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DEVELOPMENT OF PROJECT-BASED LEARNING (PJBL) STUDENT WORKSHEET INTEGRATED WITH ETHNOSCIENCE ON THE TOPIC OF MATTER AND ITS CHANGES

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ABSTRACT

This research is motivated by the low involvement of students and difficulties in understanding the abstract concept of the material "Substances and Their Changes", as well as the absence of Student Worksheets based on Project Based Learning (PjBL) integrated with ethnoscience at SMK Negeri 1 Lubuk Dalam. This study aims to develop Student Worksheets based on PjBL (Project Based Learning) integrated with ethnoscience. This study uses the type of Research and Development research with the ADDIE model (Analysis, Design, Development, Implementation and Evaluation). The data collection instrument in this study is a questionnaire for validity and practicality tests. Based on the results of the study, it shows that the developed Student Worksheets have a very valid category as evidenced by the validity test given by material experts obtaining a score of 93.3% and 97.7% and language experts obtaining a score of 85%. The results of the practicality test obtaining score of 95 % in the small group trial and 96,5 % in the large group trial, both of which are included in the very practical category. The developed LKPD contains project activities based on local Riau culture, such as making sour and spicy patin fish, bolu kemojo, es laksamana langka, boiling hibiscus flowers, making cassava tapai and sticky rice tapai which are integrated into the material on substances and their changes. The development of LKPD based on PjBL integrated with ethnoscience contributes to creating contextual learning based on local wisdom while increasing active participation, scientific literacy, and student character.

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1. INTRODUCTION

This research was conducted to develop a Project-Based Learning (PjBL)-based student worksheet (LKPD) integrated with ethnoscience on the topic of substances and their changes for use at SMK Negeri 1 Lubuk Dalam. The research responds to the challenges of 21st-century learning which demands contextual, student-centered, and culturally relevant materials. Previous studies have either applied PjBL without ethnoscience integration or vice versa. This study positions itself to bridge that gap by incorporating local Riau scientific practices — such as the making of asam pedas ikan patin, bolu kemojo, tapai, and traditional drinks — into a PjBL-based LKPD framework. The conclusion confirms that integrating ethnoscience within PjBL-based worksheets provides not only meaningful scientific conceptual understanding but also contributes to the preservation and recognition of local wisdom. The development model employed was ADDIE, ensuring a systematic approach in addressing students' lack of interest and the limitations of existing materials. Future research should explore the application of this integrated approach in other scientific themes and educational levels, measure its long-term impact on students' critical and creative thinking skills, and possibly develop digital versions to expand its accessibility and interactivity. Furthermore, ongoing studies are examining the effectiveness of similar ethnoscience-integrated project-based modules for environmental science topics and traditional health practices in different regions.

2. METHODS

The research employed a Research and Development (R&D) approach using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The aim was to develop a Project-Based Learning (PjBL)-based student worksheet (LKPD) integrated with ethnoscience for the topic of substances and their changes. The research subjects were Class X students of SMK Negeri 1 Lubuk Dalam, with trials conducted in two stages: a small group trial with 18 students and a large group trial with 53 students. The research procedure began with an analysis phase to identify learning problems through documentation, interviews, and student needs assessments using questionnaires. This was followed by the design phase, where learning materials and validation instruments were drafted. The development phase involved creating the LKPD and validating it with experts. After revisions, the implementation phase tested the LKPD in both small and large groups. Lastly, the evaluation phase was carried out formatively at each stage to improve the product continuously. Materials used included documentation forms, interview guidelines, validation sheets, and student response questionnaires. Data collection techniques encompassed documentation, interviews, and questionnaires. Data analysis was performed using descriptive statistical techniques — calculating validity scores based on expert validation, and practical scores based on student responses, using Likert scales and categorized with specified criteria ranges for validity and practicality.

3. FINDINGS AND DISCUSSION

This section presents the results of the product development process, including validation by experts, dan practicality testing. It also discusses the integration of ethnoscience elements into the learning materials.

3.1 Product Validity

The developed LKPD was validated by material experts, media experts, and practitioners. The results showed an average validity score above 85%, the developed Student Worksheets have a very valid category as evidenced by the validity test given by material experts obtaining a score of 93.3% and 97.7% and language experts obtaining a score of 85%, indicating the product met the criteria for content accuracy, clarity, visual design, and integration of local knowledge. This confirms that the worksheet is highly suitable for classroom use.

3.2 Practicality Test

Practicality testing was conducted through student response questionnaires. Based on the results of the study, it shows that The results of the practicality test obtained an average score of 95% in the small group trial and 96,5% in the large group trial, both of which are included in the very practical category.The majority of respondents rated the LKPD as easy to use, well-structured, and engaging. Instructions were clear, and the activities aligned well with learning goals. These findings indicate that the product is practical and applicable in real classroom settings.

3.3. Integration of Ethnoscience

A key innovation in this study was the integration of ethnoscience through the use of Ethnoscience was integrated by selecting traditional Riau culinary practices to illustrate physical and chemical changes in matter. The selected ethnoscience activities included: Making asam pedas ikan patin Making bolu kemojo Preparing es laksamana mengamuk Boiling bunga raya (hibiscus flowers) Fermenting tape ketan (fermented glutinous rice) and tape singkong (fermented cassava) These activities were designed as ethnoscience-based projects to enable students to connect scientific concepts with real-life applications rooted in local cultural traditions. Each project activity within the LKPD was accompanied by background information on its ethnoscientific relevance, explaining the cultural significance of the process and how it illustrates specific physical and chemical phenomena. This integration of ethnoscience aimed to make science learning more meaningful, contextual, and engaging for students while preserving and appreciating the local wisdom of Riau society.

This study aimed to develop a Project-Based Learning (PjBL) Student Worksheet (LKPD) integrated with ethnoscience on the topic of *matter and its changes* in the Proyek IPAS subject at SMK Negeri 1 Lubuk Dalam. The findings successfully addressed the initial research objectives outlined in the introduction, particularly in responding to the lack of engaging, contextual learning resources integrated with local culture..

The results confirmed that the existing teaching process was dominated by lectures and discussions, with minimal use of project-based, culturally contextual materials. The developed LKPD integrated traditional Riau culinary practices as ethnoscientific content to contextualize abstract science concepts. This directly supported previous findings by Fitriyeni (2023) and Nurhayati et al. (2021), who emphasized the effectiveness of contextual, culturally integrated science teaching in improving student engagement and comprehension.

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Scientifically, the results can be interpreted as evidence that combining PjBL with ethnoscience not only makes abstract material more accessible but also fosters students' critical thinking, collaboration, creativity, and communication skills (4C competencies), essential in 21st-century education. The study also revealed that gender differences may affect learning perceptions, as female students tended to respond more positively to hands-on, culturally familiar project-based tasks.

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4. CONCLUSION

This study successfully developed a Project-Based Learning (PjBL) Student Worksheet (LKPD) integrated with ethnoscience for the topic of *matter and its changes* in the Proyek IPAS subject at SMK Negeri 1 Lubuk Dalam. The results demonstrated that the developed LKPD was categorized as very valid based on expert validation and very practical based on small- and large-group trials. The integration of ethnoscience through local culinary projects effectively contextualized abstract scientific concepts, increased student engagement, and supported 21st-century skill development. The research findings confirmed the initial objectives outlined in the introduction, addressing the need for innovative, culturally contextual learning resources in vocational education. Moreover, the study reinforced previous research findings on the positive impact of combining PjBL and ethnoscience in science education. Future studies are recommended to apply this model to other scientific topics and educational levels, as well as in different local cultural settings. Further research could also explore the long-term effects of ethnoscience-integrated PjBL on students' scientific literacy, cultural awareness, and character education.

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