained:

Average score = (Total score)/(Total Max score) = $\frac{398.33}{400}$ x100%= 99.58 %

2) Linguistic Aspects

The total number of scores for the Language Usage aspect is 298.33 with a maximum score of 300, so the average score is obtained:

Average score = (Total score)/(Total Max score) = $\frac{298.33}{300}$ x100% = 99.58 %

3) Graphic Aspect

The total score for the Graph aspect is 490 with a maximum score of 500, so the average score is obtained:

Average score = (Total score)/(Total Max score) = $\frac{490}{500}$ x100%= 98 %

4) Format Aspect

The total score for the graphic aspect is 195 with a maximum score of 200, so the average score is obtained:

Average score =(Total score)/(Total Max score = $\frac{195}{200}$ x100%= 97.5 %

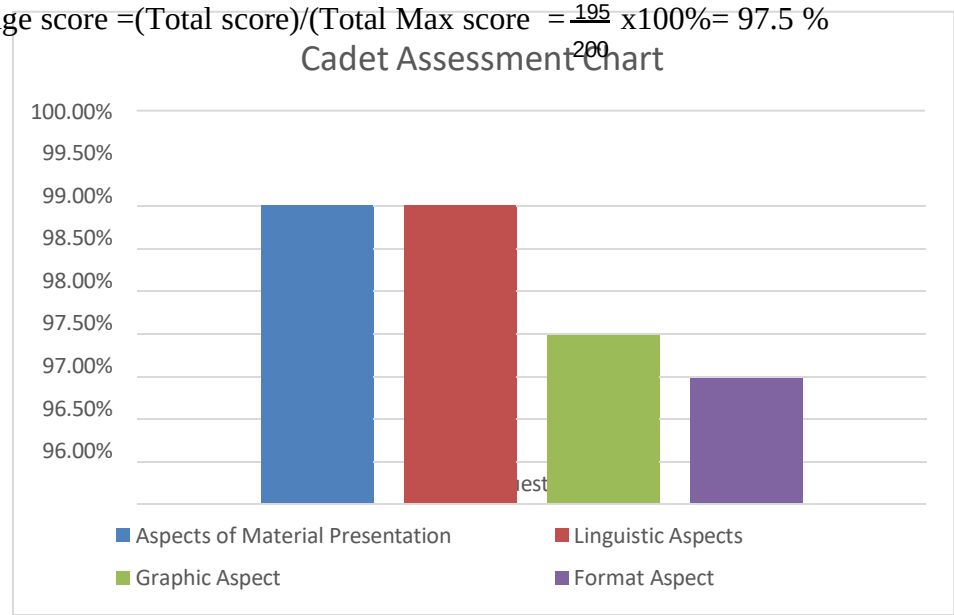

Figure 3. Cadet Assessment Chart

4. Conclusion

In the initial stage, the researcher identifies problems and assesses educators' needs. The researcher designs the module, including content, titles, and covers, and creates

questionnaires for expert evaluations. The researcher collects feedback from material and ADDIE experts, resulting in a highly valid module with no need for further revisions. The module may require further improvements and effectiveness assessments in the future. The study has limitations, including its focus on cadet feedback and constraints related to time and resources.

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