

Development of Project Based Learning (PjBL) Based Student Learning Motivation on Virus Material for Class X SMA Bina Utama Pontianak

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Abstract. This study aims to develop a Student Worksheet (LKPD) based on Project Based Learning (PjBL) on student learning motivation in class X virus material. The subjects of the research trial included validators of media experts and material experts, small-scale tests on 13 students, and large-scale tests on 26 students in class XB of SMA Bina Utama Pontianak. The instruments used include expert validation sheets, student response questionnaires, and learning motivation questionnaires. The validation results showed that the LKPD was declared very valid, with an average value of media expert validation of 91% and 95% of material expert validation. Small-scale tests obtained an average of 82% with a valid category. In large-scale tests, the total score obtained was 77 out of 90, with the average being in the very good category. In addition, the results of the student learning motivation questionnaire showed an increase in various motivation indicators after using the LKPD. Based on the overall findings, the Project Based Learning based LKPD developed through the Hannafin and Peck model was declared valid, practical, and has the potential to increase student learning motivation, so it is suitable for use as teaching material in learning Virus material in class X.

Keywords: Student Worksheet, Project Based Learning (PJBL), Virus, Learning motivation

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1. Introduction

Educational progress in Indonesia today is inseparable from technology. Every aspect of human life is profoundly influenced by the rapid advancements in science and technology, particularly in the 21st century. Society is undergoing rapid changes toward more modern and efficient practices (Nugraha, 2022). These changes are a tangible manifestation of behaviors that inevitably influence learning processes.

Learning is of utmost importance for every student. According to Suhaemi et al. (2020), learning is a series of physical and mental activities aimed at achieving behavioral change as a result of an individual's experiences while interacting with their environment, involving cognitive, affective, and psychomotor dimensions. Teachers, as educators, are a key factor in educational success. Therefore, teachers are required to enhance their creativity in the teaching-learning process.

Teachers are constantly seeking methods to ensure that learning yields outcomes aligned with the objectives. Learning will be successful if students have the drive to learn. Thus, learning motivation is one of the critical factors for achieving success in meeting learning objectives. In the learning process, motivation is crucial because without it, a person cannot engage in learning activities.

Student motivation must be continuously nurtured because academic failure is not solely the student's fault; it can also stem from teachers who fail to inspire students' enthusiasm for learning, which leads to a decline in interest and poor academic performance. Student motivation is a crucial factor in the quality of teaching and the learning process. Motivation serves as a driving force and enabler of achievement (Harahap et al., 2021).

Based on the results of interviews conducted with teachers at SMA Bina Utama Pontianak on January 20, 2025, the following information was obtained: 1) the biology learning process still uses teaching materials in the form of textbooks; the LKPD used is only in the form of practice question sheets. As a result, students are less actively involved in the learning process and do not have learning tools that can help them connect the concept of viruses with real life and have not been integrated with active learning models such as Project Based Learning (PJBL). 2) The methods used still use lecture methods, group presentations, practice, and games. 3) There is material that is difficult for students to understand, namely virus material. Where student scores show incomplete achievement of the learning objective criteria (78).

Students' poor understanding of viruses is due to the theoretical nature of the material, complex scientific terminology, and the inability to directly observe objects (Maharani & Fuadiyah, 2024). A needs questionnaire completed by 22 students also showed that 56% experienced significant difficulties in learning about viruses, while 44% reported no difficulties in biology. Eighty percent of students preferred student worksheets (LKPD) as a learning medium, as seen in the summary of the student needs questionnaire results.

LKPD are learning materials packaged in such a way that students can study the material independently, enabling them to be more active in solving problems through group discussions, practical work, and problem-solving activities related to everyday life. This provides students with a greater sense of challenge than a one-way learning process. The problem-solving activities in these Student Worksheets (LKPD) can ultimately influence students' thinking skills, including critical thinking (Astuti et al., 2018). The purpose of this study was to determine the feasibility of LKPD, based on the validity and practicality of the product.

2. Method

The method used is a type of research and development (R&D). The Hannafin and Peck model is one of many product-oriented learning design models. The Hannafin and Peck model consists of three phases, namely needs assessment, design, development, and implementation. The sampling technique in this study used a purposive sampling technique. According to Sugiyono (2014), purposive sampling technique is a technique for determining samples with certain considerations. The research subjects included media expert validators and material experts, small-scale tests on 13 students, and large-scale tests on 26 class XB students of SMA Bina Utama Pontianak. The instruments used included expert validation sheets, student response questionnaires, and student learning motivation questionnaires. Analysis of practical validity data and motivation skills used a Likert scale, while to determine the results, the following formula was used:

$$percentage = \frac{\text{total score obtained}}{\text{highest score}} \quad (1)$$

3. Results and Discussion

Research on the development of Project Based Learning-based Student Worksheets (LKPD) on student learning motivation on virus material at SMA Bina Utama Pontianak, using the Hannafin and Peck model which provides a constructional overview, which consists of three phases: needs

assessment, design stage, development and implementation, evaluation and revision. The following are the steps in the development research carried out by the researcher:

Needs Research

In the initial stage, a needs analysis, student analysis, and materials analysis were conducted. The aim was to identify student learning issues and identify student needs in the teaching and learning process, thus developing a product that met these needs.

a. Needs Analysis

The first stage, a needs analysis, aimed to determine the core problems in the learning process and identify the media that needed to be developed. This analysis was conducted through interviews with teachers at SMA Bina Utama Pontianak and by distributing student needs questionnaires to students. The results of this analysis required the development of a product in the form of a PjBL-based worksheet (LKPD) to build student learning motivation.

b. Student Analysis

Based on observations at SMA Bina Utama Pontianak, students experienced difficulties in learning the virus material. 1) The worksheets provided by teachers were still simple, consisting of multiple-choice questions and essays. 2) Students' daily test scores fell below the Learning Objective Achievement Criteria (KKTP) for the virus material. (1) Class XA achieved 95.45% (2) Class XB achieved 85.71%.

c. Material Analysis

The material analysis phase of the Merdeka curriculum was conducted by observing the learning objectives (ATP) used in schools so that the material contained in the developed learning media aligned with the learning outcomes (CP). By the end of phase E, students understood the classification process of living things; the role of viruses, bacteria, and fungi in life; ecosystems and the interactions between components and the factors that influence them; and the use of biotechnology in various areas of life.

The selection of the virus material was based on suboptimal student learning outcomes. Virus material was quite difficult for students to understand if explained alone without the use of media.

Design Stage

In the design stage, researchers created a product design based on a needs analysis conducted in accordance with the existing problem. The design consisted of a Student Worksheet (LKPD) framework, which was then validated with the aim of improving and developing it before product trials were conducted. This resulted in improved LKPD results, which are expected to optimize the learning outcomes of 10th-grade students at SMA Bina Utama Pontianak.

The initial LKPD design consisted of: (1) Cover page, (2) Book identity, (3) Learning outcomes, (4) Learning objectives, (5) Learning stages, (6) Concept map, (7) Materials (containing explanations of the definition of viruses, characteristics of viruses, history of viruses, structure of viruses, forms of viruses, classification of viruses, reproduction of viruses, and the role of viruses in the lives of living things), (8) Bibliography, (9) Author biodata.

Development and Implementation Stages

a. Development (Development Stage)

The Development Stage is the stage where researchers create and produce the initial product that has been designed. The developed initial product is then validated and assessed for its feasibility by expert validators before being used for pilot testing in schools. The purpose of the initial assessment by the validator is to obtain input that will later be used to correct or revise errors in the initial design.

Therefore, the criticism and suggestions provided by the validator in the Student Worksheet (LKPD) are used by researchers to produce valid, practical media that can be used in the learning process:

1. Media Expert Validation

At this stage, researchers used the validation sheet instrument provided to the validators to assess the product's feasibility and provide criticism and suggestions on the developed LKPD. The feasibility aspects used to validate the media by the media expert validators included several indicators: a) Appearance, b) Consistency, c) Font Use, and d) Physical Criteria.

A summary of the media expert validators' assessments can be seen in Table 1.

Table 1. Recapitulation of Media Expert Assessment

Media Validator	Percentage	Criteria
Validator I	92 %	Very valid
Validator II	82%	Very valid
Validator II	98%	Very valid
Average	91%	Very valid

Based on Table 1, the media validation data obtained an average score of 91%, meeting the validity criteria.

2. Subject Matter Expert Validators

Subject matter expert validators assessed aspects such as general feasibility, content feasibility, completeness feasibility, and Project-Based Learning feasibility.

A summary of the subject matter expert validators' assessments can be seen in Table 2.

Table 2. Material Expert Assessment

Material validator	Aspect	Score	%	Criteria
Validator I	General eligibility	23	92%	Very valid
	Suitability of content	18		
	Completeness eligibility	18		
	Project Based Learning based feasibility.	24		
	Total	84		
Validator II	General eligibility	24	92%	Very valid
	Suitability of content	17		
	Completeness eligibility	19		
	Project Based Learning based feasibility.	25		
	Total	85		
Validator III	General eligibility	25	100%	Very valid
	Suitability of content	20		
	Completeness eligibility	20		
	Project-based learning-based feasibility.	25		
	Average	95%	Very valid	

Based on Table 2, the media validation data obtained an average score of 95%, meeting the validity criteria.

3. Small-scale testing

After conducting validation by material experts and media experts, a small-scale test was conducted on 13 students in grade 11. The results are shown in Table 3:

Table 3. Recapitulation of small-scale test results

No.	Assessment Aspects	Mark
1	Aspects of LKPD feasibility	84%
2	Project Based Learning Aspects	81%
3	Aspects of Student Learning Motivation	81%
Average		82%

Based on Table 3, the results of the small-scale test showed an average score of 82%, meeting the valid criteria.

b. Implementation

The implementation stage is the stage where the initial product that has been developed is validated and revised. After going through the validation and revision process, the next stage is to conduct a trial of the product. This study conducted a large-scale trial using 26 students from grade XB of SMA Bina Utama Pontianak. The large-scale trial was conducted at SMA Bina Utama Pontianak, involving 26 students as respondents.

The practicality of the Student Worksheet (LKPD) was assessed through a student response questionnaire. The results of the student response questionnaire were conducted to determine students' perceptions of the developed LKPD. The results of the student response questionnaire were used to answer the second sub-question, namely to measure the practicality of the developed LKPD and to revise the LKPD before it was finalized. The large-scale student response test was conducted on Tuesday, October 7, 2025, face-to-face with 26 students at SMA Bina Utama Pontianak. Based on the large-scale trials that have been carried out, the following results were obtained:

Table 4 Summary of Large-Scale Test Results

No.	Assessment Aspects	Mark
1	Aspects of LKPD feasibility	85%
2	Project Based Learning Aspects	85%
3	Aspects of Student Learning Motivation	84%
Average		85

Based on Table 4, the average percentage of student responses to the large-scale virus worksheet (LKPD) was 85%, with the criteria of being very practical. To assess student learning motivation in virus learning, researchers distributed a student motivation questionnaire to 26 students in class XB of SMA Bina Utama Pontianak. This can be seen in Table 5 below:

Table 5 Student Learning Motivation

No	Student Learning Motivation	Results	Average
1	Small-Scale Student Learning Motivation	81	82.75
2	Large-Scale Student Learning Motivation	84.5	

Based on Table 5, the average percentage of the results of the student learning motivation questionnaire regarding the LKPD virus was 82.75%, with the criterion of being very practical. In

the next stage, the researcher conducted research at SMA Bina Utama Pontianak by giving students to work on the LKPD that the researcher had developed. The results of the LKPD work based on Project Based Learning can be seen in Table 6 below:

Table 6. LKPD Assessment

No	LKPD Assessment	Results	Average
1	LKPD Assessment Meeting 1	91.25	91.5
2	LKPD Assessment Meeting 2	93.75	

Based on Table 4.7, the average percentage of student virus worksheet assessment results (LKPD) was 91.5%, with the criteria being very practical.

Evaluation and Revision Stages

After receiving the assessment results from the validators (media experts and content experts), the next stage was to evaluate and revise the student virus worksheet based on the improvements and suggestions from the validators. This validation included several improvements from the media expert and content expert validators, including: (1) revising the concept map, (2) providing a theory of viruses based on expert opinion, (3) adding a learning video for LKPD 2, and (4) adding a learning video to encourage students to apply syntax 1 (basic questions).

The developed student virus worksheet had several main sections: (1) introduction, (2) content, (4) project section, and (5) biography section, which made the learning process using the LKPD more structured and directed. The feasibility of the Project-Based Learning LKPD was assessed using a questionnaire given to students and teachers as a form of feedback on the product's feasibility and practicality. A questionnaire was also administered to measure the level of student and teacher response to the development of LKPD (Fitz et al., 2022).

The validation results from material experts reviewed from the aspect of product feasibility, as well as providing criticism and suggestions for the LKPD that has been developed. The feasibility aspects used to validate the media by media expert validators include several indicators, namely: a) Appearance, b) Consistency c) Use of letters and d) Physical criteria. Based on the results of the assessment from media experts, the feasibility of learning LKPD reached a total score of 232 from a maximum score of 85 with an average percentage of media experts of 91%, the results of the assessment from material experts, the feasibility of learning LKPD reached a total score of 258 from a maximum score of 90 with an average percentage of material experts of 95%. This can be interpreted as meaning that the material and media experts stated that the product developed, a Project-Based Learning Student Worksheet (LKPD), for student learning motivation on viruses in grade X at SMA Bina Utama Pontianak, is categorized as very valid for use as teaching material for grade X.

According to Hidayat and Nizar (2021), validity is the primary benchmark in media development because it ensures that the content, presentation, and technical information delivery are academically and pedagogically sound. Content validity plays a crucial role in measuring whether the material presented in the LKPD truly reflects the expected learning objectives and outcomes. When learning media demonstrates a high level of theoretical and empirical validity, it can be considered effective in improving student learning processes and outcomes. This is in line with research by Ahmadi et al. (2018), which states that a new learning medium is worthy of field trials after undergoing a refinement process based on recommendations from subject matter expert validators.

The practicality of the Project-Based Learning (LKPD) in this study demonstrated very satisfactory results. Practicality was measured through the distribution of a response questionnaire to teachers

and students on a broad scale after the learning process had taken place. Data analysis showed that on a broad scale, the LKPD obtained a practicality score of 84.44%, while on a small response questionnaire, the LKPD obtained a score of 82%. All scores were in the very practical category, indicating that the LKPD was easy to use, relevant to student needs, and able to support the learning process effectively. Data analysis showed that on the student learning motivation questionnaire, the average score was 84.7% on the broad scale. Students' LKPD completion results were 91.25% in the first meeting and 93.75% in the second meeting, with an overall average of 91.5%. This shows that the product has been designed with language that is appropriate to the stage of cognitive development of students, equipped with clear work instructions, and contains concrete examples that guide students in completing each stage of Project Based Learning-based activities. Support from teacher and student responses indicates that this LKPD is not only effective in content, but also efficient and fun to use in classroom practice, while the results of the student learning motivation questionnaire analysis in the LKPD show an average score of 81.6%. This can be interpreted that the value of the motivation questionnaire filled out by student respondents can be said to be very practical.

4. Conclusion

Based on data analysis and discussion of research results, several conclusions can be formulated as follows: The validity of LKPD based on Project based learning on student learning motivation on virus material in class X SMA Bina Utama Pontianak obtained an average result from media and material experts of 93.5% which is said to be very valid. The practicality of LKPD based on Project Based Learning on student learning motivation on virus material in class X SMA Bina Utama Pontianak was assessed by large and small scale student response questionnaires which obtained an average result of 83.2% which is said to be very practical. Meanwhile, the average questionnaire result of student learning motivation of 82.75% is said to be very valid.

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