The Readiness of Competency-Based Training Modules for Industrial Engineering Skills on Competing in Energy-Saving Car Contests for Vocational Education Students

Muslim[1], Nur Basuki[2], and Batumahadi Siregar[3]

{muslim@unimed.ac.id; nurbasuki@unimed.ac.id; batumahadi@unimed.ac.id}

[1,2] Mechanical Engineering Education, Faculty of Engineering, Universitas Negeri Medan, Indonesia
[3]Profession Engineer, Faculty of Engineering, Universitas Negeri Medan, Indonesia
Willem Iskandar Street Psr. V Medan 20221, Telp. (061) 6613276 Fax. (061) 6614002
muslim@unimed.ac.id

Abstract. There is no training equipment for Car Model Design Competition Energy Efficient Car Design (KMHE) skills to compete at the Indonesian Talent Development Center (BPTI), especially at KMHE. The aim of this research is to prepare Car Model Design training tools to increase students' readiness to participate in KMHE events. Test the validity of the training module through focus group discussions and try it out on a small class of 15 students. The research results show that for the training module which consists of a material book, trainee handbook, and instructor handbook with an Aiken's-V value > 0.677 of 0.832, it is declared valid. It was concluded that the competency-based training module for student readiness to compete was valid and could be continued to the implementation stage in the form of effectiveness and practicality tests to conclude the final results of the research product.

Keywords: Competency-based training tools, engineering competencies, KMHE competitions.

1 Introduction

The presence of rapid technological development encourages graduates to be able to adapt to change, be enthusiastic about lifelong learning, and have concern for sustainable development. This is in line with the objectives of the Independent Learning and Independent Campus (MBKM) policy which encourages students to become creative individuals. , innovative, highly competitive, and characterized [1], [2], [3].

Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi Republik Indonesia in the field of student talent development is under and responsible to the Head of the National Achievement Center. One of the talent development programs for higher education students in the field of automotive technology is the Energy Saving Car Contest (KMHE) [4]. In accordance with the skills needs of the industrial world, in the regulations published annually by the KMHE organizers of the National Achievement Center (Puspresnas) of the Ministry of Education, Culture, Research and Technology (Kemendikbudristek), as indicated in the

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competition guide, there are design skills for the car models that will compete. , failure in design reduces evaluation and results in failure to complete [4], [5].

The failure in student participation in the competition was due to the team's weakness from the evaluation results, namely the students' unpreparedness in the regulations set by the organizers. This weakness became a stumbling block for the mechanical engineering education study program, especially in teaching students skills, especially in Industrial Engineering courses and competitive competence. at national and international levels [6].

The skills resulting from higher education for several areas of expertise required by the job market do not yet have clear competency standards, and in some cases the curriculum developed has not touched the competency needs of the job market or input from the industrial world. As a consequence, there is a mismatch between the competencies of vocational education graduates and the competencies required by industry and this is a factor in vocational education graduates' job unpreparedness or unemployment [7].

The study of job market needs for vocational education graduates requires that they have competency skills according to their field, thus the implementation and development of training models in higher education is expected to result in graduates acquiring new skills. Well-designed training management can definitely make graduates' mindset adaptable to the rapid development of technology. Furthermore, good training management will also influence training success and can provide direction for better training management in the future: [6], [8], [9].

In this connection with MBKM learning which is brought closer to the Outcome Based Education (OBE) model for the challenges of current technological advances, several changes are needed regarding the world of work, culture, social and education. The learning process is carried out as an effort to develop innovation related to student needs, personality, capacity and creativity. The implementation of the MBKM program refers to several qualities that must be implemented as well as possible. These qualities include the quality of assessment, presentation of results and reporting, implementation of activities that include adequate infrastructure and facilities, external and internal supervisors, implementation, and competency of participants. Students who participate in MBKM activities will gain broad insight, and have creative, innovative knowledge, and be able to solve problems, especially in the field of education [10].

The learning carried out in Vocational Education refers to the applicable KKNI, but the demands of the industrial world require Vocational Education graduates to have the work skill competencies expected by industry, but this can be realized through holding training with SKKNI standards to support an OBE (Outcome Based Education) based curriculum. It is hoped that the Independent Learning-Independent Campus (MBKM) policy can be a response to these demands. The Independent Campus is a form of learning in higher education that is autonomous and flexible in order to create a learning culture that is innovative, non-restrictive and consistent with the needs of students: [1], [11].

In accordance with what Makulova A.T., et. al. that competitive capacity as well as special and professional skills as requirements of the global labor market which are softened in the long term can be achieved by developing training models for new professional skills based on

a holistic and multidimensional approach , integrative, practice-oriented basic principles, according to each level of the higher education system. [12]

The problem studied is the preparation of training materials within the framework of developing a competency-based training model to achieve learning outcomes or OBEs and at the same time meet the skills of preparing students to participate in the KMHE event organized annually by the Puspresnas Kemendikbudristek.

2 Methodology

The validation of research products in the form of competency-based training modules to gain recognition from experts so that training can be carried out and applied to vocational education students for competency skills to compete in energy-saving car contests through industrial engineering courses is carried out using descriptive research methods. Experts or experts according to their field will assess the research instruments through focus group discussions involving 7 (seven) people consisting of language experts, media experts, equipment and machine engineering content experts, material experts in the field of vocational education, and evaluation experts.

The product resulting from this research is a training tool, namely a competency-based training module book for industrial engineering in competing in KMHE which consists of: 1) Module, 2) Information Book (Material Book), 3) Workbook (Participant Guidebook), and Assessment Book (Instructor's Manual), where this book product is a single unit arranged in a Module Book. This product was then validated by several domain experts using the expert judgment method through focus group discussion (FGD) activities and expert evaluation through questionnaires. FGD contains discussion activities involving experts or experts whose aim is to provide suggestions and inputs for improvements for the refinement of the product under development. Experts can also provide assessments regarding the validation of the content of the developed book.

The opinions, input and suggestions of these experts are of concern to researchers as a step to perfect and revise the research product and then carry out validation, preceded by a request for a research permit. This stage is carried out as part of ensuring that the research product is valid when used in large-scale classroom trials.

The validation of module books (modules, information books, workbooks, and assessment books) for KMHE car model design skills training in this research carried out validation aspects of the appropriateness of the content, construction, and language of the module books. The description of the data carried out in the validation analysis of the appropriateness of the content, language and graphics of the model book was carried out with a focus group discussion and by distributing an assessment questionnaire containing a grid as shown in **Table 1.** The obtained evaluation results are then analyzed using Aiken's V formula, provided that if the V value is > 0.677, the research product is declared valid.

Table 1. Book Validation Instrument Grid KMHE car model design skills training module

Variable	Indicator	Statement Items	Item Number	Aiken's-V Average
Validity of Module Books (Module books, information books, workbooks and assessment books)	Content Eligibility	11	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.	0,828
	Language	9	12, 13, 14, 15, 16, 17, 18, 19, 20.	0,829
	Graphics	8	21, 22, 23, 24, 25, 26, 27, 28.	0,838
	Total Items	28		0,832

3 Result and Discusion

The book validation results of the KMHE Automotive Model Design Skills Training Module are compiled based on the variables and aspects assessed by the experts, to: a) validate the adequacy of the content with the assessed indicators, to namely suitability to needs, usefulness, interest. , and adequacy of the content of the 11 reporting elements declared valid and appropriate for use in training with an average Aiken's V value of 0.828, b) linguistic validation with assessed indicators, namely readability, writing and language use from 9 statement elements declared valid and suitable for use in training with an Aiken V value on average of 0.829, and c) graphic validation with evaluated indicators, namely the use of letters , layouts and illustrations in images with 8 statement elements declared valid and suitable for use in training with an average Aiken V value of 0.838. The results of book expert validation of the KMHE automobile model design skills training module used in the competency-based training for professional industrial engineering skills in the production of automobile products competing in KMHE from the three variable qualifications, the average Aiken V value is 0.832, as shown in **Table 2.**

Table 2. Validation Results of the KMHE car model design skills training book

Variable	Rated aspect	Indicators assessed	Statement Items	Aiken's V Aspect Value Average	Results of Assessment Aspects
Validation of Module Books (module books, information books, workbooks and assessment books)	Content Eligibility	according to the needs usefulness interesting according to substance	11	0,828	Valid
	Language	Legibility Writing Language use	9	0,829	Valid
	Graphics	Use of letters Layout Image illustration	8	0,838	Valid
Total Items			28	0,832	Valid

The Results of expert validation of the KMHE Car Model Design Skills Training Module Book with 3 (three) qualification aspects assessed and 10 (ten) indicators from 28 (twenty eight) statement items assessed, declared "Valid" and "Appropriate for Use in Training Competency Based for Industrial Engineering in Competing in KMHE" with an average Aiken's V value of 0.832 as seen in **Figure 1.**

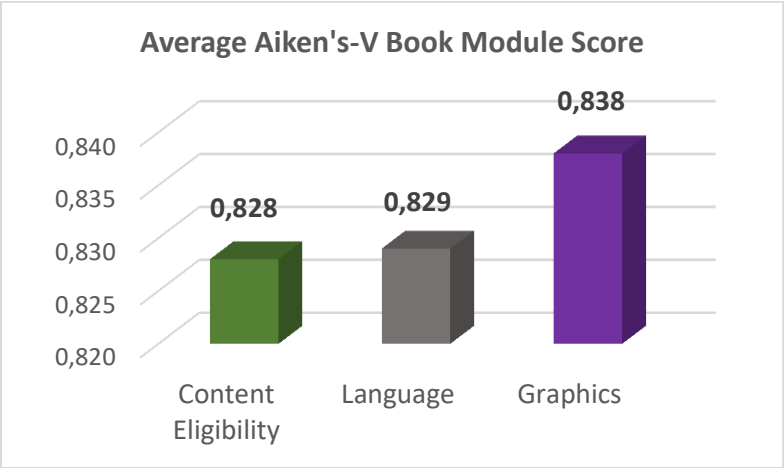

Fig. 1. The average value of Aiken's V Module Book validation

The KMHE Automotive Model Design Skills Training Module which will be used as a competency-based training tool for industrial engineering skills during the competition at KMHE for vocational education based on validation results using expert methods by 7 (seven) experts in their respective fields, as shown in the **Figure 1.** and says "Suitable for use in competency-based training for competitive industrial engineering in KMHE" is consistent with the statement by Glaudius Alexander Vajra et al., (2021) [5], that a good design concept is a requirement for participating in the KMHE competition, as did Imam K. Reksowardojo, et al., (2022) [4] stated that the vehicle design report was the team's obligation to complete as a requirement to become a KMHE finalist participant, then Adi Setiawan, et al., (2023) [2] stated that through the MBKM program it is in line with training students to be able to think and work individually and in groups to foster a spirit of participation, innovative, collaborative, creative, critical and superior.

4. Conclusion

The KMHE Automotive Model Design Skills Training Module proves that the training tools meet training management requirements and can be used for large-class testing of engineering skills-based training industrial as part of the competition at KMHE for vocational education with tests carried out using instruments. evaluated by experts and the Aiken validation method was declared valid with an Aiken-V value > 0.677 out of 0.832. It is therefore concluded that the KMHE automobile model design skills training module book can be used as a

competency-based training tool for industrial engineering skills when competing at KMHE for vocational education.

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