Current STEAM and Education Research
Volume 2, Issue 2, August 2024

DOI: doi.org/10.58797/cser.020201

Development of Problem Based Learning Teaching Modules Based on Blended Learning in the Implementation of the Independent Curriculum

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Abstract

The implementation of the independent curriculum in the education system requires teachers to develop teaching modules while conducting instructional activities in the right direction. This research aims to develop a problem-based learning teaching module based on blended learning that is suitable for implementation within the context of the independent curriculum. The type of this research is Research and Development using the ADDIE development model, which stands for analysis, design, development, implementation, and evaluation. In this research, the implementation is limited to the development stage only. The suitability of the teaching module is measured through the validation results of the teaching module, as well as the responses from teachers and students. The subjects of this research are physics teachers and 11th-grade students at SMA Methodist Banda Aceh. Data collection techniques involve the validation questionnaire for the teaching module by experts and practitioners, as well as questionnaires to gather responses from teachers and students. The research data is then analyzed using quantitative descriptive methods with percentage techniques. The overall validation results of the teaching module by content experts indicate a score of 99.7%, construction experts at 91.5%, and practitioners at 90%, all falling under the category of highly valid. Additionally, the results from the teacher response questionnaire show a score of 90%, and the student response questionnaire indicates a score of 86%, both falling into the category of very good. Based on the research findings, it can be concluded that the development of a problem-based learning teaching module based on blended learning is suitable for implementation within the framework of the independent curriculum.

Received: 20 March 2024
Revised: 24 July 2024
Accepted: 26 July 2024
Published: 9 August 2024
Assigned: 30 August 2024

Current Steam and Education Research
e-ISSN: 3025-8529

Keywords: blended learning, problem based learning, teaching module

INTRODUCTION

The Minister of Education and Culture strives to improve the quality of education, including curriculum development. The Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) provides three curriculum options that educational institutions can implement in their teaching: the 2013 curriculum, emergency curriculum, and prototype curriculum. The "Kurikulum Merdeka" (Independent Curriculum) is the new name for the prototype curriculum, officially launched by the Minister of Education, Culture, Research, and Technology (Jasrial et al., 2023).

The "Kurikulum Merdeka" (Independent Curriculum) is a curriculum concept that emphasizes independence for students. In this curriculum, learning takes place not only within school but also outside of it, while also encouraging the creativity of both teachers and students (Jasrial et al., 2023). The implementation of the Independent Curriculum is carried out at all educational levels with the aim of improving the learning process. With the implementation of the Independent Curriculum in the education system, teachers are required to develop teaching modules as part of their instructional activities (Dam & Janssen, 2021).

The teaching module of the Independent Curriculum refers to a series of media, tools, methods, instructions, and guidelines systematically designed to meet the needs of students. The teaching module itself can be illustrated by the Pancasila Student Profile as the implementation goal of the Learning Objectives Flow (ATP) developed from Learning Outcomes (CP). The teaching module is structured according to the stages or levels of student development (Banegas, 2022). The purpose of developing the teaching module is to serve as a reference for instructional materials that can guide teachers in conducting both closed and open classroom teaching. The Independent Curriculum provides the freedom for teachers to choose or modify teaching modules prepared by the government, adapting them to students' characteristics, and individually structuring modules according to content and student characteristics (Pichault et al., 2019).

Based on the observation results conducted at SMA Methodist Banda Aceh, the teaching methods employed are still conventional in nature. This is characterized by instructional sessions that predominantly involve explanations followed by assignments and exercises. Furthermore, the physics teaching modules utilized employ a problem-based learning model, but the instructional steps do not align with the syntax of the problem-based learning approach. As a result, there is a need for teaching modules with appropriate models and approaches to provide more focused and aligned instructional guidance in accordance with the learning steps.

The teaching model prioritized by the government in the Independent Curriculum is the problem-based learning (PBL) model (Yang et al., 2023). Problem-based learning is an instructional approach grounded in real-world issues, aimed at fostering critical thinking skills in students (Anggraeni et al., 2023). The adoption of the problem-based learning model is chosen because it requires students to be actively engaged in the problem-solving process (Ali et al., 2022).

Furthermore, in the implementation of instruction, the limited time available poses a challenge for teachers. According to (Herliani Rini, 2017), the problem-based learning model faces constraints in terms of face-to-face meeting time in the classroom, often resulting in incomplete coverage of the planned curriculum. The time limitations for in-person meetings can be addressed by leveraging information technology in education through a blended learning approach.

Blended learning is a combination of face-to-face and virtual learning. Learning based on the blended learning approach aims to facilitate education by providing various learning resources. This type of learning also encourages students to make the best use of face-to-face interactions to develop their knowledge. Subsequently, preparation and follow-up activities can be conducted both offline and online (Tran, 2019). According to Thedjo (2021), the development of blended learning-based teaching modules can enhance basic skills, creativity, and efficiency, serving as an effective means to address the scarcity of classroom hours by introducing technology to students. Based on the findings of Qalbi & Saparahayuningsih (2021), the implementation of blended-problem based learning enables students to enhance their critical thinking skills, enabling them to provide simple explanations, build foundational skills, offer further explanations, determine problem-solving actions, and draw accurate conclusions.

Based on the description above, the development of teaching modules based on the problem-based learning model with a blended learning approach is highly necessary for both teachers and students in the learning process. This approach provides a more focused direction to learning and helps address the constraints of limited time in the learning process.

METHOD

The research design employed in this study is a development research (Research and Development or R&D). The chosen development model for this research is the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. During the analysis phase, the researcher analyzes the problem, examines the existing teaching modules, reviews the instructional materials used in schools, and determines appropriate solutions. In the Design phase, the researcher defines the model and approach to be used. Moving on to the Development phase, the researcher creates the teaching module according to the chosen model and approach, while also developing assessment instruments to measure the effectiveness of the teaching module. The module is then validated by a panel of experts, and a limited trial is conducted with teachers and students.

For this research, the development of the problem-based learning teaching module based on blended learning is only pursued up to the development stage. The Implementation and Evaluation stages will be carried out after the completion of this study.

The subjects of this research are physics subject teachers and 11th-grade students at SMA Methodist Banda Aceh. The suitability of the teaching module is assessed using expert validation, practicality testing, and response evaluation. Data collection for this study employs a questionnaire instrument designed with a Likert Scale (ranging from 1 to 5). The assessment criteria for the

suitability of the teaching module are expressed in percentages (Sudijono, 2011 : 318), calculated using the following formula:

Percentage of validity score =

$$\frac{Total\ scor\ achieved}{Total\ possible\ score}\ x\ 100$$

Table 1. Criteria For The Level of Suitability of The Moudule (Arikunto, 2010)

Percentage of Suitability	Classification
01, 00% < P ≤ 50,00%	Not Suitable
50,01% < P ≤ 70,00%	Moderately Suitable
70,01% < P ≤ 85,00%	Suitable
85,01% < P ≤ 100,00%	Very Suitable

Table 2. Score of Teacher and Student Response (Arikunto, 2013)

Level of Achievement (%)	Classification
0-21	SKB
21-40	KB
41-60	CB
61-80	B
81-100	SB

RESULTS AND DISCUSSION

The result of this research is a problem-based learning teaching module based on blended learning. The teaching module developed by the researcher aligns with the components of a teaching module. Based on the conducted research, it is evident that the developed teaching module is suitable for use, as indicated by the completed stages.

Analysis Phase

In this phase, observations of instructional activities and direct interviews with teachers and students at SMA Methodist Banda Aceh are conducted. Based on interviews with a physics teacher, it was found that the teaching model used by teachers is still conventional. This is characterized by instructional sessions primarily involving explanations followed by assignments and exercises. The teaching modules utilized by the teachers in the school employ a problem-based learning model, but the instructional steps are not in line with the syntax of the problem-based learning approach.

Furthermore, the teaching modules do not include LKPD that correspond to the syntax of the problem-based learning model. Additionally, during classroom instruction, the limited time available becomes a challenge for teachers, resulting in incomplete coverage of the subject matter.

Design Phase

In this phase, the researcher engages in the planning process for developing and structuring the teaching module and LKPD (LKPD) in alignment with the syntax of problem-based learning based on blended learning. The construction of the teaching module is carried out based on the components of the teaching module, which are 1) general information, 2) core components, and 3) appendices (Qasem et al., 2021). This teaching module is structured using the steps of the problem-based learning model. Problem-based learning involves students in problem-solving through stages of the scientific method (Bridges, 2019). According to Perusso and Leal (2022), the five steps of problem-based learning are as follows: 1) orienting students to the problem, 2) organizing students for learning, 3) guiding individual and group investigations, 4) developing and presenting the results of work, and 5) analyzing and evaluating the problem-solving process.

In the initial step of the instructional activity, an illustrative story about waves is provided. The steps of the instructional activity can be seen in Figure 1:

Kegiatan Inti (durasi 90 menit)		
Fase 2. Orientasi Peserta didik Pada Masalah		
7. Guru membagi peserta didik ke dalam beberapa kelompok diskusi 8. Guru membagikan LKPD kepada setiap kelompok 9. Guru menjelaskan pentunjuk penggunaan LKPD 10. Guru memberikan orientasi masalah mengenai gelombang yang terdapat di LKPD  Sumber gambar : https://sainsmania.com/beberapa-contoh-gelombang-transversal-dalam-kehidupan-sehari-hari/ 11. Guru memberi arahan siswa untuk menulis rumusan masalah di LKPD	7. Peserta didik duduk berdasarkan kelompok yang ditentukan 8. Peserta didik menerima LKPD yang diberikan oleh guru 9. Peserta didik mendengarkan penjelasan terkait penggunaan LKPD 10. Peserta didik mengamati dan menganalisis permasalahan di LKPD 11. Peserta didik menuliskan rumusan masalah di LKPD	Sinkron

Figure 1. Steps of Student Orientation to the Problem

In the section of the step involving student orientation to the problem, the teacher discusses the learning objectives, describes various essential logistical needs, and motivates students to engage in problem-solving activities (Laah-On et al., 2021). Problems for PBL are chosen in such a way that they stimulate students' interest to collaborate and require strategies to resolve them (Lopes et al., 2020).

The next step is to coordinate students in their learning. In this stage, the teacher assists students in defining and organizing learning tasks/investigations to address the issue. Students actively seek solutions to the problem by reading books or other supporting materials. These activities encourage students to actively engage in problem-solving and seek foundational theories as references for problem-solving (Chase et al., 2019). The steps of the instructional activity can be seen in Figure 2.

Fase 3. Mengokordinasikan peserta didik dalam belajar		
12. Guru menjelaskan dan menayangkan video tentang jenis-jenis gelombang dan Link: https://youtu.be/0Anh9HthWgQ 13. Guru memancing pengetahuan peserta didik denga memberi pertanyaan tentang: 1) Apakah gelombang laut merambat memerlukan medium? 2) Apakah bentuk gelombang pada tali dan pada slinki sama ?	12. Peserta didik mendengarkan penjelasan materi dan menyimak video pembelajaran 13. Peserta didik berdiskusi secara kelompok untuk menjawab pertanyaan di LKPD	Sinkron

Figure 2. Steps of Coordinating Students in Learning

Next is the step of guiding the investigation. In this part, students are encouraged to gather accurate information and conduct their own inquiries. With the PBL model of learning through discovery, students become active participants in the learning process, engaging in problem-solving and finding solutions through their own efforts. As a result, students' ability to construct their own knowledge is enhanced (Ha, 2021). The steps of the instructional activity can be seen in Figure 3.

Fase 4. Membimbing penyelidikan individual dan kelompok		
14. Guru mengarahkan setiap kelompok untuk melakukan percobaan gelombang transversal dan longitudinal, sesuai dengan langkah-langkah yang ada di LKPD adalah wujud profil belajar Pancasila bergotong royong	14. Setiap kelompok melakukan percobaan sesuai dengan langkah-langkah di LKPD	Sinkron

Figure 3. Steps of Guiding the Investigation

In the step of developing and presenting the results of their work, the teacher assists students in presenting the outcomes of their discussions and then guiding them through presentations. At this stage, students are given the opportunity to provide feedback or ask questions related to the group's topic. The presentation aims to enable students to express their opinions, ask questions, and develop critical thinking skills through every response, question, and answer. The steps of the instructional activity can be seen in Figure 4.

Fase 5. Mengembangkan dan menyajikan hasil karya		
15. Mengarahkan peserta didik mengembangkan dan menjawab pertanyaan di LKPD sesuai dengan hasil percobaan yang telah dilakukan adalah wujud profil belajar Pancasila kemandirian. 16. Mengarahkan peserta didik untuk mempresentasikan hasil diskusi dari salah satu kelompok yang dipilih.	15. Peserta didik mengembangkan dan menjawab pertanyaan di LKPD sesuai dengan percobaan yang telah dilakukan 16. Peserta didik mempresentasikan hasil diskusi	Sinkron & Asinkron

Figure 4. Steps of Developing and Presenting the Results of Work

The final step of the problem-based learning model is to analyze and evaluate the problem-solving process. In this stage, students reflect on their investigations, draw conclusions, and answer assessments provided by the teacher on Google Classroom. The developed teaching module employs a blended learning approach, where students are facilitated to learn and review materials independently using online resources (Syaifullah & Diliarosta, 2023). Blended learning-based PBL effectively enables students to gather information extensively to enhance their thinking skills and develop independent problem-solving attitudes (Sala et al., 2024). The blended learning approach in education makes students more engaged and motivated to learn since students are more inclined to spend time on social media platforms, allowing them to engage with the content more effectively than traditional methods (Habibah et al., 2022). The steps of the instructional activity can be seen in Figure 5.

Fase 6. Menganalisis dan mengevaluasi proses pemecahan masalah		
17. Guru membimbing peserta didik untuk memberikan kesimpulan hasil diskusi dari percobaan yang telah dilakukan 18. Mengarahkan peserta didik untuk mengumpulkan kembali hasil diskusi di LKPD secara online melalui WA Group	17. Peserta didik memberikan kesimpulan hasil diskusi dari percobaan yang telah dilakukan 18. Peserta didik mengumpulkan hasil diskusi kelompok dengan mengirimkan LKPD melalui WA Group.	Sinkron & Asinkron
Penutup (durasi 20 menit)		
19. Guru memberikan penguatan dan konfirmasi terkait hasil diskusi kelompok melalui media power point atau link video Youtube melalui WA Group Link : https://youtu.be/Lwf8H3uo24Y https://youtu.be/zuBZhwGndwA 20. Membimbing peserta didik untuk menyimpulkan hasil pembelajaran hari ini dengan menunjuk peserta didik secara acak 21. Memberikan asesmen formatif (tes tertulis, umpan balik, dan refleksi) melalui G-Form adalah wujud profil belajar Pancasila bernalar kritis 22. Guru menyampaikan materi pembelajaran untuk minggu depan agar peserta didik mempersiapkannya	19. Peserta didik mendengarkan penguatan hasil diskusi dan menonton video yang diberikan oleh guru 20. Menyimpulkan hasil pembelajaran 21. Mengerjakan asesmen formatif dan melakukan refleksi melalui G-Form 22. Menyimak guru menyampaikan materi untuk pertemuan selanjutnya 23. Berdoa dan menjawab salam	Sinkronus dan Asinkronus

Figure 5. Steps of Analyzing and Evaluating the Problem-Solving Process

Development Phase

The development phase is a follow-up to the design process. This phase aims to assess the extent to which the designed teaching module can be utilized. Once the assessment is obtained, the teaching module and LKPD (LKPD) will be revised based on the feedback received from the validators..

Based on the conducted research, it is evident that the developed teaching module is suitable for use, based on the stages undertaken in this study. The teaching module that has been developed adheres to the syntax and steps of problem-based learning, unlike the previous teaching module which utilized the problem-based learning model but lacked the appropriate syntax for its instructional steps. Additionally, the existing LKPD (LKPD) were found to be irrelevant. The problem-based learning model encompasses a fundamental step where students are introduced to problem situations and engage in finding solutions through presentation and analysis of their work (Bridges, 2019).

Furthermore, the teaching module developed by the researcher employs a blended learning approach. This is evident through the inclusion of relevant instructional video links, online-accessible LKPD (LKPD), and assessments. This aligns with the statement by Nurhadi (2020), that blended learning empowers students with the freedom to learn at their own pace, with feedback provided by facilitators over time. The developed teaching module underwent validation by experts, practicality testing, and response evaluation from both teachers and students. The results of the expert validation can be seen in the table below:

Table 3. Material expert validation results.

No	Aspect	Average Percentage	Validation Criteria
1	Content Suitability Aspect	100%	SV
2	Languange Suitability Aspect	100%	SV
3	Presentation Aspect	99.25%	SV
Overall Average Percentage		99.7%	SV

The expert validation results in Table 3 indicate that all components of the teaching module and LKPD (LKPD) are categorized as highly valid, with an overall percentage of 99.7%.

Table 4. Construction expert validation results.

No	Aspect	Average Percentage	Validation Criteria
1	Teaching Module Aspect	91.3%	SV
2	LKPD Aspect	91.7%	SV
Overall Average Percentage		91.5%	SV

The validation results of the problem based learning blended learning module by the instructional design expert in Table 4 show that all components in the assessment sheet are categorized as very valid, with an overall average percentage of 91.5%. After the validation by the instructional design expert, the module's practicality was further tested by teachers in the school. The results of the practicality test can be seen in the table below:

Table 5. The results of the validation of teaching modules and worksheets by practitioners.

No	Indicator	Average Percentage	Validation Criteria
1	Content Suitability	90%	SV
2	Languange	90%	SV
3	Presentation	87%	SV
4	Graphic Design	93%	SV
	Overall Average Percentage	90%	SV

Based on the validation results of the teaching module by instructional design experts, as shown in Table 5, all components on the assessment sheet fall under the highly valid category with an overall average percentage of 90%, meeting the highly valid criteria. The highest percentage achieved in the practicality test is 93% for the indicator of graphic design. This is attributed to the presence of clear activity instructions in both the teaching module and LKPD (LKPD), which facilitates both students and teachers in carrying out the activities. This aligns with the statement by

Leufer et al. (2019) that LKPD provide guidance as student facilitators, containing materials, instructions, and summaries that students work on, making learning more accessible for them. After revising and validating the teaching module, the next step is to conduct a limited trial of the teaching module with teachers and students at SMA Methodist Banda Aceh. The results of the teacher response test can be seen in the following table:

Table 6. Results of Teacher Response Test

No	Assessment Indicator	Average Percentage	Rating Category
1	Material Presentation	88%	SB
2	Teaching Module Presentation	93%	SB
3	LKPD Presentation	90%	SB
	Overall Average Percentage	90%	SB

Based on Table 6, the overall assessment percentage by teachers on the teaching module and LKPD is 90%, which falls within the "Very Good" criteria. The average result of the teacher response questionnaire indicates agreement with the problem-based learning blended learning teaching module. According to the teachers at SMA Methodist Banda Aceh, the developed teaching module meets the criteria for being suitable for use in the teaching process under the Merdeka curriculum. It is also noted that the module aligns well with the chosen model and approach.

Table 7. Student Response Results

No	Assessment Indicator	Average Percentage	Rating Category
1	Ease of Use of LKPD	87%	SB
2	Ease of Following the Learning Process	86%	SB
3	Assistance of Students in Understanding Material Using LKPD	87%	SB
4	Assistance of Students in the Learning Process	86%	SB
	Overall Average Percentage	86%	SB

Based on Table 7, the obtained average percentage results of student assessment towards the developed teaching module and LKPD are 86%, which falls into the "very good" category. The average responses from the student questionnaire towards the problem based learning module based on blended learning indicate agreement, with the highest percentage being 87% for the indicators of ease of use of LKPD and assistance of students in understanding the material using LKPD. During the conducted limited trial, students actively engaged in the learning process and participated effectively in using the LKPD. This is consistent with the statement by Yi et al. (2024) LKPD are a collection of sheets containing guidance for student activities, allowing students to engage in practical activities related to the objects and topics being studied.

Furthermore, the developed LKPD by the researcher are based on blended learning, as evidenced by the inclusion of instructional video links that support the students' learning process. The LKPD can also be accessed online, allowing students to easily access it both inside and outside the classroom. The lowest percentage result in the student response questionnaire is 86%, specifically in the indicators of ease of following the learning process and the assistance provided by the LKPD during the learning process. This is consistent with the statement by Hammasa et al. (2024) that LKPD can facilitate students in understanding the material as it is user-friendly. Additionally, LKPD can be utilized for experiments both within and outside the classroom, as well as at home.

Based on the presentation above, the problem based learning module based on blended learning is deemed suitable for use in the "Kurikulum Merdeka" (independent curriculum). Problem based learning based on blended learning facilitates students in acquiring a wealth of information to enhance their critical thinking skills and independent problem-solving abilities (Johnson & Griffin, 2023). This aligns with the statement by Wodzanowski et al. (2022) that modifying the steps of problem based learning by incorporating online activities proves beneficial; students find it easier to comprehend the material and it supports their thought processes.

CONCLUSION

The problem-based learning teaching module based on blended learning, which has been developed, is suitable for use in the implementation of the Merdeka curriculum. Data analysis and discussion of the research findings reveal that the validation of the teaching module by content experts, instructional design experts, and educational practitioners yielded validity results within the percentage range of 90% to 100%, falling under the highly valid criteria. Furthermore, the feedback from teachers towards the teaching module amounted to 90%, while student responses were at 86.5%, both falling within the category of "very good". This study has great potential for future research as a reference by taking advantage of longitudinal studies and evaluating the long-term impact of PBL modules. In addition, the development of this PBL module can be a comparative study for different educational levels thus providing insights into the effectiveness of varied PBL modules. Through this approach, it can deepen the understanding and contribute to the wider application of PBL at different levels of education.

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