

## Project-based Module Development as Teaching Material for Light Vehicle Engine Maintenance: Validity Test

Muslim<sup>1)\*</sup>, Nizwardi Jalinus<sup>2)</sup>, Refdinal<sup>3)</sup>, Ahmad Arif<sup>4)</sup>, Wagino<sup>5)</sup>

<sup>1,2,3,4,5</sup>Universitas Negeri Padang, Jl. Prof. Dr. Hamka, Air Tawar Barat, Padang, Indonesia

[muslim@ft.unp.ac.id](mailto:muslim@ft.unp.ac.id)\*; [nizwardi@ft.unp.ac.id](mailto:nizwardi@ft.unp.ac.id); [refmoein@ft.unp.ac.id](mailto:refmoein@ft.unp.ac.id) ; [ahmadarif@ft.unp.ac.id](mailto:ahmadarif@ft.unp.ac.id) ; [wagino@ft.unp.ac.id](mailto:wagino@ft.unp.ac.id)

\*Penulis Koresponden

### ABSTRAK

Keterbatasan bahan ajar tidak dilengkapi dengan konten yang memotivasi serta strategi pembelajaran yang tidak sesuai sehingga membuat siswa merasa kesulitan dalam menguasai kompetensi yang dibutuhkannya. Adapun tujuan dari penelitian adalah untuk menguji tingkat kevalidan produk yang dikembangkan dalam bentuk modul pembelajaran. Prosedur pengembangan yang digunakan adalah model ADDIE. Data penelitian didapatkan melalui observasi, wawancara dan angket penelitian. Angket penelitian digunakan untuk mendapatkan nilai validitas dari produk yang dikembangkan. Uji validitas dilakukan pada fase pengembangan, untuk itu tahapan penelitian ini memaparkan pada fase pengembangan saja. Data uji kevalidan didapatkan dengan cara menyebarkan angket kepada 5 orang validator ahli yang terdiri dari 2 dosen ahli dan 3 guru produktif. Hasil penelitian menunjukkan bahwa bahan ajar yang dikembangkan berbasis proyek memiliki kategori valid. Pengembangan produk akan dilanjutkan dengan melakukan revisi yang diberikan oleh tim ahli. Langkah yang akan ditempuh setelah tahap validasi adalah kepraktisan dan efektifitas dari produk yang dikembangkan. Guru juga dapat mengembangkan dan menyusun bahan ajar sehingga penggunaan produk ini tidak terbatas pada kompetensi yang dikembangkan saja. Perlu adanya penelitian lebih lanjut mengenai pengembangan bahan ajar agar tercipta bahan ajar yang dapat memotivasi siswa dalam belajar.

**Kata Kunci:** Inovasi Media Pembelajaran; Model ADDIE; Uji Validitas; Bahan Ajar.

### ABSTRACT

The limitations of teaching materials are not equipped with motivating content and inappropriate learning strategies, which make students feel difficult in mastering the competencies they need. The purpose of this present study is to test the level of validity of the product developed in the form of a learning module. The development procedure used is the ADDIE model. Research data was obtained through observation, interviews, and research questionnaires. The research questionnaire is used to obtain the validity value of the product being developed. The validity test was carried out in the development phase, for this reason, this research stage describes only the development phase. Validity test data was obtained by distributing questionnaires to 5 expert validators consisting of 2 expert lecturers and 3 productive teachers. The results of the study show that teaching materials developed on a project basis have a valid category. Product development will continue with revisions provided by a team of experts. The steps to be taken after the validation stage are the practicality and effectiveness of the product being developed. Teachers can also develop and arrange teaching materials so that the use of this product is not limited to the competencies that are developed. There is a need for further research regarding the development of teaching materials to create teaching materials that can motivate students in learning.

**Keywords:** Learning Media Innovation; ADDIE Model; Validity Test; Teaching Material.

diunggah: 11/24/2022, direvisi: 04/08/2023, diterima: 04/18/2023, dipublikasi: 05/30/2023

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Cara Sitasi: Muslim, M., Jalinus, N., Refdinal, R., Arif, A., & Wagino, W. (2023). Project-based Module Development as Teaching Material for Light Vehicle Engine Maintenance: Validity Test. *JINoP (Jurnal Inovasi Pembelajaran)*, 9(1). 16-30. <https://doi.org/10.22219/jinop.v9i1.23442>

## INTRODUCTION

Education is always associated with the efforts made by individuals in elaborating abilities within themselves by increasing knowledge, skills, and traits to lead to a better direction. In addition, education is critical for survival in an environment that is constantly changing. The importance of education will change attitudes, behavior, and patterns of life of every human element. The formation of quality human beings will produce individuals who have good reasoning abilities. This ability can be honed continuously through learning activities in education. Regarding education, the use of media in the learning process will make the learning process more active, students will be motivated because of the supporting facilities so they can learn independently (Ningrum et al., 2021). One of the learning media that is useful as a source of student learning is the form of teaching materials.

Teaching materials are all forms of materials that can be useful for students and teachers in the learning process (Silvana et al., 2021). The material is arranged systematically both written and unwritten. Good teaching materials will increase reading interest due to a more flexible and structured pattern, which are developed based on students' needs (Fitrianingrum & Sari, 2022; Fonda & Sumargiyani, 2018). Teaching materials will provide opportunities for students to practice and learn independently, solve difficulties, and increase creative and communicative thinking power commensurating with their needs (Rahmayani et al., 2022; Suzana et al., 2021). Concerning its function, teaching materials are divided into functioning for teachers and functioning for students.

Teaching materials can be used to save time for teachers in the learning process. In addition, it adds to the role of the teacher as a facilitator so that the learning process becomes more effective and efficient, and interactive (Acosta, 2016; Agitsna et al., 2019; Meika et al., 2019). Teaching materials guide teachers during learning process activities through the substantial competencies that should be taught to students (Devi et al., 2021; Rizki & Wildaniati, 2015). Teaching materials also serve as an evaluation tool for competency achievement that has been given to students (Purwanto & Rizki, 2015). For students, teaching materials help students to learn independently prior to active learning (Pujiastuti et al., 2020; Vahlia, 2017). Students can use teaching materials conveniently at their own pace where the completion of learning is adjusted to their needs (Farida et al., 2022). However, students mostly can learn well according to the order that has been given. Hence the success of learning process remained being determined by the teacher as a professional educator, who has the authority in choosing materials to use during the learning process.

However, a little is documented in the literature about teaching materials in the subject of Vehicle Engine Maintenance (VEM). This limitation closely relates to the content and learning that are not well-equipped with particular learning

approaches or strategies. It is noteworthy that VEM study various matters, ranging from cooling systems, lubrication systems, ignition systems, and fuel systems in light vehicles. These materials are mandatory for students to understand the basics of the existing systems in light vehicles. Based on the preliminary observation, the researchers denote that many materials require illustrations, but the much needed illustrations are not incorporated in the available teaching materials. This makes students feel difficult in the learning process and mastering the required competencies. Most teaching materials used are old publications with many inconsistencies between the lesson delivery and the study objectives. Without adequate teaching materials, consequently, students will find it difficult to adjust their learning, especially when the material delivered is in the form of lecturing. It can be said that students need teaching materials that can scaffold them to retrace the delivered material, be able to achieve study objectives independently.

Accordingly, the resolution to this problem is through the development of teaching materials that suit students' characteristics, which can motivate them to learn independently and enjoy the learning process following their skills and competency ([Hartini et al., 2020](#)). According [Fernandez et. al \(2021\)](#), the development of teaching materials must take into account learning strategies that are appropriate to student characteristics, student knowledge, and skills . [Rahmi et. al. \(2019\)](#) similarly state that the use of appropriate learning strategies in developing teaching materials can get students to learn independently, which gradually add to students' knowledge. Hence, it can be said that appropriate teaching materials will certainly make students more active and motivated in solving problems given during their learning activities. According to [Rahmani et. al. \(2021\)](#), developing teaching materials using an appropriate approach will also increase student creativity in learning.

A number of previous studies (i.e., [Kamid et al., 2020](#); [Nurhairunnisah & Sujarwo, 2018](#)) found that the development of teaching material comprises series of activities including selecting, adapting, and making based on certain frameworks and reference steps following the student needs. It follows the notion where the preparation of good teaching materials must be equipped with learning methods that are appropriate to the characteristics of students ([Ananda, 2018](#); [Muslim et al., 2021](#)). At the end, learning methods that are well-integrated into teaching materials will result in a positive learning experience where learning objectives may be achieved properly ([Purmadi & Surjono, 2016](#)). Hence, it is necessary to develop teaching materials that incorporates effective learning strategies and approaches. This present study offers innovation in the vocational teaching through the development of a project-based light in VEM to improve students' learning abilities independently. Results of this study emerge from the integration of innovation and students' ability in solving problems where it is directly applied to real-life situations.

Project-based learning (PjBL) links technology with everyday life problems in the form of project assignments where there is a collaboration between students and teachers, and among students ([Supianti et al., 2022](#)). PjBL is innovative because it is centered on students while the functioning the teacher as a motivator and facilitator, who provide opportunities for students to construct their learning process ([Muslim et al., 2020](#)). The development of PjBL entails an activity of designing teaching materials that are ready to be used in learning activities that suit the needs of students, and students using a project-based approach. In so doing,

several things need to be considered including time constraints. It also requires more resources such as equipment, materials, and experts, with a strong support from teachers, parents, and the school for an optimum experience.

The development of teaching materials requires a feasibility or validity test. They are fundamental to ensure that the resulting product is suitable for use or application. The feasibility of the developed product is carried out by conducting a content validity test. It is a testing activity to examine the elements in the assessment instrument that are relevant to the previously planned concept ([Gómez-Rey et al., 2021](#); [Zhai et al., 2021](#)). Content validity is commonly used to determine the reliability of products made in the early stages of developing teaching materials ([Hartell & Strimel, 2019](#); [Xu et al., 2022](#)). This can reduce the risk of product manufacturing errors prior to the decision of the practicality and effectiveness stage of the product being developed ([Luo et al., 2019](#); [Muslim et al., 2022](#); [Roller et al., 2020](#)). One way to find out the value of content validity is to look at the entire content in the teaching materials being developed. If it is able to measure what should be measured in the teaching material, then there is no doubt that validity has been fulfilled ([Chen & Wei, 2022](#); [Ko et al., 2021](#)).

This present study particularly aims to test the level of validity of the product developed in the form of a module about light VEM. The development of a PjBL teaching materials in the form of this module is expected to contribute to the improvement of education quality and lay foundations on the further research about teaching materials development. More importantly, the materials developed in this research can be applied in the real-life in the teaching of light VEM in vocational schools.

## METHOD

This study employed Research and Development. It is a step taken to develop an existing product by replacing it with a new and accountable product ([Setiawan & Rizki, 2018](#)). The developed product is in the form modules as a teaching material. The developed product developed will be validated to obtain a validity value as the results of this study. The development model used was the ADDIE model consists of *analysis* stage, the *design* stage, the *development* stage, and the *implementation* stage. All these stages underwent *evaluation* where the results of each stage became input and initial product of the next stage.

At the *analysis* stage, the researchers analyzed curriculum, formulated learning indicators, and analyzed student characteristics and concepts. Next, during the *design*, the researchers designed products in the form of teaching materials. The process included drafting cover, choosing formats, deciding materials and presentations, and considering language and readability aspects. In the *development* stage, the researchers developed teaching materials based on the *evaluation* results of the design stage. At this stage, the developed prototype was be validated by media experts and linguists. The results of the validity and input provided were important and must be used for a product revision ([Astuti et al., 2018](#)). Following this, the product is ready to be assessed for practicality in practicality tests. It is important to investigate the practicality level, which was done by distributing questionnaires to the teachers of SMKN 1 Lahat. In the *implementation* stage, the teaching materials were tested on students to get their effectiveness value.

The types of data used are qualitative data and quantitative data. Qualitative data is used to obtain data sources derived from observation sheets in the forms of

input, criticism, and suggestions related to the teaching materials being developed. Meanwhile, quantitative data is data in the form of numbers from the measurement results obtained from the results of data from material experts and media experts. The questionnaire used to assess the feasibility was adopted from [Riduwan et. al. \(2013\)](#) summarized in the grids in [Table 1](#) and [Table 2](#).

**Table 1. Project-based Module Validation Grid (Material Expert)**

No	Aspect	Assessment Indicator
1.	Content Eligibility	Conformity of material description with KD Material accuracy Material update
2.	Eligibility of Presentation	Encourage curiosity Presentation technique Serving support Presentation of learning
3.	Language eligibility	Simple Communicative Dialogic and Interactive Suitability with student development Conformity with language rules Use of terms, symbols, or icons

**Table 2. Project-based Module Validation Grid (Media Expert)**

No	Aspect	Assessment Indicator
1.	Graphic Eligibility	Book Order Book cover layout Book cover typography Book cover illustration Book content layout Book typography Book illustration

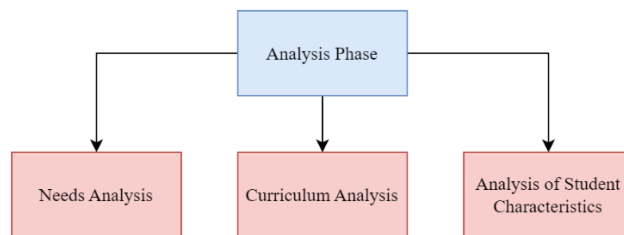
[Table 1](#) details a module validation grid from material experts which contains a lattice of content feasibility, presentation, and language feasibility. [Table 2](#) summarises a module validation grid on the graphical feasibility aspect which presents an assessment grid of the graphics used in the teaching materials that have been developed. The purpose of validation is to obtain assessments, input, and suggestions for improvement and refinement of teaching materials so that a product that avoids errors will be obtained that is feasible to be tested ([Handoyo & Listyarini, 2018](#)). The next stage is to make necessary revisions or improvements to the teaching materials in the form of input that have been suggested by experts.

These instruments are used to analyze the level of validity is in the form of a feasibility questionnaire. The feasibility questionnaire was carried out using a Likert scale. The steps are to provide a score that will be filled in by each validator. Then the results of the score are tabulated by providing an assessment of the validity aspect using the validity value formula which has been modified by [Trianto \(2014\)](#). The score results obtained by each validator can be seen in [Figure 6](#). The result of the validity value is then interpreted into the validity criteria table ([Purwanto, 2011](#)) to get the intended level of validity.

## RESULT AND DISCUSSION

### Result

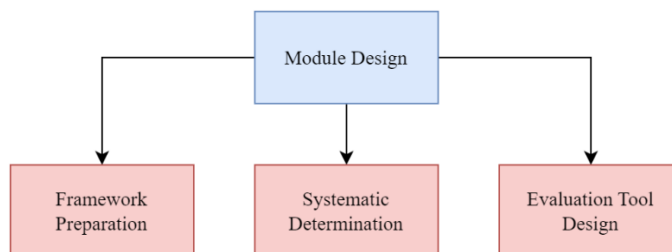
The ADDIE model has several stages used in the process of developing a product. These comprise *analysis*, *design*, *development*, and *implementation*. The *analysis* phase was dedicated to carry out a needs analysis to obtain information about the developed product. The needs' elements included curriculum analysis to analyze student characteristics. Based on the analysis, the learning approach is designed to carry out methods that can encourage students to be more active and independent in learning. Therefore, an integrated project-based approach is used in the development of these teaching materials. See [Figure 1](#) for more details on the analysis phase.



**Figure 1. Stages of Analysis**

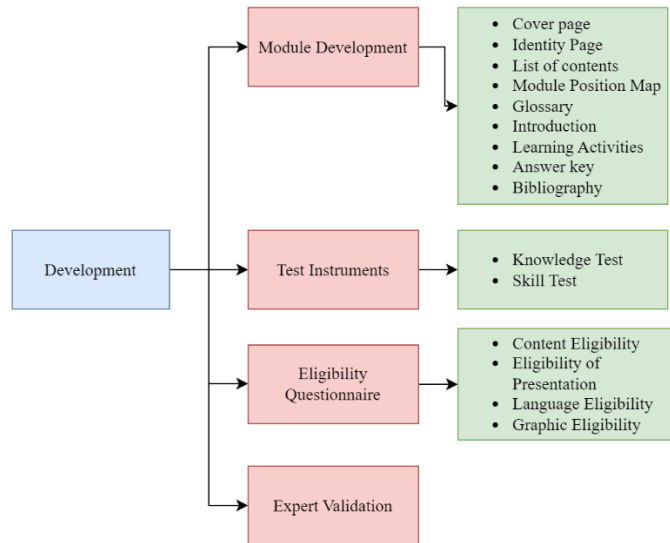
[Figure 1](#) depicts the stages of the analysis prior to the production of a project-based teaching material design.

The second stage is *design* that covers module framework compilation, determining the systematics of learning activities, and making evaluation tools in the form of project assignments, exercises, and formative tests. The *design* phase can be seen in [Figure 2](#).



**Figure 2. Design Stages**

The third phase is *development* that consisted of the creation of cover page, module identity page, preface, table of contents, module position map, introduction, development of learning activities, summaries, project assignments, exercises, formative tests, answer keys and closed with a bibliography. The *development* phase is summarized in [Figure 3](#). The cover page in this phase contains a field of study expertise, module titles, and illustrations representing the module cover page stages. The display of the cover page of the module can be seen in [Figure 4](#).



**Figure 3. Development Stages**



**Figure 4. Module Cover Page**

[Figure 4](#) shows that the first page of the product was compiled and developed. This page was adapted to the title of the light vehicle engine maintenance subject which will be studied for one semester. The front page is also equipped with the level of students who will use the module and also illustrations to attract readers' interest in reading the module. The module identity page and preface contain information on using the module. The preface is part of expressing the contents of the author's thoughts regarding the modules compiled and developed. Making a table of contents to make it easier for readers to find the intended page. Module position map that shows the position of the module in the overall learning program. The introductory section contains a brief description of the material information that will be presented in the module. Furthermore, the development of learning activities that contain learning objectives, material

descriptions, summaries, project assignments, exercises, and formative tests is equipped with answer keys and a bibliography. The appearance of learning activities that have been prepared and developed can be seen in [Figure 5](#).

### Kegiatan Belajar 1

#### DASAR PEMELIHARAAN KENDARAAN

**A. Tujuan Pembelajaran**

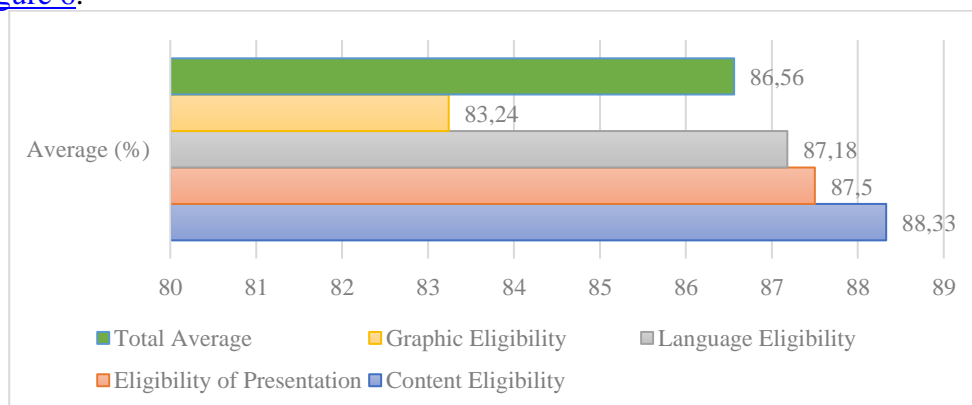
Dalam kegiatan belajar pertama ini, kita akan belajar mengenai dasar pemeliharaan kendaraan secara berkala (servis berkala). Untuk meningkatkan sikap kerjasama dan tanggung jawab, pada kegiatan belajar ini diberikan tugas proyek secara berkelompok.

Setelah menyelesaikan materi dasar pemeliharaan kendaraan secara berkala (servis berkala), siswa mampu:

1. Bertambahnya rasa syukur terhadap lingkungan ciptaan tuhan.
2. Menunjukkan sikap bertanggungjawab dalam mengikuti pembelajaran.
3. Menunjukkan sikap bekerjasama dalam mengerjakan tugas.
4. Menjelaskan pengertian, tujuan dan persyaratan pemeliharaan berkala atau servis kendaraan bermotor.
5. Menyiapkan, menggunakan dan merawat tempat kerja dan peralatan perawatan berkala sesuai dengan prosedur yang benar.
6. Mengangkat berbagai jenis kendaraan dengan aman dan sesuai dengan prosedur yang benar.

**Figure 5. Display of Learning Activities**

[Figure 5](#) is a display of learning activities that have been prepared and contain learning materials. The content of learning activities has been developed using PjBL methods. After the product has been developed, it will be validated by expert lecturers and productive teachers to assess the level of validity of the product being developed. The instrument used for product validation is a validity assessment questionnaire. The result of this validity will be used as a guide in revising the product that will be used later. The aspects that will be validated on the product consist of the feasibility of the content, presentation, language, and graphics. The results of the scores that have been obtained from the validators are then analyzed using the validity value formula described earlier so that the percentage of each feasibility is obtained. The average percentage results are then interpreted in the validity criteria table to obtain the validity level. To make it clearer, the data validation results has been converted in percentage form as seen in [Figure 6](#).



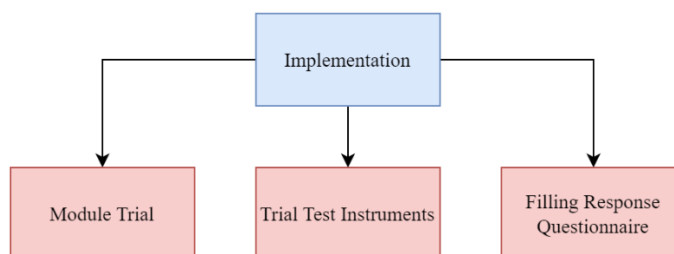
**Figure 6. Validation Test Results by Material Experts and Media Experts**

Based on [Figure 6](#), the average value in each aspect ranges from 83.56% to 88.33%. The highest validation value is on the content feasibility aspect while the lowest is on the graphical feasibility aspect. The total average in each aspect of



feasibility is 86.56%. After being interpreted with the validity data interpretation table, the final value of the product developed is in the valid category. During the validity assessment activities, there were several revisions suggested by the validator, namely by adding coloring to the entire content of the module and adding answer keys to answer the formative tests that had been presented. The last suggestion is from the validator by adding feedback for students in using the module.

The next is *implementation*. It is the stage after product development. In this phase, product trials were carried out by obtaining response data or responses from teachers regarding the teaching materials that had been developed. The data from questionnaire responses is measured to obtain practicality values from the products being developed. Further, students' learning is tested to measure the effectiveness of product development. In this case, the learning outcomes can be tested in the form of knowledge tests and skills tests. The details of the implementation phase can be seen in [Figure 7](#).



**Figure 7. Implementation Stages**

Figure 7 portrays the last step to measure the practicality and effectiveness of the product being developed. Different from the original ADDIE model that puts *evaluation* at the last stage, this present study uses evaluation in each phase starting from *analysis*, *design*, *development*, and *implementation*. In this case, every ending of each stage in this product development marks the beginning of the next stage. Evaluation of each of these phases can be done formatively or adaptively.

## DISCUSSION

The results of this research show that particular teaching materials are potentially developed on the subject of project-based light vehicle engine maintenance. The developed teaching materials already have a structure in the manufacture of teaching materials consisting of covers, identity pages, preface, table of contents, module position maps, introductions, learning activities, and their supporters, and ends with a bibliography. The learning activities developed can be used in one semester. The next result is the validity of the teaching material. The validity carried out in this study was more directed to content validity, which was declared valid by the experts because the developed materials following the learning objectives on the subject of light vehicle engine maintenance.

This is in line with research conducted by [Khoiriyah & Rizki \(2017\)](#) and [Taufik et. al. \(2021\)](#) that the validity results found will be in line with products developed with the correct steps. The purpose of product validation is to find out whether the product being developed is feasible or not so that it can be applied later in the field ([Juniantari et al., 2020](#); [Munandar & Rizki, 2019](#)). Based on the material and media aspects, the teaching materials developed are by the provisions for the

development of teaching materials. The contents of the teaching materials prototype are based on the developmental concepts that apply in the field of science. The aspect of presenting the module is following the criteria for writing standard teaching materials and has been presented systematically (Permitasari et al., 2022). Presentation of each topic has been presented systematically with a project-based approach. In line with research conducted by Lin (2018) states that product development using good learning strategies will produce good and valid products. Presentation of learning activities and their completeness is included in the developed module.

Based on the linguistic aspect, the teaching materials that have been developed are by the level of understanding of students in understanding the content and language presented in the teaching materials (Kusmana, 2020). In developing teaching materials, the use of language is the most important factor. The use of language by using effective sentences in compiling meaningful paragraphs greatly influences the intent and benefits of the content of teaching materials (Arianti et al., 2022). The use of a format that is consistent with attractive packaging but the language presented is not understood by students, so the teaching materials developed are meaningless, for that all of these aspects will be interconnected with each other so that the developed teaching materials meet valid criteria (Widya et al., 2020). If the development of teaching materials is carried out in a good manner and following the correct procedures, it will produce products with valid categories (Murni et al., 2019). Good teaching materials will motivate students to learn independently and be able to do the assignments given and the emergence of curiosity about the material that has been presented next.

There are important findings in this study, namely using project-based teaching materials can increase students' understanding of technical concepts and practices regarding light vehicle engine maintenance. In line with the study by Jiang(2021), the development of project-based teaching materials allows students to be more active in learning direct experiences obtained in real situations. According to Lin (2018) and Sari (2018), that the application of project-based teaching materials will increase student learning motivation because they are directly involved in the project given by the teacher. On the other hand, students can solve problems, be creative, and can collaborate directly with colleagues. Teachers must consider the factors of availability of resources and time to apply the developed teaching materials optimally. The involvement and support of parents in learning can increase student success in learning, especially in the subject of maintenance of light vehicle engines. The development of project-based teaching materials can provide significant benefits for students in increasing their understanding and skills in the learning process.

## CONCLUSION

Teaching materials developed on a project basis in the form of learning modules about light vehicle engine maintenance are per the validity criteria. This is evidenced by the value given by the material expert validators and linguists who produces teaching materials in the valid criteria. This development research shows that the teaching materials developed are feasible to be implemented and carried out practicality assessment tests. The existence of a project approach in the development of teaching materials will make students accustomed to solving

problems, finding solutions, and being able to produce project assignments that are based on the problems given before.

Learning will tend to be more active due to habits in the learning process with group discussions so that the objectives of learning will be achieved. In addition, teachers will also be helped by the teaching materials developed, because these project-based teaching materials will facilitate the learning process. The development of project-based teaching materials at this validity stage is taken into consideration to be able to go through the next stage, namely practicality testing and effectiveness testing. Teachers can also develop this teaching material even better so that the use of this product is not limited to the competency standards that researchers have developed. There is a need for further research regarding the development of project-based teaching materials, especially about the maintenance of light vehicle engines.

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