Primary: Jurnal Pendidikan Guru Sekolah Dasar
journal homepage: https://primary.ejournal.unri.ac.id/
contents lists available at SINTA and DOAJ

Vol. 15 No. 2 (2026): April
http://dx.doi.org/10.33578/jpfkip.v15i2.403-413

Effectiveness of PjBL on pgsd students' ability to design social studies modules-based local wisdom

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Article info

Keywords:
local wisdom, PGSD, pre-service teachers, project-based learning, social studies teaching modules

Abstract

The present study examines changes in PGSD students' ability to design local wisdom-based social studies modules after participating in Project-Based Learning (PjBL). The study employed a quasi-experimental one-group pre–test–post–test design involving 42 fifth-semester students. The intervention consists of PjBL activities, including exploring local culture, designing collaborative projects, and engaging in reflective learning. Data were collected using pre- and post-tests, observations, and validated self-assessment instruments. Data were subsequently analyzed using paired-sample t-tests and N-Gain calculations. The results indicate a significant increase in students' module design skills, particularly in content organization, integration of local wisdom, collaboration, and socio-cultural relevance ($p < 0.001$). These findings indicate that PjBL supports the development of more advanced skills in designing contextual learning modules.

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DOI: http://dx.doi.org/10.33578/jpfkip.v15i2.403-413
Received 9 January 2026; Received in revised form 26 March 2026; Accepted 8 April 2026
Available online 28 April 2026
e-ISSN 2598-5949 | p-ISSN 2303-1514 © The Authors.

1. Introduction

The development of education systems is closely linked to integrating 21st-century skills into the learning process. Contemporary education emphasizes equipping students with critical thinking, collaboration, creativity, and communication skills to prepare them for complex social and professional challenges. These competencies require learning environments that promote active participation, problem-solving, and contextual understanding. Consequently, teacher education institutions are expected to prepare pre-service teachers who not only understand pedagogical theories but also implement them in meaningful learning practices. In this context, students enrolled in the Primary School Teacher Education Program (PGSD) are required to develop the ability

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to design learning experiences that support the development of 21st-century competencies from the early stages of schooling (2011 dalam Ceyhun & Zorba, 2024).

One essential aspect of pre-service teachers' pedagogical competence is the ability to design teaching modules as structured learning guides that include learning objectives, materials, instructional strategies, and assessment. Well-designed modules can facilitate interactive, meaningful, and student-centered learning, particularly at the elementary school level (Theresa & Nardo, 2017). In Social Studies, teaching modules play a crucial role in connecting conceptual knowledge with students' real-life experiences and socio-cultural contexts, thereby fostering social understanding and character development.

Despite this importance, teaching modules developed by pre-service elementary school teachers often remain textual and theoretical, with limited reflection on the principles of 21st-century learning that emphasize active engagement, collaboration, and contextual problem-solving. Previous studies indicate that pre-service teachers frequently experience difficulties in integrating innovative learning approaches into meaningful instructional designs (Kain et al., 2024). In many cases, social studies teaching modules are abstract, insufficiently linked to real-life contexts, and rarely incorporate local wisdom as a learning resource.

In practice, social studies in elementary schools still tends to rely heavily on textbooks and often does not utilize the potential of local culture as a contextual learning source (Suherman & Winarso, 2020). As a result, learning activities become less relevant to students' daily experiences and social environments. This condition highlights the need for instructional approaches that encourage students to think critically, collaborate with others, and connect theoretical knowledge with real-world contexts.

This condition reflects the gap between PGSD students' conceptual understanding of contextual learning and their ability to apply it in designing teaching modules. At Ahmad Dahlan University (UAD), for instance, PGSD students still struggle to explore and integrate local cultural potential into social studies teaching modules. The resulting modules tend to be descriptive, theoretical, and dependent on references provided by lecturers. The lack of exploration of local cultural sources results in a less creative module design process that does not fully encourage students' social sensitivity and cultural awareness as pre-service teachers.

To address these challenges, learning models that actively engage students in collaborative inquiry and practical problem-solving are required. One instructional approach considered relevant is Project-Based Learning (PjBL). This model is grounded in constructivist learning theory, which emphasizes that knowledge is actively constructed through experience, exploration, and social interaction (Gomez-del Rio & Rodriguez, 2022). Through PjBL, students participate directly in planning, implementing, and reflecting on learning projects, thereby encouraging active engagement and responsibility in the learning process.

A growing body of research has demonstrated the educational benefits of PjBL. Studies have shown that project-based learning can enhance critical thinking, collaboration, creativity, and the application of knowledge in authentic contexts (Brundiers & Wiek, 2013; Krajcik &Shin, 2014;Wu et al., 2026). Similarly, Kaushik (2020) reported that PjBL contributes positively to students' learning experiences, particularly in affective aspects such as motivation and engagement. Guo et al. (2020) also found that PjBL can improve cognitive learning outcomes, learning behaviors, and the quality of students' products.

The implementation of PjBL is also closely related to the concept of deep learning. In project-based environments, students are not limited to memorizing concepts; they engage in higher-order thinking through exploration, analysis, reflection, and application. Research findings reveal that

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deep learning approaches enable students to develop a comprehensive understanding, connect multiple concepts, and strengthen metacognitive skills (Farrow et al., 2024; Purwanti & Syamsi, 2025). In the context of designing social studies teaching modules, PjBL can support pre-service teachers in developing learning designs that emphasize both content mastery and meaningful learning processes.

Integrating local wisdom into Project-Based Learning further enhances the model's relevance in teacher education. Previous research indicates that the incorporation of local knowledge into teacher learning activities can strengthen professional identity and stimulate creativity in instructional design (Triyanto & Handayani, 2020). Similarly, Ting et al. (2023) found that project-based approaches in module development can support students' scientific practices and critical thinking, particularly when project activities are connected to local contexts. Projects that explore local traditions, environmental issues, or community economic activities allow students to understand socio-cultural phenomena in a more authentic and contextual manner (Rabia et al., 2024). In addition, systematic reviews of teacher education emphasize the importance of integrating local knowledge and perspectives into learning modules to foster cultural sensitivity and strengthen 21st-century pedagogical competencies (Yip dan Chakma (2024).

Despite previous studies having highlighted the benefits of PjBL, most research has primarily focused on students' use of teaching modules rather than on the process through which pre-service teachers collaboratively design those modules through project-based learning (Guo et al., 2020). Empirical studies that specifically examine the role of PjBL in improving PGSD students' ability to design local wisdom-based social studies teaching modules remain limited. Furthermore, the integration of local wisdom into teaching module design in teacher education contexts has not been systematically examined. (Bae & Kim, 2022)

In light of the foregoing, this study aims to examine the changes in PGSD students' ability to design local wisdom-based social studies teaching modules following the implementation of Project-Based Learning. The research findings are expected to contribute to the development of teacher education practices, particularly by strengthening the pedagogical competence, creativity, and cultural awareness of pre-service elementary school teachers in designing contextual and meaningful learning experiences.

2. Method

This study employs a single-group quantitative quasi-experimental design with a pre-test–post-test approach to examine the effectiveness of Project-Based Learning (PjBL) in improving PGSD students' ability to design social studies modules based on local wisdom. This research method allows direct measurement of changes in students' abilities before and after the intervention within the same group, enabling researchers to observe improvements in learning resulting from the implementation of the learning model (Creswell, 2014).

The research design used in this study is a one-group pre-test–post-test design with three main stages: pre-test, treatment, and post-test. In this design, students' abilities are first measured with a pre-test (O_1), subsequently the Project-Based Learning model is implemented as the treatment (X), and finally measured again with a post-test (O_2). The flow of the research procedure is illustrated in Figure 1.

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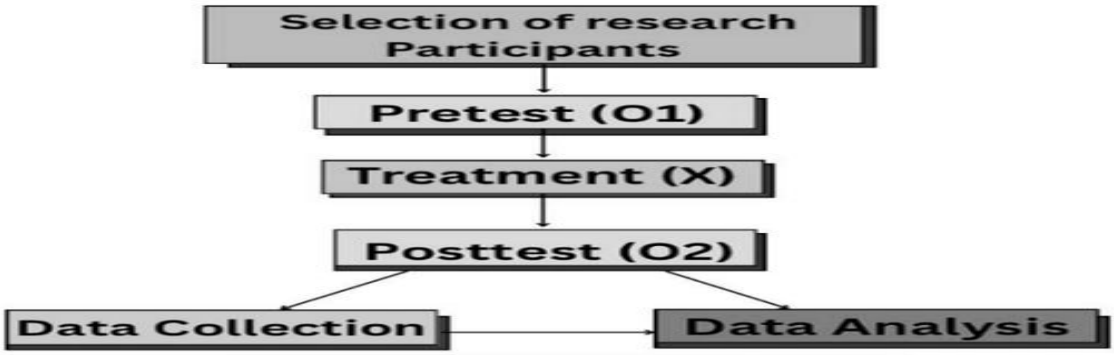


Figure 1. Flowchart of the one-group pre-test–post-test research design

2.1 Selection of research participants

The independent variable in this study is the implementation of Project-Based Learning (PjBL) in designing local wisdom-based social studies teaching modules, while the dependent variable is PGSD students' ability to design contextual, creative social studies modules that integrate local wisdom values. The research population consists of all 42 PGSD students in semester 5 class C. The research activities were conducted from September 23 to November 4, 2025.

2.2 Pre-test (O_1)

Before giving the treatment, a pre-test is conducted to measure students' initial ability to design social studies modules based on local wisdom. The assessment covers several aspects, including module systematics, the formulation of learning objectives, the suitability of materials, the integration of local wisdom values, the design of learning activities, and the assessment components. The results of the pre-test serve as baseline data to determine students' initial competencies before participating in the learning intervention (Almulla, 2020).

2.3 Treatment (X)

The treatment stage is conducted using the Project-Based Learning (PjBL) model. During this stage, students are guided through several phases of project-based learning, including identifying issues related to local wisdom, planning the project, collecting relevant data, developing learning modules, presenting the results of the project, and conducting reflection activities (Hinostroza et al., 2025). Through these stages, students work collaboratively to design contextual and creative social studies modules that incorporate local wisdom values.

2.4 Post-test (O_2)

After completing the project-based learning activities, a post-test is administered using the same assessment indicators as the pre-test. The purpose of the post-test is to determine the improvement in students' ability to design local wisdom-based social studies modules after participating in learning activities using the Project-Based Learning model (Masida et al., 2025).

2.5 Data collection

Data in this study were collected through pre-test and post-test assessments, observation sheets documenting student participation during the module design process, and self-assessment questionnaires (Balqis & Andriani, 2024). These instruments are validated by experts in elementary social studies development to ensure they accurately measure students' abilities before and after the implementation of Project-Based Learning. In addition, the validity and reliability of the

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instruments are assessed to ensure that the measurement tools can consistently evaluate students' abilities in designing local wisdom-based social studies modules (Taber, 2018). The criteria for assessing students' ability to design PjBL-based social studies modules are presented in Table 1.

Table 1. Assessment criteria for students' ability to design pjbl-based social studies modules

No	Score Ranges	Criteria
1	3.41 < score ≤ 4.00	Highly Skilled
2	2,.81 < score ≤ 3.40	Skilled
3	2.21 < score ≤ 2.80	Moderately Skilled
4	1.61 < score ≤ 2.20	Less Skilled
5	0 < score ≤ 1.60	Not Skilled

The assessment, as presented above, is conducted by the same supervising lecturer to maintain consistency. Instrument reliability is tested using an intra-rater reliability approach. In this procedure, the supervising lecturer reassesses 10 randomly selected student assignments every 1 week. The data are analyzed using Pearson correlation in JASP. The results reveal a correlation coefficient of r = 0.86, indicating high consistency in assessment. In light of this finding, the instrument is considered reliable and suitable for measuring students' abilities in designing PjBL-based social studies teaching modules.

2.6 Data analysis

Data analysis in this study is conducted in several stages. First, the results of the pre-test and post-test are tested for normality using the Shapiro–Wilk test to determine whether the data are normally distributed (Rahmanian et al., 2020). Second, a paired-samples t-test is used to determine whether there is a significant difference between students' pre- and post-test scores. Third, the improvement in students' abilities is calculated using the Normalized Gain Score (N-Gain) to assess the effectiveness of Project-Based Learning implementation.
The N-Gain formula used in this study is as follows:

$$g = \frac{(S_{post} - S_{pre})}{(S_{max} - S_{pre})}$$

Where S_{post} represents the post-test score, S_{pre} represents the pre-test score, and S_{max} represents the maximum score.

The interpretation of the N-Gain score follows the classification proposed by Richard R. Hake (1999), as presented in Table 2.

Table 2. Normalized gain criteria

No	Score Ranges	Criteria
1	g ≥ 0.7	High
2	0.3 ≤ g < 0.7	Medium
3	g < 0.3	Low

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These results indicate the extent to which the Project-Based Learning model is effective in improving students' ability to design social studies teaching modules containing local wisdom values.

3. Results

The data analysis reveals that students' ability to design social studies teaching moduls based on local wisdom increased following the implementation of Project-Based Learning (PjBL). The increase was observed across all assessment aspects, including content organization, creativity in integrating local wisdom, collaboration and involvement, and relevance to the socio-cultural context.

Table 3. Assessment Criteria for the Ability to Design PjBL-Based Social Studies Modules

Assessment Aspects	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Gain Scores
Content organization	71.2 ± 6.8	84.6 ± 5.3	+13.4
Creativity in integrating local wisdom	70.5 ± 7.0	86.1 ± 5.2	+15.6
Collaboration and involvement	72.0 ± 6.4	87.3 ± 5.1	+15.3
Relevance to the socio-cultural context	70.9 ± 6.5	85.7 ± 5.5	+14.8
Total average	**71.15 ± 6.67**	**85.93 ± 5.27**	**+14.78**

The results reveal that the largest improvement is in creativity in integrating local wisdom (+15.6), followed by collaboration and involvement (+15.3). These findings indicate that project-based activities provide opportunities for students to actively explore cultural resources in their environment and translate them into instructional design.

To examine the statistical significance of the improvement, a paired-samples t-test was conducted using JASP. The analysis showed that the significance value Sig. (2-tailed) = 0.000 < 0.05, indicating a statistically significant difference between the pre-test and post-test scores.

Table 4. Results of the paired sample t-test for the ability to design social studies teaching modules

Variable	Mean Difference	t	df	Sig.	Description
Pre-test–Post-test	-14.78	-8.9541	41	0.000	Significant

These results indicate that implementing Project-Based Learning (PjBL) significantly improves students' ability to design local wisdom-based social studies teaching modules.

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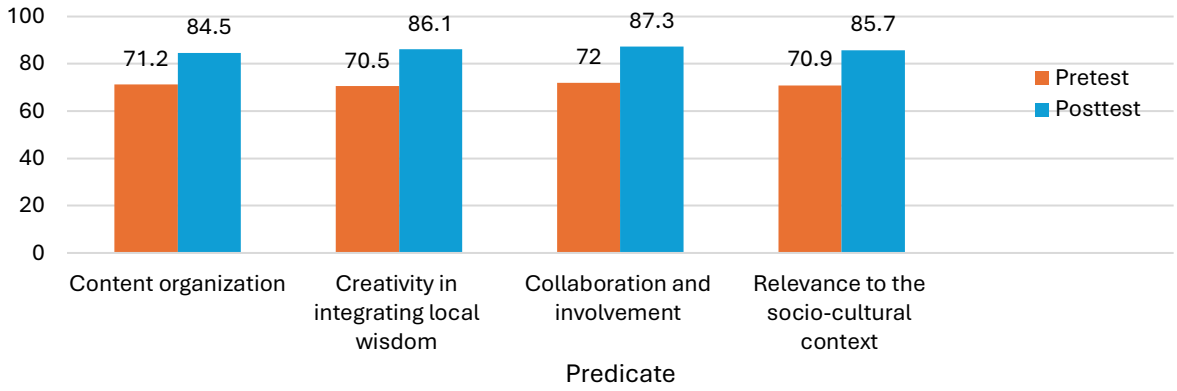


Figure 2. Comparison of students' ability before and after pjbl

The diagram illustrates a clear improvement across all assessment aspects after the implementation of Project-Based Learning (PjBL). The most substantial increase is in creativity in integrating local wisdom, rising from 70.5 to 86.1, followed by collaboration and engagement, which increase from 72.0 to 87.3. These improvements indicate that the project-based learning process not only enhances students' technical ability to organize learning modules but also stimulates creative and collaborative competencies essential for pre-service teachers.

4. Discussion

The research results indicate that integrating Project-Based Learning (PjBL) with local wisdom improves pre-service teachers' ability to design creative, contextual, and culturally relevant social studies modules. The observed improvements across several assessment domains indicate that project-based learning not only enhances technical skills in instructional design but also encourages deeper pedagogical reflection on how learning materials can be connected to students' sociocultural environments.

One essential finding of this study is that the largest improvement was in creativity in integrating local wisdom. This result reveals that the project-based learning process provides opportunities for students to explore cultural resources within their communities and reinterpret them as meaningful learning materials (Zaki et al., 2024a). In teacher education contexts, this competence is essential because pre-service teachers are expected to design learning experiences that are responsive to their students' cultural realities. The process of identifying local traditions, social practices, and environmental contexts during the project activities appears to have stimulated students to develop instructional ideas that are more authentic and relevant to elementary school learning contexts (Faenza et al., 2021).

The interpretation of these findings is consistent with research conducted by Bui, Duong, and Lu (2023) who found that implementing PjBL significantly improves pre-service teachers' professional knowledge, pedagogical skills, and attitudes toward learning. Similar patterns were observed in this study, in which students not only practiced designing teaching modules but also developed a deeper understanding of how project-based and culturally contextual learning approaches could be implemented in social studies instruction.

Supporting evidence is also provided by research conducted by Retnowati, Istiana, and Nadiroh (2020), which shows that local wisdom-based PjBL can improve students' problem-solving abilities,

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reflected in an N-Gain value of 0.69 in the experimental class. Integrating local wisdom into project activities enables students to connect cultural values, traditions, and community practices with their learning experiences. In this study, students actively identified local cultural elements, such as community traditions, environmental practices, and everyday social interactions, that could be integrated into the teaching modules they designed. This process not only enriched the learning materials but also strengthened students' cultural awareness as pre-service teachers.

Another essential aspect revealed by this study is PjBL's role in stimulating higher-order thinking. According to Zaki et al., (2024), the PjBL model provides cognitive stimulation that encourages students to think more critically, creatively, and reflectively. The research findings align with this perspective, as students are required to analyze cultural contexts, evaluate their relevance to learning objectives, and creatively transform them into instructional activities. Such experiences appear to contribute to the development of pedagogical sensitivity and socio-cultural awareness, which are essential competencies for teachers in the context of twenty-first-century learning and the emerging Society 5.0 educational paradigm.

The integration of cultural perspectives in instructional design also reflects the principles of culturally sustaining pedagogy proposed by Django Paris (2012). This perspective emphasizes the importance of maintaining and developing local cultural identities within educational practices. Through the development of teaching modules based on local wisdom, students in this study demonstrated an increasing ability to recognize cultural assets within their communities as valuable learning resources. In this sense, the project-based learning approach not only supports academic competence but also encourages pre-service teachers to internalize cultural values and use them as foundations for meaningful learning.

A similar perspective is presented in Diaz (2021), who argues that culturally responsive teacher education can shape educators who are more sensitive to their students' social identities and cultural backgrounds. The research findings reflect this idea, as PGSD students designed teaching modules that not only conveyed social studies content but also incorporated local values as instructional elements. As a result, the learning process contributed not only to the development of pedagogical skills but also to the strengthening of students' cultural awareness and professional identity as future educators.

Nevertheless, this study has several limitations that should be considered when interpreting the findings. The use of a one-group pre-test–post-test design without a control group limits the ability to attribute the observed improvements exclusively to the PjBL intervention. Other factors, such as increased familiarity with instructional design tasks or collaborative peer learning, have also influenced the improvement in students' abilities.

Future studies can strengthen the evidence by employing experimental designs that include comparison or control groups. In addition, further research may examine how the teaching modules developed by pre-service teachers function when implemented in real elementary school classrooms, particularly their impact on students' learning engagement and outcomes.

Finally, future research can also explore integrating digital technologies into local wisdom-based project learning to address the evolving educational context of Society 5.0. The use of digital platforms, interactive media, or collaborative technologies may enhance students' ability to document and reinterpret cultural knowledge while maintaining the contextual relevance of learning materials.

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5. Conclusion and implications

This study explores the use of Project-Based Learning (PjBL) integrated with local wisdom in supporting PGSD students' ability to design social studies modules. The findings indicate that students show improvements in several aspects of module design after participating in the project-based learning process, including the organization of learning materials, the integration of cultural values, and the modules' contextual relevance. These results indicate that the PjBL approach combined with local cultural resources has the potential to support the development of pedagogical skills and contextual awareness among pre-service elementary school teachers.

However, the findings should be interpreted cautiously, considering the methodological limitations of this study. The research employed a one-group pre–test–post–test design without a comparison group, meaning the observed improvements cannot be attributed solely to the implementation of PjBL. In addition, the teaching modules developed by students were evaluated at the design stage and were not implemented in real classroom contexts. These conditions limit the extent to which the results can be generalized to participants beyond those involved in this study.

Despite these limitations, the study provides initial insights into how project-based learning activities that incorporate local wisdom support teacher education programs in encouraging culturally responsive instructional design. For teacher education institutions, such as PGSD programs, integrating culturally contextual learning approaches helps pre-service teachers reflect on how local cultural knowledge can be connected with social studies instruction. Future research is recommended to employ experimental or quasi-experimental designs with control groups, implement the developed modules in real elementary school classrooms, and examine how technology integration can further support culturally responsive project-based learning.

Credit authorship contribution statement

Nurul Sinta Nirwana: Conceptualization, Methodology, Formal Analysis, Data Curation, Investigation, Writing Draft. **Vera Yuli Erviana:** Supervision, Instructional Support during Implementation, Methodology, Validation **Oktavian Muning Sayekti:** Supervision, Field Guidance, Validation, Review

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. Because the data include human participant information, they are not publicly available to protect participant privacy.

Ethical Declaration

All participants provided informed consent prior to their involvement in the study. They were informed about the study's purpose, procedures, and their right to withdraw at any time without consequence.

Acknowledgement

Contributors who are not mentioned as authors should be acknowledged, and their particular contributions should be described. All funding sources for the work must be acknowledged; the research funder and the grant number (if applicable) should be given for each source of funds.

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[e-**ISSN 2598-5949** | p-**ISSN 2303-1514**]