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Validity and Practicality of Hydrocarbon LKPD Based on Guided Inquiry Learning (GIL) Integrated with Ethnoscience for Phase F SMA/MA

Rahminawati, Andromeda*
Department of Chemistry, FMIPA, Universitas Negeri Padang, Padang,25131, Indonesia

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* *Corresponding author:*

E-mail: andromeda@fmipa.unp.ac.id

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A B S T R A C T

The advancement of time and technology has resulted in foreign cultures easily entering, which can displace students' knowledge of cultural values. This poses a challenge for educators to develop ethnoscience-integrated teaching materials. The purpose of this research is to produce Hydrocarbon LKPD Based on Guided Inquiry Learning Integrated with Ethnoscience for Phase F SMA/MA. The type of research used is educational design research, employing the Plomp model. This research was conducted by designing LKPD, which was followed by the validation and practicality stages. The research instruments used are the validity questionnaire and the practicality questionnaire. The validity questionnaire was analyzed using the Aiken's V formula, while the practicality questionnaire was analyzed using the percentage method. The validity test results yielded an average of 0.85, which falls into the valid category, while the practicality questionnaire results showed a score of 92% from student responses and 91% from teacher responses, both categorized as very practical. Based on the research results, it can be concluded that the hydrocarbon LKPD based on guided inquiry learning integrated with ethnoscience for Phase F SMA/MA is declared valid and practical, thus can be used in the learning process.

1. Introduction

Indonesia needs to reconstruct its educational paradigm in accordance with 21st-century learning to remain relevant in the current era of educational globalization (Faiz & Faridah, 2022). The 21st-century learning concept emphasizes the ability of learners to think analytically, communicate, collaborate, and be highly creative (Indarta dkk., 2022). 21st-century learning also requires students to master scientific literacy skills as a primary need in the learning process (Deming et al., 2012).

Based on the results of the Program for International Student Assessment (PISA), which aims to test students' literacy competencies, it was found that Indonesian

students' science literacy skills are still low (OECD, 2019). This is very concerning because the ability of science literacy is fundamental for acquiring knowledge in problem-solving, critical thinking, logical reasoning, and initiative in accordance with the demands of the 21st century. One of the causes of low science literacy in Indonesia is the improper use of learning models (Fatmawati & Utari, 2015). Science literacy can be enhanced through meaningful learning that is student-centered, such as using the guided inquiry learning model (Rakhmawan dkk., 2015).

The Guided Inquiry Learning (GIL) model can enhance science literacy skills in chemistry concepts due to its focus on student-centered learning. This is supported by research Pratika & Muchlis (2016) which shows that the guided inquiry learning model can train students' science literacy skills. In addition, research from Fitri & Fatisa (2019) conclude that the guided inquiry learning model can be used as a support for students' science skills. However, in the implementation of the learning model, effective teaching materials are needed to support students in achieving learning competencies. One example is the use of student worksheets (LKPD).

LKPD has become one of the teaching materials that can be used in learning (Bierera & Muchlis, 2021). LKPD is used as a learning resource that supports the learning process and can be applied with other learning media to reinforce the learning material for students (Anggini & Andromeda, 2023). Before developing LKPD, it is necessary to examine the latest issues, where advancements in time and technology allow foreign cultures from other countries to easily enter, which can displace students' knowledge of cultural values (Gutiawati & Wulansari, 2022). Thus, a renewal in education is needed, one of which is the implementation of learning integrated with ethnoscience.

Learning integrated with ethnoscience can be used to preserve cultural values in society, and it can also enhance students' science literacy skills. This is in line with previous research by Sumarni (2018b) shows that ethnoscience-based LKPD can enhance students' science literacy in chemistry learning in terms of content, context, and competence. This is also in line with the research conducted by Asda et al., (2023) shows that ethnochemistry-based LKPD is effective in significantly improving students' science literacy skills. Learning integrated with ethnoscience can be applied in chemistry education.

Integrated ethnoscience chemistry learning is closely related to everyday life, thereby enhancing students' understanding of chemistry concepts (Sumarni, 2018a). Integrated ethnoscience chemistry learning can be applied to the topic of hydrocarbons. The local community's culture regarding the traditional food of pisang kapik and the use of paraffin in batik can be linked to chemistry, specifically in the topic of hydrocarbons. Based on the above explanation, the author conducted research to develop teaching materials in the form of ethnoscience-integrated Student Worksheets (LKPD) that highlight the traditional food pisang kapik and the use of paraffin in batik-making. Therefore, the author

developed Hydrocarbon LKPD Based on Guided Inquiry Learning Integrated with Ethnoscience for Phase F SMA/MA.

2. Methodology

The type of research used is educational design research (EDR) using the Plomp model (Plomp & Nieveen, 2013). This research will be conducted according to the Plomp development procedure, which consists of three stages: preliminary research, prototyping phase, and assessment phase. However, this research is limited to the second stage, the prototyping phase. This research was conducted at SMAN 1 Kec. Payakumbuh in the 2024/2025 academic year. The subjects of this research are 3 Chemistry lecturers from FMIPA UNP, 2 chemistry teachers, and 9 students from Phase F at SMAN 1 Kec. Payakumbuh.

The research instrument used for data collection in this study is a questionnaire, consisting of a validation questionnaire and a practicality sheet. The validation sheet is used to assess the validity of the produced LKPD. The components being tested include content components, linguistic components, presentation components, and graphical components. The data obtained is used to reveal the level of validity of the produced LKPD. Meanwhile, the practicality sheet used consists of a questionnaire for student and teacher responses to determine the practicality level of the product. The evaluation results from the validators were analyzed using the Aiken's V formula, which is as follows.

$$V = \frac{\sum s}{n(c-1)} \quad S = r - lo$$

Here is the validity level based on the obtained V calculation score. The Aiken's V scale is listed in the following table 1.

Table 1. Validity Criteria

Aiken's V Scale	Category
V≥0,80	Valid
V<0,80	Invalid

(Aiken, 1985)

The assessment of the practicality sheet is obtained through the results of questionnaires from students and teachers, then analyzed using a formula modified from Purwanto (2010) the following.

$$\text{NP} = \frac{R}{SM} \text{ x } 100$$

The criteria for evaluating the practicality of the developed product can be seen in Table 2.

Table 2. Practicality Criteria

Assessment	Category
86%-100%	Very Practical
76%-85%	Practical
60%-75%	Quite Practical
55%-59%	Less practical
≤54%	Not Practical

(Purwanto, 2010)

3. Results and Discussion

This research was conducted to reveal the validity and practicality of the developed product, namely the Hydrocarbon LKPD based on GIL integrated with Ethnoscience for Phase F of SMA/MA. This LKPD was developed using the Plomp development model, limited only to the validation and practicality stages.

Preliminary Research

The preliminary research phase begins with conducting a needs analysis, context analysis, literature review, and development of a conceptual framework. The results of the analysis that have been conducted are as follows.

a. Needs and Context Analysis

Based on the results of the needs analysis that has been conducted, it was found that the school has been using the independent curriculum in its teaching. The demand of the independent curriculum is to link learning materials with cultural values, but it was found that there is still a lack of teaching materials that connect with cultural values. Additionally, it was found that 83.8% of students are not yet aware of learning integrated with cultural values.

b. Literature review

Based on the stages of the literature review that have been conducted, it was found that LKPD integrated with ethnoscience can enhance students' science literacy. This can be proven by research conducted by Sumarni (2018b) shows that ethnoscience-based LKPD can enhance students' science literacy in chemistry learning in terms of content, context, and competence. This is also in line with the research conducted by Asda *et al*., (2023) shows that ethnochemistry-based LKPD is effective in significantly improving students' science literacy skills. The components of the LKPD preparation are referred to from the creative guide for making innovative teaching materials by Prastowo (2015) and the content of the LKPD material is referenced from textbooks and scientific articles.

c. Context analysis

At this stage, the development of the conceptual framework is carried out by first identifying the problems in detail based on the results of needs analysis, context analysis, and literature study that have been conducted, which are then developed into a conceptual framework that serves as a reference in developing the Hydrocarbon LKPD based on GIL integrated with ethnoscience.

Development or Prototyping Phase

In the stage of development and prototype formation, there are four stages of prototype formation. However, in this research, it is limited only to prototype IV. Each stage of prototype development involves formative evaluation aimed at improving product quality. The results of each prototype can be described as follows.

a. Prototype I

At the stage of forming prototype I, a product design in the form of LKPD was carried out. This product is designed according to the LKPD components based on the guidelines Prastowo (2015) and the GIL-based learning syntax developed by Hanson (2005) which consists of orientation, exploration, concept formation, application, and closure. The cover and orientation of learning 2 from the developed LKPD can be seen in figure 1.

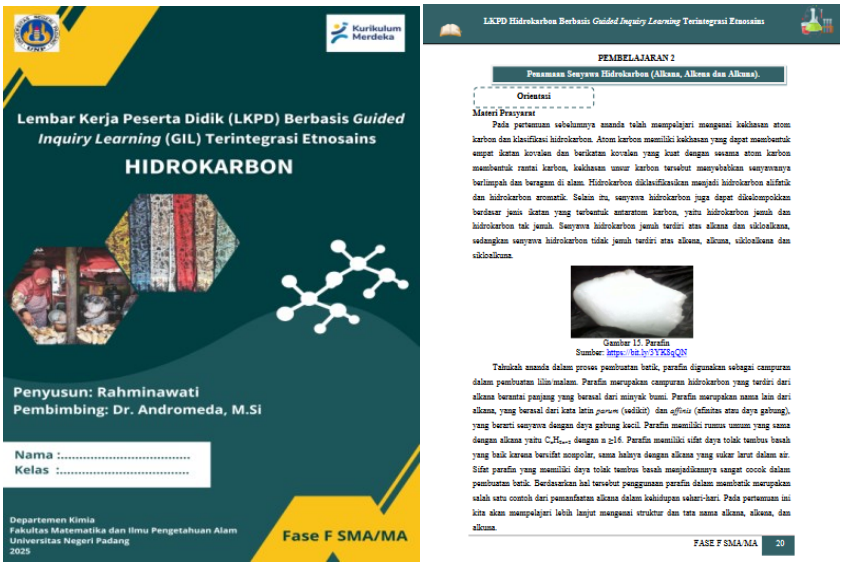

Figure 1. Cover and Learning Orientation 2

b. Prototype II

Prototype II was produced after a self-evaluation of Prototype I. In the self-evaluation, there is a checklist containing the components that must be included in the LKPD. In the self-evaluation, an examination is conducted on the completeness of the components of the LKPD that support learning, such as the cover, preface, concept map, table of contents, usage instructions, learning

outcomes, learning objectives, and bibliography. Based on the self-evaluation, it was found that the components of the hydrocarbon LKPD based on GIL integrated with ethnoscience are complete.

c. Prototype III

Prototype III was produced after an expert review and one-to-one evaluation to determine the validation level of the designed product. The results of this stage are as follows.

a. Expert Review

The validation activity of prototype II was conducted through expert review with the aim of measuring the validity level of prototype II. Validation was conducted by three chemistry lecturers and two teachers from SMAN 1 Kec. Payakumbuh using a validity questionnaire. The following are the results of the validation data analysis that can be seen in Figure 2.

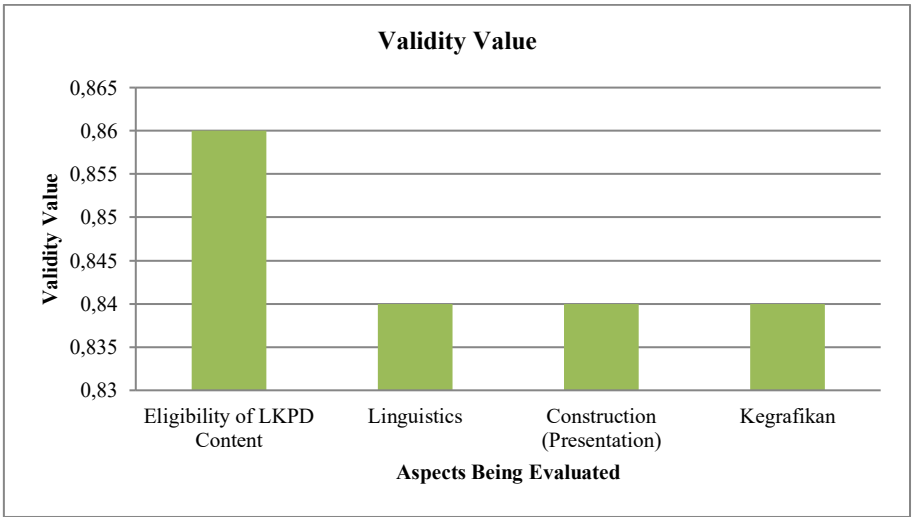

Figure 2. Results of Validity Data Analysis

Based on the validity test that has been conducted, the validity score of the Hydrocarbon LKPD Based on GIL Integrated Ethnoscience for Phase F SMA/MA is 0.85 with a valid category. These results indicate that the developed LKPD is considered valid from various component aspects, such as the content feasibility component, linguistic component, construct component (presentation), and graphic component.

The validity results of the content feasibility component of the LKPD obtained an average of 0.86, categorized as valid. This proves that the developed LKPD has good content feasibility components. The developed LKPD is in accordance with the CP and TP of the independent curriculum found in Kemendikbudristek (2024), The concept of hydrocarbon material presented is in accordance with the theory, and the ethnoscience used aligns with the discussed material, thereby enhancing

the knowledge of the students.

The validity results of the linguistic components of the LKPD obtained an average score of 0.84, categorized as valid. This proves that the developed LKPD has simple sentences, making the conveyed information clear and easy to understand (Depdiknas, 2008). This is in line with the findings of the research by Alfirahmi & Andromeda (2018) which states that producing good teaching materials requires the evaluation of linguistic components consisting of readability, clarity of information, and adherence to the rules of proper and correct Indonesian language.

The validity results of the construct component (presentation) of the LKPD obtained an average of 0.84, categorized as valid. This proves that the developed LKPD has presentation components that are systematically and sequentially arranged, containing ethnoscience concepts, and the presented images are relevant to the material presented. The presentation components are also in accordance with the GIL syntax, starting from orientation, exploration, concept formation, application, and closure (Hanson, 2005). The LKPD components are also in accordance with the LKPD components according to Prastowo (2015) which consists of the title, learning instructions, learning outcomes, tasks and work steps, and evaluation.

The validity results of the graphic components of the LKPD obtained an average score of 0.84, categorized as valid. This proves that the developed LKPD has attractive graphic components in terms of the type and size of the font used, the layout is orderly, the cover is appealing, the color selection, and the presentation of the images are clear, thereby increasing students' interest (Andromeda dkk., 2017). The instructions and information displayed must be able to help students understand the content of the LKPD (Depdiknas, 2008).

b. *One to one evaluation*

One to one evaluation was conducted by interviewing three students with the aim of understanding their responses to the prototype II that had been created. Based on the results of interviews with students regarding the GIL-based hydrocarbon LKPD integrated with ethnoscience, it was found that the cover design is attractive, the color selection in the LKPD is appropriate, the font is readable, the ethnoscience study is relevant to the hydrocarbon material, the learning model used helps students discover concepts in answering questions, and this LKPD can enhance students' knowledge in studying local cultural wisdom.

d. Prototype IV

Prototype IV was produced from a practicality test aimed at evaluating the practicality value of the GIL-based hydrocarbon LKPD integrated with ethnoscience. The small group trial was conducted with two chemistry teachers and nine students. The practicality results for the students and teachers can be seen in figures 3 and 4.

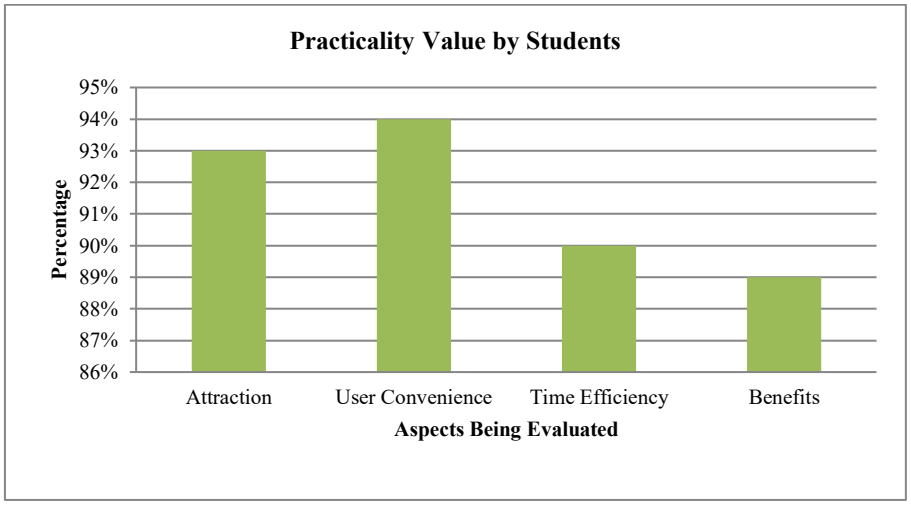

Figure 3. Results of the Practicality Analysis of Students

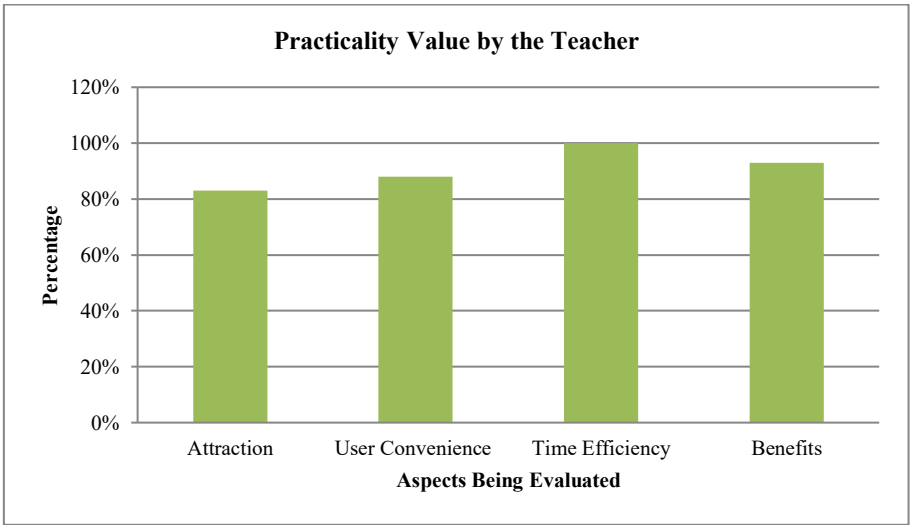

Figure 4. Results of Teacher Practicality Analysis

The practicality of the LKPD is determined through the results of questionnaires from students and teachers. The results of the practicality data analysis can be seen in figures 3 and 4, which explain that the hydrocarbon LKPD based on GIL integrated with ethnoscience shows an average of 92% for the student response questionnaire and 91% for the teacher response questionnaire, both categorized as very practical.

The practicality test of the attractiveness aspect was obtained with an average of 93% from student responses in the very practical category and 83% from teacher responses in the practical category. This indicates that the appeal of the developed LKPD is practical and can be accepted in learning. The appeal of the LKPD can be seen in ethnoscience learning, where this LKPD highlights the local community's culture regarding the traditional food of pisang kapik and the use of paraffin in batik-making within the community. This is in line with the statement

Hanifa & Andromeda (2025) where attraction plays an important role in creating a conducive learning atmosphere, which can encourage student engagement in learning.

The practicality test of the user-friendliness aspect was obtained with an average of 94% from student responses and 88% from teacher responses, categorized as very practical. This indicates that the LKPD is very easy to understand and practical to use. This opinion is in line with the statement Prastowo (2015) which shows that LKPD can make it easier for students to understand the material.

The practicality test of the time efficiency aspect was obtained with an average of 90% from student responses and 100% from teacher responses, categorized as very practical. This shows that the use of this LKPD makes learning time more efficient, where students can learn at their own pace. This is in line with the opinion Asda *et al*., (2023) which states that LKPD can help overcome time constraints in the learning process, making it efficient to use.

Practicality test of the benefit aspect The LKPD was obtained with an average of 89% from student responses and 93% from teacher responses, categorized as very practical. This shows that this LKPD can help students understand the concept of the material and foster their interest in learning, making this LKPD practical in terms of benefits. This is in line with research by Yerimadesi dkk., (2016) which shows that the developed teaching materials are in accordance with the functions and benefits of teaching materials for independent learning without having to depend on the teacher.

The practicality of LKPD can also be seen from the analysis of students' answers during the learning activities. The analysis of answers aims to determine the extent of students' understanding of the material provided. The results of the analysis of students' answers to the LKPD obtained average scores of 96, 91, 89, and 94 for KP1, KP2, KP3, and KP4, respectively. Based on the explanation above, it can be concluded that the GIL-based Hydrocarbon LKPD integrated with Ethnoscience for Phase F SMA/MA that has been developed can be declared valid and practical.

4. Conclusion

Based on the research results that have been described, it can be concluded that the GIL-based hydrocarbon LKPD integrated with ethnoscience for the SMA/MA phase F has been successfully developed using the Plomp model. The developed LKPD has a special characteristic, namely the integration of local wisdom with the concept of hydrocarbon material. The validation results show that the developed LKPD is valid. The practicality results of the LKPD received a practicality percentage categorized as very practical from student questionnaires and teacher questionnaires. So, overall, this LKPD is deemed feasible and practical for use in learning activities.

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