Feasibility Of A Hots-Based Learning Design Module Developed Using The Four-D Development Model

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Abstract. Higher-order thinking skills (HOTS) are required for analyze learning and get used to student utilize knowledge and technology to be implemented in society. Module design available learning as reference subject design learning Not yet based HOTS. Because matter the need developed module design learning HOTS based . This research aims to determine the feasibility of a design-based learning module (HOTS) which was developed using the 4-D model, namely through the define, design, develop and disseminate stages. A module feasibility test was carried out by material experts, learning design experts and learning media experts. Data collection techniques for feasibility testing are carried out by distributing questionnaires. The criteria for feasibility testing by experts in the module use a Likert scale, with category values namely 5 (very good), 4 (good), 3 (fairly good), 2 (poor) and 1 (very poor), which are analyzed descriptively. The research results showed that the feasibility value for material experts was 85.5 %, learning design experts 83.5%, and learning media experts 87.5%. Thus it can be concluded that the metal forming module developed is very suitable for dissemination.

Keywords: feasibility, module, learning design, HOTS

1 Introduction

The advent of Industry 4.0 has left its mark on the field of education, shaping the way learning unfolds. It's widely recognized that the future hinges on an efficient classroom model that prioritizes the cultivation of 21st-century competencies, encapsulated by the 4Cs: communication, critical thinking, collaboration, and creativity. Furthermore, the integration of Higher Order Thinking Skills (HOTS) into educational frameworks is imperative to ensure that graduates possess the requisite abilities for success in the modern era.

HOTS is a thinking skill that requires other abilities, not just memory skills [2]. According to Ridwan Abdullah Sani HOTS are things that include critical, logical, reflective, metacognitive and creative thinking abilities. Higher thinking skills are also needed in solving the problems being faced and in making the right decisions [3]. Improving human resources at the tertiary level can be done by carrying out a Higher Order Thinking Skills (HOTS) oriented learning process. HOTS is the final goal achieved through learning approaches, processes and methods.

Developing countries are seen struggling with HOTS in education [4], this also happens in the educational learning process in Indonesia. The learning journey within the Learning Design course currently lacks a structured approach towards nurturing student creativity.

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Specifically, in the context of curriculum planning courses, particularly within the assessment framework, the emphasis remains predominantly on the transmission of information. This approach tends to be overly reliant on verbal communication and often yields learning materials that lack alignment with Higher Order Thinking Skills (HOTS). Initial observation results show that lecturers tend to choose and use learning methods for learning design courses that are speculative in nature, resulting in learning activities and completing assignments for learning design courses being less interesting and boring.

Higher Order Thinking Skills (HOTS) are utilized to dissect experimental findings and acquaint students with the application of scientific principles, technology, and their local environment. HOTS also emphasizes honing students' capacities to analyze, assess, draw conclusions, and synthesize novel insights from existing data. This educational paradigm, often equated with advanced cognitive abilities or high-level thinking concepts, stems from the educational reform rooted in Bloom's taxonomy, which emerged in the early 21st century. Its integration into education aims to equip individuals with the skills needed to navigate globalization. In the contemporary era, the expectation for human resources extends beyond mere compliance with governmental directives, emphasizing the importance of possessing a diverse skill set.

Currently, the Faculty of Engineering, Medan State University uses the Outcomes Base Education (OBE) curriculum which encourages students to be more active in the learning process. In the OBE curriculum, the learning process develops students' potential from various aspects: affective, cognitive, psychomotor and the process is student-centred.

According to Tjokorde Walmiki Samadhi OBE are skills and attitudes that are mastered or able to be demonstrated by learners after completing a learning unit whose scope can be a course or study program. On the other hand, OBE aligns various elements to facilitate learning achievement by students. The elements mentioned include learning outcomes themselves, curriculum, learning methods, learning assessment, continuous quality improvement, and all resources such as lecturers, physical facilities, including learning materials. [5]

The Outcome-Based Education (OBE) curriculum, employed through an approach emphasizing process skills and the integration of science, technology, and societal considerations, mandates the cultivation of advanced thinking abilities among students to prepare them for the challenges of the future. Proficiency in generating and analyzing information at a sophisticated level plays a crucial role in effective problem-solving within this framework. [6]

Within the Outcome-Based Education (OBE) curriculum, students are mandated to possess Higher Order Thinking Skills (HOTS). These skills encompass the abilities to create, evaluate, and analyze, as denoted by action verbs such as construct, design, create, develop, write, formulate, evaluate, assess, refute, decide, choose, support, compare, examine, criticize, and test. [7]

Learning resources encompass a variety of human-created materials, including data and various forms designed to support students in achieving their learning objectives and facilitating the learning process. While library books offer substantial resources, they often lack updates and alignment with students' specific requirements. The learning process essentially entails the exchange of information, serving as a form of communication between educators (lecturers) and students. Hence, the integration of media as communication tools in learning activities becomes essential for effectively delivering educational content. One important thing that needs attention is that students should not feel unfamiliar with learning media, especially computer-based media. The learning process in the Learning Design course does not yet show a process of developing student creativity. The learning process for learning

planning courses, especially in the evaluation system, is still limited to a transfer of knowledge process, is verbalistic in nature and produces products in the form of learning tools that are not HOTS oriented. Initial observation results show that lecturers tend to choose and use learning methods for learning design courses that are speculative in nature, resulting in learning activities and completing assignments for learning design courses being less interesting and boring.

A module is a series of learning that aims to achieve several learning objectives that are formulated clearly and specifically for independent learning and can be defined as a unit that can stand alone and is arranged in a structured manner. Thus, module teaching can be synchronized with the personality of each student [8]. The module provides students with the opportunity to test/evaluate themselves through tests or exercises presented in the module.

Design Learning is courses taught mandatory in the Department Education Technique Machine Faculty Engineering University Medan State. Courses Design Learning started from to understanding design learning, theory learning from a number of experts, and knowing various design models learning. For this reason, developing a HOTS-based Learning Design course module is needed. Digital books can be in paid or free versions, depending on the goals of the author and publisher, whether they want to commercialize them or not. However, looking at it as a whole, digital books are more economical both in terms of purchase price and maintenance. Because they do not use paper that comes from tree trunks, digital books are more environmentally friendly so there is no more deforestation to make paper, thus triggering global warming.

Based on observations and interviews with students who attended learning design courses at the Department of Mechanical Engineering Education, Medan State University, they tend to face difficulties in working on analytical questions that require high-level thinking. Based on the advantages of learning using digital modules, it is necessary to develop learning by combining several of the latest computer applications that are currently not available in Learning Design courses. With the digital module for the HOTS-oriented Learning Design course that will be developed, it is hoped that it can increase the competency of graduates so they can compete in the world of work.

Module development activities are planned activities that require a model. The four-D development model comprises four distinct stages: define, design, develop, and distribute. Four-D model represents a fish guidelines dynamic and flexible to build a system effective learning and performance tools supporters . Temporary excess from development of this 4D model is simpler and in accordance used for development module, its description seen complete as well as systematic [9].

2 Research Methods

2.1 Research Procedure

Procedure study This using the four-D development model . Module feasibility is obtained from 3 stages, namely define, design and development. The module feasibility test subjects are material experts in the field of learning design science, learning media experts and educational technology experts. The intended audience for the module includes students enrolled in the Learning Design course within the Department of Mechanical Engineering Education at the Faculty of Engineering, Medan State University. This study was conducted within the Department of Mechanical Engineering at the Faculty of Engineering, Medan State

University, over the duration of one semester. Material experts were selected based on their proficiency in educational technology, specifically lecturers who specialize in teaching learning design courses.

This study employs the research and development (R&D) approach, which is a systematic method utilized for the creation and validation of educational materials, including textbooks, instructional videos, and similar resources. The process of educational research and development encompasses multiple stages, involving the creation, testing, and refinement of a product based on field test outcomes. The selection of media and learning design experts relies on their proficiency in educational technology, specifically among lecturers specializing in learning media technology and learning design. Procedure research is shown in figure 1.

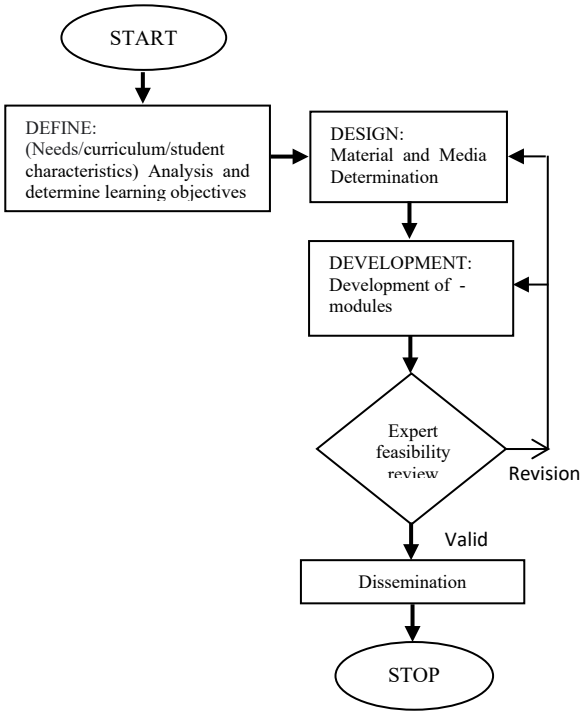

Fig. 1. Research Produce

2.2 Data Analysis Methods and Techniques

In this study, qualitative analysis was employed as the method for data collection. The instruments used for data collection were tailored to each stage of the research process. Specifically, (a) a questionnaire comprising a set of questions was utilized for observation purposes, and (b) during the stages of development and expert validation, the Learning Object Review Instrument (LORI) version 1.5 with a Likert scale was employed. [10]

2.3 Feasibility Criteria

The analysis of data was conducted utilizing descriptive analysis methods, involving the examination of quantitative data gathered from expert test questionnaires and field tests, followed by qualitative interpretation. Following data collection, the subsequent step involves data analysis. To analyze data from the questionnaire, calculate the score for each subvariable using the formula:

$$X = \frac{\Sigma x}{\mathrm{N}}$$

Information:

X = Score Appropriateness
$\sum X$ = Amount score each subvariable
N = Amount subvariable

Based on the calculations above, the percentage *range* and qualitative criteria can be determined, as shown in Table 1.

Table 1. Module Feasibility Criteria Score Range 0 - 5

No	Score Intervals	Criteria
1	$x > 3.25$	Very Worth It
2	$2.5 < x \leq 3.25$	Worthy
3	$1.75 < x \leq 2.5$	Not enough Worthy
4	$x \leq 1.75$	No worthy

The product being developed is said to be feasible if the level of feasibility achieved is at least within the feasible criteria or reaches the > 2.5 category, then the product is suitable for implementation. If the score obtained is less than < 2.5 then the product must go through a revision stage first before it is suitable for implementation. [11]

3 Results and Discussion

This research produces a product in the form of a Learning Design module. Three development model steps on this research, adopted of the 4 steps of the four-D development model which include; define, design, and development.

3.1 Define

Define, this stage is in the form of an analysis of the needs necessary by users to obtain the latest information. Information obtained about need curriculum (learning content), characteristics student, analysis and determine achievements learning served on Figure 2.

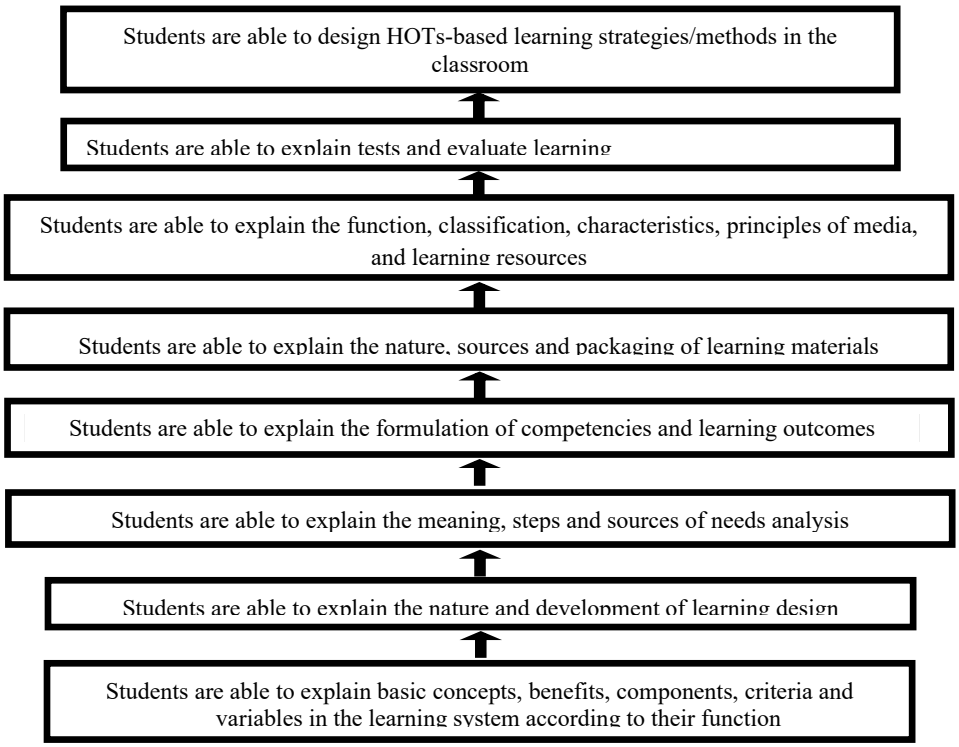

Fig. 2. Learning Analysis for Learning Design Courses

3.2 Design

The module design stage begins by determining the material content of the learning design course. At the design stage, material is collected to be used to fill in the learning design module, such as articles and images related to learning design. This material was obtained from several websites and previously used teaching materials. The materials needed to achieve learning outcomes are: (1) basic concepts, benefits, components, criteria and variables in the learning system according to their function; (2) the nature and development of learning design; (3) the nature and models of learning design; (4) understanding, steps and sources of needs analysis; (4) formulation of competencies and learning outcomes; (5) nature, sources and packaging of learning materials; (6) functions, classification, characteristics, principles of media and learning resources; (7) tests and learning evaluation; (8) learning using HOTs-based learning strategies/methods in class.

3.3 Development

The Development stage is realizing the module design that was created previously. The steps taken in developing the module are developing it based on the design and content that

has been collected. The cover appearance of the learning design module can be seen in Figure 3.

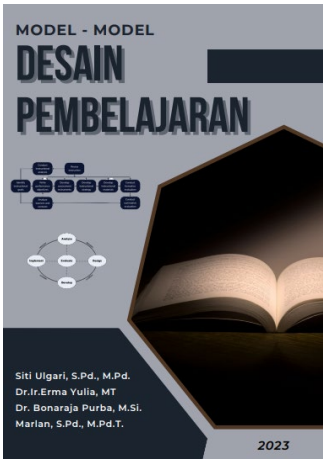

Fig. 3. Cover of Printed Learning Design Module

3.4 Expert Feasibility Results

The assessment of digital module viability is conducted on the digital platform itself. The feasibility evaluation involved three experts, comprising one specialist in learning design, one in learning materials, and one in learning media. The results obtained can be seen in Figure 4.

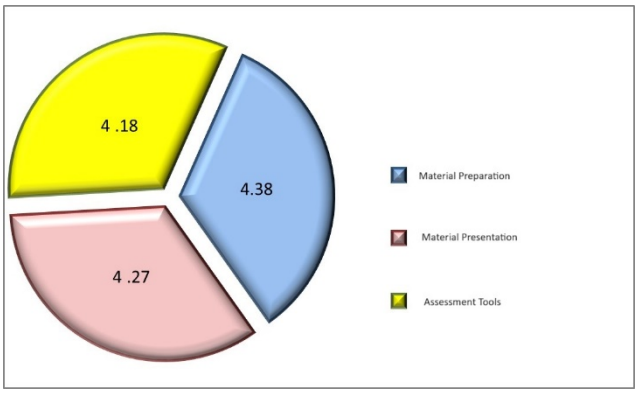

Fig. 4. Average Material Expert Feasibility Test

Out of the three dimensions evaluated by the material experts, the average score attained was 4.27, corresponding to 85.5%, categorizing it as "very good."

3.5 Learning Design Expert Feasibility Test Results

The assessment conducted by learning design experts is segmented into four distinct aspects, encompassing learning objectives, instructional strategies, material development, and evaluation instruments. The evaluation provided by the learning design expert is depicted graphically in Figure 5.

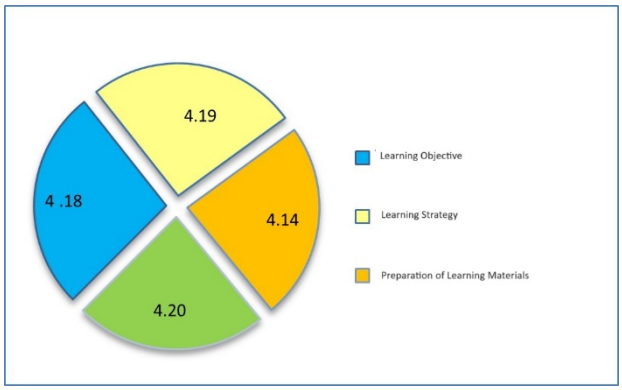

Fig. 5. Average Feasibility Test for Learning Design Experts

The mean rating assigned by learning design experts across the four aspects of assessment is 4.18, equivalent to 83.5%. Consequently, the validation evaluation by learning design experts falls within the "very good" category. Learning design experts provide several additional suggestions, namely: It is necessary to add a conclusion or summary at the end of each chapter to make it easier to understand the learning. Need to add final product task template learning Forsupports the implementation of PjBL learning strategies. The assessment tool is equipped with discussion and presentation observation assessment sheets. Overall, the Learning Design textbooks are deemed appropriate for incorporation into the Learning Design course curriculum.

3.6 Learning Media Expert Feasibility Test Results

The assessment provided by learning media experts is segmented into three distinct aspects: layout, cover design, and visual representation. Additional recommendations proposed by media experts include: adjusting the printing layout of the book's contents to enhance readability, revising the front cover page of the Learning Design textbook, and diversifying the color composition to enhance visual appeal. The evaluation provided by the learning media expert is illustrated graphically in Figure 6.

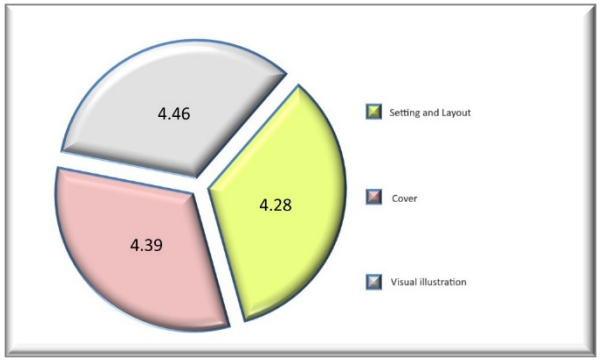

Fig. 6. Average Feasibility Test for Learning Media Experts

Following the feasibility assessment, learning media experts awarded an average score of 4.38, equivalent to 87.5%, categorizing it within the "very good" range. The outcomes of the feasibility analysis conducted by learning design experts, material experts, and learning media experts are detailed in Table 4.

Table 4. Due diligence from experts

No	Expert	Average Value	(%)
1.	Materials Expert	4.27	85.5 %
2.	Learning Design Expert	4.18	83.5 %
3.	Learning Media Expert	4.38	87.5 %

3.7 Discussion

The outcomes of developing HOTS-based learning design modules indicate that the modules created have the potential to enhance student proficiency in line with the competencies sought by stakeholders for graduates. These competencies include the ability to articulate fundamental concepts, advantages, components, criteria, and variables within the learning system. Additionally, students should be capable of delineating the essence and evolution of learning design, elucidating various learning design models, outlining the significance, steps, and resources involved in needs analysis, as well as articulating the formulation of competencies and learning outcomes, Able to explain the nature, sources and packaging of materials, able to explain the function, classification, characteristics, principles of learning media and resources, able to explain tests and learning evaluations, able to design HOTs-based learning strategies/methods in the classroom.

Results test appropriateness from opinion expert material , expert design learning And learning media expert , pointed out that module design learning developed based on HOTS using the ADDIE development model meets criteria worthy , so can be implemented in learning eye design college learning. Findings study This naturally in line with research that has been done by (Utami, Jatmiko, & Suherman, 2018: 166) which states that , in fact line big

objective held learning use module is open chance for student For Study according to speed And method respectively. [12]

By Because that , you can just inside processing something Same problem , yet Of course every student show Same result , though time processing started in a way simultaneously . Teaching module the give chance for individual For Study according to speed each in solve problem certain based on background behind knowledge And habit every student with varied ways. _ Besides the , usage module felt very ok For overcome difficulty Maha student in Study because arranged in a way Interesting , aside That during the learning process only need time A little.

On study This produce module design learning on a HOTS basis that can be done enrich teaching materials for lecturers , students and practitioner industry especially in frame increase cooperation between party industry with world education specifically Faculty Technique University Medan State.

Development process module design learning HOTS based _ Still there is a number of limitations, including the subject involved in the test process try Still very limited , that is student Major Education Technique Machine University Medan State with the number of 35 people, so quality developed module need tested return on subjects in other study programs at different universities.

The objective of this field test is to pinpoint any deficiencies in the Digital Learning Design Module when employed in the learning activities for PP courses under real-world circumstances. The field trial took place at the Mechanical Engineering Department of Unimed, involving a total of 30 attending students.

Classroom observations were conducted to assess the learning process during the field trial, where the Digital Learning Design Module was utilized. From the observations made during the classroom sessions, it can be inferred that the preliminary activities, presentation activities, and concluding activities adhered to the designed model as intended.

The primary objective of preliminary activities is to ready and inspire students to engage actively in the learning process while offering them guidance on the learning materials. These activities encompass orientation, apperception, and motivation. However, the classroom atmosphere during the preliminary activities was deemed less conducive. Students began to show interest in the lecturer's explanations when the lecturer established connections between the current material and previously covered topics, as well as future content. The ability to communicate and apply learning methods in the opening activities used by the lecturer is appropriate and lightens the atmosphere. When students have adapted to the learning process, a pre-test is carried out. The pre-test questions are distributed and students answer the pre-test questions on the answer sheets provided.

The class atmosphere becomes more conducive because students become more focused. The beginning of the presentation activity is an explanation of the learning objectives followed by conveying the flow of the learning process based on the lecturer's guidebook. Activities that can be observed and documented in material presentation activities are student involvement in the learning process, observing problems that arise, collecting information to solve problems and analyzing and interpreting data. Students have been divided into several groups for this presentation activity. Learning uses several methods of presenting learning that suit the characteristics of the participants. The methods used in presentation activities vary, namely: (1) Interactive Questions and Answers, (2) Group Discussions and (3) Presentations.

The closing activity carried out is a follow-up activity, namely by the lecturer giving students the opportunity to review the material they have studied and summarize the learning

material. Lecturers also give assignments to students to do independently at home. The closing activity ended with carrying out a post test.

At the conclusion of the trial, the effectiveness of the model was evaluated through a posttest. The average pre-test score was calculated to be 41.12, while the post-test average was 74.80. Comparing the pre-test and post-test scores reveals an increase of 33.69 points, representing an improvement of 81.92% in learning outcomes. These findings indicate that there was a notable enhancement in learning outcomes during the Learning Design course when utilizing the developed learning model.

4 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 textbooks/modules/diktat design HOTS based yet available, thus it is necessary to develop a design module HOTS based . Module development produces a design module design learning HOTS - based with material: basic concepts, benefits, components, criteria and variables in the learning system. According to its function, the nature and development of learning design, the nature and models of learning design, understanding, steps and sources of needs analysis, formulation of learning competencies and achievements, nature, sources and packaging of materials, functions, classifications, characteristics, principles of learning media and resources, able to explain tests and evaluation of learning, designing HOTs-based learning strategies/methods in the classroom.
b. A feasibility test was carried out using a one to one test and a small group test. Every at this stage, there is always a always a revision of the product resulting from the development of the learning model for the learning design course. The digital learning design module developed is suitable for implementation because it has gone through the experts validation stage carried out by learning design experts.
c. Feasibility of design modules HOTS -based development results were declared suitable for implementation with a very valid level. This is proven by the material expert validation results of 4.27 (85.5%), learning design experts 4.18 (83.5%) and learning media experts 4.38 (87.5%). From the expert assessment, the average score was 4.27 (85.5%), including the appropriate criteria .

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