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Feasibility of Basic Automotive Engineering Modules (TDO) Based Industrial Needs

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ABSTRACT
This study aims to determine the feasibility of the Automotive Basic Engineering (TDO) module based on industrial needs. This module consists of text and images with the characteristics of module material based on industrial needs, wherein the preparation of the module involves the industry so that there is a link and match between the world of education and industry. As a reference in developing modules using the ADD development model (Analysis, Design and Development), i.e. (1) needs analysis stage, namely conducting FGD with industry, (2) design stage, namely formulating learning objectives. (3) development stage, namely module development and preparation of material (4) formative evaluation, namely feasibility assessment by experts. Data collection techniques in the analysis of the needs of the industry and the feasibility of the module are carried out by distributing questionnaires. The feasibility assessment criteria from experts used a Likert scale, through a questionnaire with category values of 5 (very good), 4 (good), 3 (good enough), 2 (poor) and 1 (very poor), which were analyzed descriptively. The results of the study showed the feasibility of material experts 85.6 %, instructional design experts 87.5%, and instructional media experts 80.3%. Thus, it can be concluded that the developed TDO module based on industrial needs is feasible to implement.

Keywords: *Feasibility, Module, TDO, Industry.*

1. INTRODUCTION

Synergizing curriculum and learning materials in tertiary institutions towards industrial needs is important to increase the competitiveness of fresh graduates. Universities are required to be more open to the world of industry, and vice versa. On the other hand, universities are required to carry out consolidation starting from the learning planning stage to implementation and evaluation so that cooperation between universities and industry could be reach the desired goals.

The demands on university graduates that are needed by the industry in the era of the industrial revolution 4.0 are educated and trained individuals. What higher education institutions have to do now is carry out educational and learning innovations. University, government, and industry collaboration provides benefits to each other, namely to invest in developing research capabilities carried out by universities and industry in the focus of research areas for each party and find the best solutions to problems faced by the industrial world through research collaboration to improve company performance and in the end for the government will have an impact on national economic growth. [1]. This is in accordance with Unimed's vision and mission, which is to produces graduates who are able to compete not only at the national level but also internationally.

The learning process is one of the alternatives to improve capabilities and competencies. Even though learning is only one of many tools to improve competence, learning is very important [2]. In the learning process requires a module which is a learning aid both inside and outside the classroom, in other words a module is a component of learning resources or a physical vehicle that contains learning material in the student's environment that can attract the attention of students to learn [3].

Learning is essentially an activity that is designed to integrate various components to achieve the goal of changing behavior towards a better one. One of these components is the module as a learning medium. The modules contain information that can be used to find out what happened in the past, present and possibly the future so that it broadens the reader's horizons and can be a source of inspiration for obtaining new ideas [4].

Regulation of the Minister of National Education (Permendiknas) Number 2 of 2008 provides that the categorization of modules is not only limited to schools or primary and secondary education, but also includes higher education. In tertiary institutions, modules are divided into mandatory modules (main text book), which are usually more than one module, and reference modules (reference books), which are more numerous than required modules [5]. If the presentation of the contents of school modules uses psychological and pedagogic approaches with learning models based on learning theory, it is different from the approach in compiling higher education modules that refers more to content or scientific disciplines [6]. Students in tertiary institutions are considered mature and can search, sort, select, process and use the information they need. Therefore, the presentation of the contents of the module places more emphasis on messages, materials or scientific substance.

The definition of a learning module, as quoted from the Permendiknas, determines the position of the lesson module as a mandatory reference module in the learning process in tertiary institutions. The content of the learning module contains learning materials, learning objectives and learning evaluation.

Based on this, it can be concluded that learning modules besides being able to be used in classroom learning can also help students to learn independently. Learning modules must be arranged systematically so that they are easy to understand. Module elements that must be present: 1) Preface, 2) Table of Contents, 3) Body divided into chapters or sections along with their instructional objectives, 4) Bibliography, 5) Glossary, and 6) Index. [7].

The use of learning modules makes learning more focused. Students can work on practice questions according to the material being taught because the questions in the module are designed according to contextual problems. This development encourages renewal efforts in the use of technological results in the learning process.

According to Mustafa A, H.et al module in learning is a series of systematic learning activities based on curriculum tailored to the competencies to be achieved students. [8]

The learning module is the smallest teaching and learning program unit, which is studied by students themselves individually or taught by students to themselves (self-instructional) [9].

Learning modules are teaching materials that are arranged in a systematic and interesting manner which includes material content, methods and evaluations that can be used independently to achieve the expected competencies [10].

A learning module is a teaching package that contains a unit of study material concepts. Module teaching is an effort to organize individual teaching that allows students to master one unit of study material before they move on to the next unit. [11]

Based on some of the definitions of the module above, it can be concluded that the learning module is a form of teaching material that is packaged systematically and attractively so that it is easy to study independently.

According to Yaumi, the learning process in tertiary institutions tends to be content-oriented and ignores objectives; the presentation of learning material is given based on the lecturer's knowledge, not based on the needs of students and the needs of graduate users (industry); learning methods and strategies are monotonous and only take place in one direction, not maximizing various learning resources to reach each individual student; the use of learning media and technology is still conventional and assessment is only result oriented, not process [12].

The Basic Automotive Engineering (TDO) course is a compulsory subject for Unimed Automotive Engineering Education (PTO) students with 3 credits load. Information from the industry that there is often a miss conception of competence expected by industry and student competence, this happens because there is no synergy between the subject matter being taught in universities and what is needed by the industry.

The development of learning modules by involving the industry in its development is expected to minimize the occurrence of these misconceptions. Joyce and Weil reveal that the development of learning modules is a plan or pattern that can be used for curriculum (long learning materials), designing learning materials, and for delivering learning inside and outside the classroom [13].

It is stated that the development of teaching materials in the field of educational technology requires a systematic and systemic approach, which is carried out coherently and thoroughly or comprehensively. [14].

To increase student competence in the field of TDO, it is necessary to develop modules that can be used in the learning process of TDO courses as a guide for students in analyzing automotive basics according to industry needs. Then a feasibility review was carried out on the developed TDO module. The developed TDO module will be able to increase student competency in the TDO field.

2. RESEARCH METHODS

2.1. Research Procedure

This study uses a research and development (R & D) approach, and for development of module done with the ADDIE development model (analysis, design,

development, implementation, evaluation) from Gagne [15] .

The feasibility of the module is obtained from 3 stages, namely analysis , design and development. The subjects of the feasibility trial in the development of this module were material experts in the field of materials testing, learning media experts and learning design experts. The target users of the module are students of the Automotive Engineering Education Department, Faculty of Engineering, Unimed who take the TDO course. The selection of material experts is based on the competency of the subject who is an expert in welding material testing, namely the lecturer in the welding material testing course. The selection of learning media experts and learning design experts is based on expertise in learning media technology and learning design, namely Educational Technology Lecturers. Procedure research is shown in Figure 1.

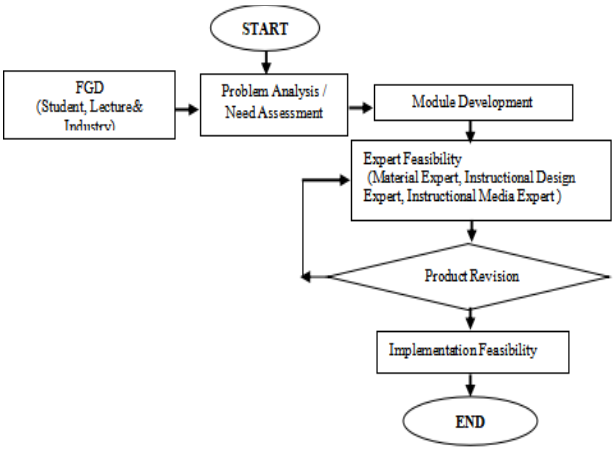

Fig 1. Research Procedure

2.2 Data Collection Technique

The data collection method in this study was analyzed qualitatively, and the data collection instruments developed in this study were related to the data collection techniques carried out at each research stage, namely: (a) a list of questions in the form of a questionnaire used for observation (b) the development and expert validation used a questionnaire from the Learning Object Review Instrument (LORI) version 1.5 (Nesbit J, et all.) with a Likert scale [16].

2.3 Data Analysis Technique

According to Sugiyono deep data analysis study This use analysis descriptive quantitative [17]. All data collected analyzed in a manner quantitative separated according to category For sharpen evaluation in interesting conclusion . Qualitative data in the form of statement very poor, poor, medium, good, and very good changed become scale quantitative with scale value 1 to 5. The result averaged and _ used For evaluate quality media learning. Criteria module will converted become mark with scale of five uses analyzed Likert scale in a manner descriptive percentage with formula as below:

$$X = \frac{\text{Total score obteined}}{\text{Total ideal score of all item}} \text{ x } 100\%$$

The assessment criteria as shown in Table 1:

Table 1. Module Feasibility Assessment Criteria

Mark	Criteria	Percentage
5	Very good	81% ≤ x < 100%
4	Good	61% ≤ x < 80%
3	Medium	41% ≤ x < 60%
2	Poor	21% ≤ x < 40%
1	Very poor	0% ≤ x < 20%

Based on table above can used as reference see percentage test try module categorized as very worthy if score > 81 %; worthy if 61 % ≤ score < 80%; Enough worthy if 41% ≤ score < 60%; not enough worthy if 21% ≤ score < 40%; And very not enough worthy if score < 20%. [18]

3. RESULTS AND DISCUSSION

3.1 Results

Results Analysis obtained from do a needs assessment through questionnaire and observation. The questionnaire was delivered to the data subjects, namely 30 (thirty) students who had attended the course TDO (Basic Automotive Engineering) . Observations were made to find out the learning process directly at the Department of Automotive Engineering Education, Unimed Medan.

Table 2. Observation Results of the TDO Course

No.	Prior Learning Process	Answer	
1.	Learning objectives based on the needs of students and industry.		No
2.	Industry need-based learning modules are available		No
3.	Learning activities consist of introduction, presentation and closing.	Yes	
4.	Conduct an initial test of student abilities	Yes	
7.	Lecturer handbook available		No
8	Student manual available		No

The questionnaire was distributed to 4 industries, the answers from the automotive industry presented in Table 3.

Table 3. Results of the Industrial Needs Analysis Questionnaire

No.	Statement	Answer (%)	
		Yes	No
1	Students can understand the subject matter of hand tools	75	25
2	Students can understand the subject matter of power tools	50	50
3	Students can understand the subject matter of workshop equipment	40	60
4	Students can understand the subject matter of special service tools.	25	75

The results of the TDO learning *module design* based on industrial needs are in the form of a TDO learning module cover as shown in Figure 2.

Figure 2. Cover of TDO module

***Development* Results**

Module development is designed from the results of needs analysis and learning analysis. Then at this development stage a feasibility review was carried out by material experts, learning design experts, and learning media experts.

TDO Material Expert Due Diligence Results

Review of a material expert consists of 3 (three) aspects namely preparation of learning materials, presentation of learning materials, and assessment tools. The results obtained can be seen in Figure 3.

Of the three aspects assessed by material experts, the average score obtained was 4.28 or 85.6% and classified as very good.

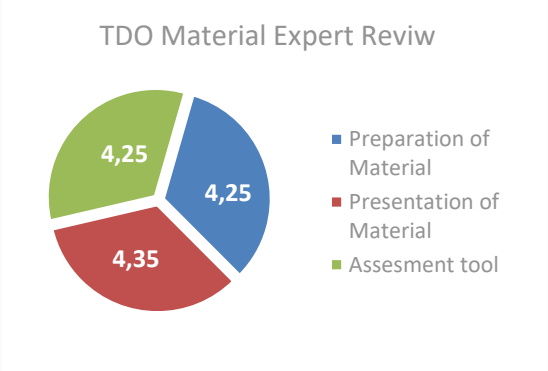

Figure 3. Average Score Material Expert Feasibility Review

Learning Design Expert Feasibility Review Results

The feasibility review from the learning design expert is divided into 4 (four) aspects, namely learning objectives, learning strategies, preparation of materials and evaluation tools. The learning design expert's assessment is shown in the diagram in Figure 4.

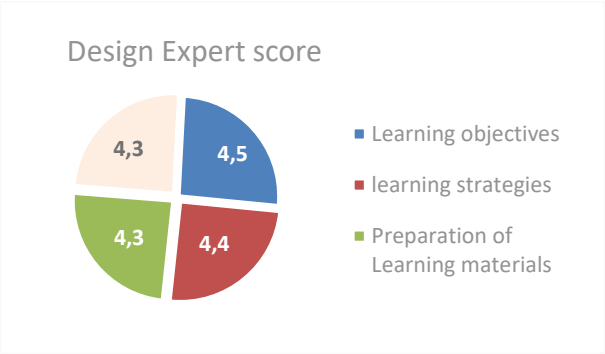

Figure 4. Average Score Instructional Design Expert Feasibility Review

The average score given by learning design experts for 4 (four) aspects of the assessment is 4.37 or 87.5%, thus the assessment of the validation of learning design experts is in the very good category.

Learning Media Expert Feasibility Review Results

Validation from learning media experts is divided into 3 (three) aspects, namely setting, cover, and visual illustration. The assessment of learning media experts is shown in the diagram in Figure 5.

Figure 5. Average Score Media Expert Feasibility Review

From the feasibility review, the learning media expert gives an average score of 4.01 or 80.3% and classified as very good.

The results of the feasibility analysis of learning design experts, materials experts and learning media experts are shown in Table 4.

Table 4 Due Diligence from Experts

No	Expert	Average Value	(%)
1.	Material Expert	4,28	85.6 %
2.	Learning Design Expert	4.37	87.5 %
3.	Learning Media Expert	4.01	80.3 %

4. DISCUSSION

The results of the development of the Automotive Basic Engineering (TDO) module are based on industry needs, where the modules developed will be able to increase student competence in accordance with the graduate competencies needed by the industry . These competencies are: students can identify the types of hand tools according to their functions, identify the types of power tools according to their functions, identify workshop equipment according to their designation, identify the types of special service tools according to their functions, identify the types of mechanical measuring instruments and their functions , using and maintaining various hand tools correctly, using and maintaining various power tools correctly, using and maintaining various workshop equipment, using special service tools according to procedures, using mechanical measuring instruments according to the operation manual.

Results test appropriateness from opinion expert matter, expert design learner And learning media expert, pointed out that TDO based module need developed industry _ using the ADDIE development model meets criteria worth, so can be implemented in learning eye engineering college Base automotive (TDO). Findings study this naturally in line with research that has done by Anjas Setyadi & Abdul Aziz Saefudin [19].

On study This produce TDO module that can enrich teaching materials for Lecturer, student And practitioner industry especially in framework increase cooperation between party industry with world education specifically Faculty Technique University Medan State .

Development process module the TDO test Still there is a number of limitations , among others the subject involved in the test process try Still very limited , ie student Major Education Technique Machine University Medan State with total 30 people, so quality developed module need tested return on subject in Education Study Program Technique Machines at different Universities. As implication from results study this, it is hoped that in the future developed module. This can implemented in the Department Education Technique Automotive Faculty Technique Unimed And world industry in need .

5. CONCLUSION

Based on results study And discussion to developed module , then can taken conclusion namely :

a. The results of the needs analysis show that so far the TDO learning text books/modules/dictates have been specifically based industry needs do not yet exist, thus it is necessary to develop a TDO learning module . Module development resulted in a TDO module design with material: identifying the types of hand tools according to their functions, identifying the types of power tools according to their functions, identifying workshop equipment according to their designation, identifying the types of special service tools according to their functions, identifying the types of tools measuring mechanics and their functions, using and maintaining various hand tools, using and maintaining various power tools, using and maintaining various workshop equipment, using special service tools, using mechanical measuring tools according to the operation manual.

b. The feasibility of the TDO module based on industrial needs as a result of the development is declared valid for implementation with a very valid level. This is evidenced by the validation results of material experts 4.28 (85.6%), learning design experts 4.37 (87.5%) and learning media experts 4.01 (80.3%). From the expert's assessment, a mean score of 4.2 (84.4%) was obtained, including the appropriate criteria.

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