INVOTEK

Jurnal Inovasi Vokasional dan Teknologi

http://invotek.ppj.unp.ac.id/index.php/invotek

Vol. 23, No. 1, Feb 2023

ISSN: 1411 – 3411 (p)
ISSN: 2549 – 9815 (e)

Analyzing the Validity of Project-Based Learning Implementation Plans in Light Vehicle maintenance: A Comprehensive Study

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Doi: https://doi.org/10.24036/invotek.v23i1.1112

Abstract

Implementation of the developed Learning Implementation Plan (LIP) will result in the risk of learning not being in line with expectations if the validity of the product is not guaranteed. Thus, this research aims to investigate the validity of developing project-based lesson plans to improve effective learning outcomes. This research is research and development with a quantitative approach using the ADDIE model procedure. To obtain product validity results, the stages used are only in the development phase. The subjects in this research were 2 expert lecturers and 3 productive teachers with expertise in light vehicle engineering, and the instrument used was a feasibility questionnaire. The findings were that the project-based LIP that was developed had an average score of 88.7% in the valid category. This study concludes that it has succeeded in developing a product in the form of a valid and usable project-based lesson plan. Carrying out learning using lesson plans that are integrated with project-based learning can be an alternative to providing more meaningful learning and have a positive impact on student development.

Keywords: Learning Implementation Plan, Problem-Based Learning, ADDIE Model, Validity Test.

1. Introduction

Education has a central role in shaping the future of a nation and preparing future generations who are globally competitive. In this increasingly dynamic and complex era, education is required to continue to adapt and innovate to meet the demands of the times. The main goal of education is to provide opportunities for every individual to develop optimally, develop their potential, and become members of society who contribute positively. Amid these challenges, the development of a Learning Implementation Plan (LIP) is crucial in creating an effective and relevant learning environment.

LIP is a document that serves as a guide for educators in designing and implementing learning activities effectively and efficiently [1]. The lesson plan includes steps, strategies, and material that will be taught to students. A good LIP must be based on the applicable curriculum, student needs, class characteristics, as well as existing conditions and infrastructure. LIP helps educators formulate clear learning objectives, plan interesting and meaningful learning activities, and evaluate learning outcomes on an ongoing basis [2]. Apart from that, LIP is also a tool that helps manage time, develop teaching strategies, choose appropriate learning methods and media, and determine the assessment or evaluation of student learning outcomes [3]. With the LIP, the learning process can be directed, structured, and follow the established curriculum.

In recent years, it has been found that there has been a shift in the learning paradigm from a traditional approach to a more contextual and student-centered approach [4], [5]. One learning approach that is increasingly gaining attention is project-based lesson plans. Project-based lesson plans emphasize the use of complex projects or assignments that provide real context for students to understand lesson material [6]. This approach emphasizes active and innovative learning, where students are involved in

Received date 03/08/2023, Revised date 25/09/2023, Accepted date 29/09/2023

P-ISSN: 1411-3414
E-ISSN: 2549-9815

real projects or tasks that are relevant to the subject matter [7]. Through projects, students are faced with challenges and problems that must be solved creatively, so that they can develop critical, creative, collaborative, and communicative skills.

Project-based lesson plans are a learning strategy that encourages students to learn actively through real experience in completing assignments or projects [8], [9]. Students are not just passive recipients of information but are more actively involved in solving problems, collaborating with peers, and facing real challenges as they would encounter in real life [10]–[12]. The project-based learning approach provides diverse benefits for students. Students have the opportunity to experience learning that is more meaningful and relevant to their lives [13], [14]. When students face tasks or projects that are related to the reality around them, they will be more motivated and challenged to actively participate in learning [15]–[17].

Although a project-based lesson plan integrated into the subject of light vehicle engine maintenance offers rich and meaningful learning potential, some challenges must be faced in its development, especially regarding its validity. The validity of a lesson plan speaks about the extent to which the lesson plan truly reflects the desired learning objectives and can produce an effective learning experience for students [18]. Without adequate validity, the use of developed products can result in less effective learning and create gaps in the achievement of learning outcomes [19], [20]. If validity is not sufficiently guaranteed, then product implementation can present the risk of learning that is less effective and does not meet expectations [21].

Many studies have highlighted the importance of validity in the development of LIP in general, but research that specifically addresses the validity of project-based LIP is still limited. Research conducted by Candra et al, with the research results explaining that it is necessary to validate the products being developed [22]. This research focuses on developing lesson plans according to needs with a practicum-based approach but does not integrate project-based learning into the product being developed. Another research conducted by Wati, with the results of research on the product validation process in the form of a guidebook for preparing lesson plans that integrate 21st-century skills in learning, is valid for use [23]. The results of curriculum revisions must include strengthening character education, literacy, skills, and HOTS. Research conducted by Siregar et al used a contextual approach, the lesson plans were developed in the valid category. It was found that in this research it was said that a contextual approach was needed in increasing understanding of concepts [24].

Research from Latjompoh says that developing LIP that are oriented towards science skills is valid. This research focuses on students' science skills in the learning process [25]. Ulfa conducted research by developing learning tools to improve student learning outcomes using the PPDP learning strategy so that the lesson plans developed were in a valid and suitable category for use [26]. Learning methods are needed that can provide active projects in real life so that they can be applied optimally.

Yondriadi et al, in their research, have highlighted the importance of validity in the development of LIP in general, however, the limited research that specifically addresses the validity of project-based LIP indicates the need for further research in this area [27]. In line with research conducted by Qur'ani, Dimama has highlighted the importance of innovative and contextual learning approaches, such as project-based lesson plans, to improve student learning outcomes [28]. Thus, this research wants to contribute to the understanding of the validity of project-based lesson plans and identify efforts that can be made to increase the effectiveness of learning through this approach. It can be concluded that based on previous research, it was found that the development of lesson plans on average is in the valid category and suitable for use by the needs of the studies that have been carried out, however, it is necessary to integrate interesting and more complex learning methods in presenting real context in learning. Using project-based methods, students will be faced with challenges that must be solved creatively so they can develop critical, creative, and collaborative skills in learning.

Based on the context of this problem, research was conducted, taking into account the urgency of increasing the validity of project-based lesson plans so that they can provide meaningful and effective learning experiences for students. Therefore, this study aims to fill this knowledge gap with a special focus on the validity of project-based lesson plans on the subject of light vehicle engine maintenance. The novelty of this research lies in its specific focus on the validity of project-based lesson plans as well as the subject of light vehicle engine maintenance. This research will provide in-depth insight into the importance of validity in the context of project-based learning and how validity can influence learning effectiveness. By understanding the role of validity in project-based lesson plans on the subject of light

P-ISSN: 1411-3414
E-ISSN: 2549-9815

vehicle engine maintenance, this research will make a significant contribution to the development of higher-quality education that is relevant to the needs of students and society in this ever-evolving era.

2. Research Method

This research is research and development (R&D) to produce a product in the form of a project-based Learning Implementation Plan (LIP) with valid criteria for use. The development model used is ADDIE which consists of analysis, design, development, and implementation phases, while evaluation is carried out on each phase that has been carried out. The presentation of the ADDIE model development procedure can be seen in Figure 1. This research may also include a limited evaluation component to test the validity of the LIP developed. The approach used in this research is qualitative and quantitative. The research subjects in this project-based LIP development stage are teachers who teach productive subjects and educational expert lecturers. 3 productive teachers will be involved as validators and 2 lecturers as validator experts to strengthen the validity value of the product being developed.

The stages used in product development are conducting a preliminary study that aims to identify the needs and challenges found in project-based learning. This preliminary study is a phase of analysis, where in determining the product to be developed a needs analysis is required first. The next step is to design the lesson plan by developing a draft by considering competencies, learning objectives, methods, and appropriate assessments. Next is the development phase, where the product in the form of a lesson plan is developed by integrating project-based learning into existing activities. The instrument used to obtain data is an interview conducted at the beginning to find out the problem so that product development is needed in the form of a project-based LIP. The next instrument is a feasibility questionnaire which is used to measure the validity of the product based on a grid that has also been created, such as a questionnaire on the feasibility of content, presentation, language, and graphics.

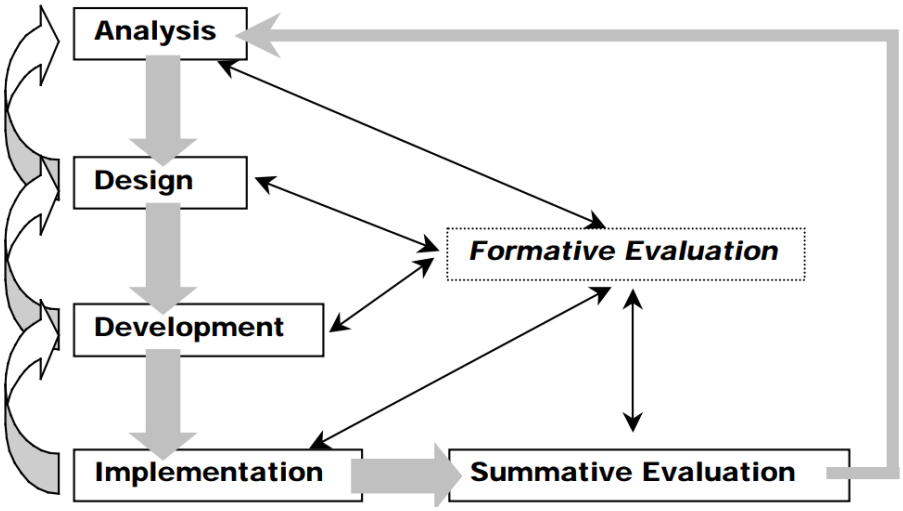


Figure 1. Procedures in Product Development Using ADDIE Models [29]

The LIP grid that was developed can be seen in Table 1. Based on this grid, a research instrument was developed in the form of a feasibility questionnaire. The purpose of this validation is to obtain the validity value of the product being developed. After the product has been developed, the next step is to test the level of validity using the instrument that has been created, based on data from a questionnaire that has been filled in by expert lecturers and expert teachers as validators and the suggestions given. Feasibility questionnaire data is presented using a Likert scale, namely giving scores to items with alternative answers provided. After that, tabulate the data that has been obtained by providing an assessment of the validity aspect using the validity value formula [30]. After obtaining data from the questionnaire, the products that have been developed will be revised based on suggestions given by experts. The results of this data will be tabulated and interpreted in the validity criteria table [31] to obtain eligibility criteria for the product.

P-ISSN: 1411-3414
E-ISSN: 2549-9815

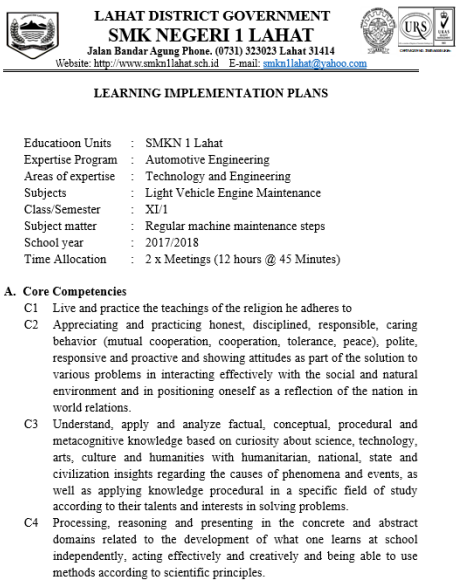
Table 1. Project-based LIP Grid

No.	Aspect	Indicator
1.	Content Eligibility	Material accuracy
		Subject identity
		Formulation of indicators and learning objectives
		Selection of learning approaches
		Learning Activities
		Selection of learning resources
		Assessment of learning outcomes
2.	Eligibility of Presentation	Serving technique
		Presentation support
		Presentation of learning
3.	Language Eligibility	straightforward
		Communicative
		Conformity with the rules of language
		Use of terms, symbols or icons
4.	Graphic Eligibility	LIP size
		LIP content layout
		LIP content typography
		Illustration of the contents of the LIP

3. Result and Discussion

3.1 Result

After going through the development process, and expert validation, the resulting project-based lesson plan was deemed valid and met the educational validity criteria. This is indicated by the high validation score from the validator. The validation process by educational experts proves that the LIP meets the relevant educational validity criteria, including aspects of linkage to competencies, clear learning objectives, appropriate learning approaches, and relevant assessment criteria. The validity of the lesson plan is important to ensure that the learning plan prepared can achieve the learning objectives and have a positive impact on student learning outcomes. The validity of the product being developed must of course be measurable. A product is said to be invalid if it gets a validity value below 59 percent. While a percentage of 60-79 states that it is quite valid, for percentage values above 60-79, the product being developed is quite valid. A percentage of 80-89 is in the valid category and finally above 90 percent means the product is very valid to use.



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LEARNING IMPLEMENTATION PLANS

Educatioon Units	:	SMKN 1 Lahat
Expertise Program	:	Automotive Engineering
Areas of expertise	:	Technology and Engineering
Subjects	:	Light Vehicle Engine Maintenance
Class/Semester	:	XI/1
Subject matter	:	Regular machine maintenance steps
School year	:	2017/2018
Time Allocation	:	2 x Meetings (12 hours @ 45 Minutes)

A. Core Competencies

C1 Live and practice the teachings of the religion he adheres to

C2 Appreciating and practicing honest, disciplined, responsible, caring behavior (mutual cooperation, cooperation, tolerance, peace), polite, responsive and proactive and showing attitudes as part of the solution to various problems in interacting effectively with the social and natural environment and in positioning oneself as a reflection of the nation in world relations.

C3 Understand, apply and analyze factual, conceptual, procedural and metacognitive knowledge based on curiosity about science, technology, arts, culture and humanities with humanitarian, national, state and civilization insights regarding the causes of phenomena and events, as well as applying knowledge procedural in a specific field of study according to their talents and interests in solving problems.

C4 Processing, reasoning and presenting in the concrete and abstract domains related to the development of what one learns at school independently, acting effectively and creatively and being able to use methods according to scientific principles.

Figure 2. Project-based LIP Initial Appearance

P-ISSN: 1411-3414
E-ISSN: 2549-9815

The product developed in the form of a project-based lesson plan on the subject of light vehicle engine maintenance has been completely developed and refined based on suggestions given by the validator. The appearance of the LIP being developed can be seen in Figure 2, which is the initial display containing the letterhead, the identity of the LIP, and a description of core competencies. The preliminary, core, and closing activities can be seen in Table 2. Table 2 shows the introduction, core activities, and closing activities. In preliminary activities, the teacher's position opens the lesson with an initial introduction such as greetings, attendance, and so on. The core activity presents a series of learning activities that are integrated with project-based learning. The steps for learning activities starting from determining basic questions, preparing project plans, preparing project schedules, evaluation, results, and monitoring have been presented in this section. All learning processes are carried out based on project-based learning steps. The closing activities in the LIP developed are summarizing the results of the learning that has been carried out, evaluating the learning, and closing the learning.

Table 2. Table Displaying the Introduction, Core and Closing Parts of the Lesson Plan

Activity	Description	Time Allocation
Introduction	• Give Greetings • Ask students about their readiness and comfort to learn • Invite one of the students to lead the prayer • Singing Indonesia Raya • Ask for student attendance • Teacher condition and motivate students to always concentrate and pay attention to lessons • Question and answer material regarding the basics of vehicle maintenance in general and applications through illustrations that are often carried out in everyday life	20 minutes
Core	Exploration • The teacher conveys the goals and competencies that students must master and achieve. • Shows an Interactive CD/Power point on the basics of general vehicle maintenance	20 minutes
	Elaboration Phase 1: Determining the Fundamental Questions • The teacher gives essential questions, namely questions that can develop students' knowledge patterns according to the project they will be working on • What is maintenance? • How to apply maintenance in everyday life? • What is regular machine maintenance? • How do you maintain the machine regularly in everyday life? Continue for the next phase...	15 minutes
Closing	• Student clarification/conclusion assisted by the teacher concludes material on the basics of light vehicle engine maintenance and its applications • Evaluation to measure the achievement of learning objectives • Students make project assignments in the module about the basics of vehicle maintenance (future assignments) • Pray • Say greetings	20 minutes

P-ISSN: 1411-3414
E-ISSN: 2549-9815

The LIP validation process is carried out through stages of data collection from education experts. Education experts involved in validation are curriculum and education experts with relevant experience in developing lesson plans. They provide assessments and input on the LIP that has been developed to ensure the quality and validity of the product. The validation results show that the project-based LIP developed meets the specified validity criteria. Important aspects of the LIP, such as clear learning objectives, linkages to competencies, appropriate learning approaches, and relevant assessment criteria, are in line with expected standards.

These results show that this project-based lesson plan can provide a strong learning foundation and support the achievement of learning goals. To make the feasibility test results clearer, you can see the product validation test graph in Figure 3. In Figure 3, the results of each aspect of the feasibility assessment which have been carried out based on the results obtained from expert validators are displayed. The total mean of all aspects is 88.78% in the valid category. Next, revise the product that has been developed with the suggestions given by the validators. The suggestions given are in the form of increasing time for each learning step in the core learning activities and adding relevant resources from the internet and other sources.

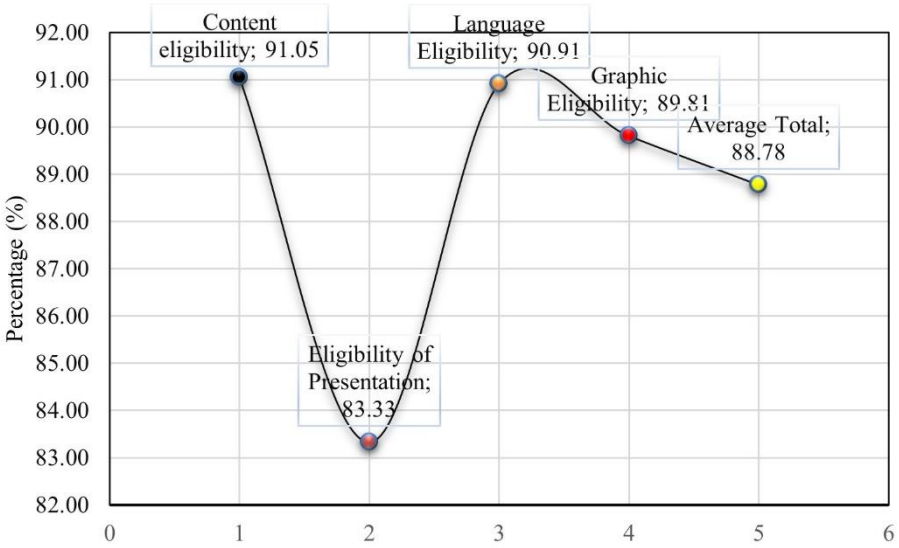

Figure 3. Project-based LIP Product Validation Test Results

3.2 Discussion

The LIP which was developed after going through analysis, found validity data based on each of the criteria explained in Figure 4 with an average content suitability aspect of 91.5%, presentation aspect of 83.33%, linguistic aspect of 90.91 and graphic aspect of 89.81%. The overall average of the validity values based on the analysis that has been carried out is a value of 88.78% after being interpreted in the percentage criteria table with a range of 80%-89% resulting in valid criteria that can be used. The project-based LIP that was developed successfully met the validity criteria to be implemented. In the development process, the LIP involves validation by education experts, in a learning environment. Acceptance of suggestions from expert teachers and expert lecturers involved as research subjects was also positive, indicating that this project-based lesson plan can be well adopted in daily learning practice.

Several previous studies also highlighted the importance of the validity of lesson plans in achieving learning objectives. The validity of the lesson plan is related to its linkage to the desired curriculum and competencies, as well as the accuracy of the approach and assessment used [18], [32]. The results of this research support these findings, stating that the project-based lesson plans developed have met the criteria for educational validity. Other findings show that the implementation of project-based lesson plans requires appropriate support from teachers and schools [33], [34]. Teachers need to be given training and provision to implement project-based lesson plans effectively. The results of this research also note good acceptance from teachers towards project-based lesson plans, indicating that support in adopting this approach has been successful.

Based on a more in-depth review, the results of this study are in line with relevant previous research findings. The development of project-based lesson plans with a focus on educational validity provides positive benefits for the learning process and student learning outcomes [35]. Valid and effective project-based lesson plans provide opportunities for students to be actively and deeply involved in the learning process, increase motivation, and develop various relevant process skills [36], [37].

This research presents a novelty in the project-based LIP development approach in the subject of light vehicle engine maintenance. A development process that is structured and involves expert validation in a learning environment provides a unique contribution to ensuring the quality and validity of the resulting lesson plans. This holistic approach ensures that the project-based lesson plans developed can achieve the expected learning objectives. The novelty of this research also lies in the main focus on the validity of project-based lesson plans on light vehicle engine maintenance subjects. The validity of the lesson plan is a very important aspect of this research because it is directly related to the quality and relevance of the learning plan. The qualitative and quantitative approaches used to measure the validity of LIP provide a comprehensive and in-depth examination of the quality and effectiveness of project-based LIP. Another novelty is the application of project-based lesson plans that are developed directly in the context of the existing curriculum. This research reflects practical efforts in presenting a project-based learning approach that is by the curriculum applicable to the educational environment studied. This provides relevance and a strong link between project-based lesson plans and the learning objectives set in the curriculum.

Generalization of the results of this research could imply that the development of valid project-based lesson plans has positive potential to improve the quality of learning and student learning outcomes in various educational contexts. However, it should be remembered that the results of this study have certain limitations, including the limited number of respondents and research subjects, so further generalization requires further research with a wider and more representative sample. Support from the school and the development of a supportive curriculum are also important for the successful implementation of project-based LIP on a wider scale.

This research also provides novelty in contributing to the development of innovative learning. Valid and effective project-based lesson plans are an attractive alternative for designing learning that is more interactive, and creative, and provides a deeper learning experience for students. The results of this research provide an important contribution to the development of education by presenting an innovative and meaningful learning approach for students. First, the project-based LIP developed has been proven to have a high level of validity. The validation process by educational experts provides validation.

4. Conclusion

The conclusion that can be drawn is that it has succeeded in producing a valid project-based LIP. A development process involving expert validation in a learning environment ensures the quality and relevance of the resulting lesson plans. Based on the research results after being interpreted in the validity criteria table, the resulting product in the form of a lesson plan that is integrated with project-based learning is valid for application with an average percentage of 88.78%. A project-based learning approach that has been integrated into a valid product can be a relevant alternative in providing more meaningful learning and having a positive impact on student development. It is necessary to carry out further studies in search of practicality and effectiveness values so that the product in the form of a LIP that is developed has the required contribution, especially in the world of education. Adopting learning methods that focus on students in developing lesson plans or learning tools in general that are by student characteristics in current conditions is expected to ensure that learning objectives can be achieved optimally.

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