JPPIPA 11(11) (2025)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

# Development of Student Worksheets (LKS) Guided Inquiry-Based Science and Technology Materials in Elementary School

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Received: August 15, 2024
Revised: May 8, 2025
Accepted: October 25, 2025
Published: November 30, 2025

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DOI: 10.29303/jppipa.v11i11.8854



**Abstract:** This research was conducted because of the low student learning outcomes. So, the researcher developed a student worksheet. The purpose to be achieved from this research is to produce inquiry-based worksheets that are valid, practical, and effective. This type of research is development research. The development method used is the Plomp model, which consists of three stages, namely preliminary research, prototyping phase, and assessment stage. Research data were obtained from validity, practicality and effectiveness tests. The results showed that the inquiry-based LKS for grade IV SD developed had met the valid criteria with the characteristics of clear LKS content, in accordance with the curriculum, containing questions that guide students to find learning concepts based on inquiry principles, clear LKS format, sentences and language used are clear, simple, concise and easy to understand, and the presentation is clear. In addition, the LKS developed has also been effective in increasing student learning activities and results with a student learning completeness rate of 91.17%. Based on these results, it can be concluded that the inquiry-based IPAS worksheet developed for grade IV elementary school students is valid, practical, and effective.

**Keywords:** Inquiry; IPAS; LKS

## Introduction

In implementing the Merdeka curriculum in elementary schools, many obstacles are found, especially the learning process at school, namely: First, students lack an in-depth understanding of learning materials. Second, students lack experience, learning because learning is still teacher-centered. Third, students are still lacking in using extensive reading sources. Fourth, student work is not kept together so it is difficult to see the learning progress of students. To overcome the above obstacles, one of the teaching materials that can be used is LKS. LKS is included in teaching materials that are deliberately designed because LKS is teaching material designed and developed to achieve learning objectives (Magdalena, 2020).

LKS is a printed teaching material in the form of sheets of paper containing material, summaries and instructions for implementing learning tasks that students must do, the sheets refer to the basic competencies that must be achieved (Saputra, 2023). By using LKS, students can learn actively in completing various learning material tasks independently and can carry out learning activities. This LKS was deliberately created so that students are more motivated to learn and this LKS was created with using novelty Canva application, so the appearance of this LKS is very good and attractive. According to Sadewa et al. (2020) LKS is a tool to convey messages to students used by teachers in the learning process. So, to create fun learning. Meanwhile, according to Ratnawati et al. (2020) states that "LKS is a tool in the learning process, training students to learn independently. Sihotang et al. (2024) state that LKS is a sheet in the form of a sheet that is used as a guide for learning which contains tasks that must be carried out by students and as a support to improve student activity skills in the learning process can also optimize learning outcomes. And according to Febriandi

**How to Cite:**
Sasmita, E., Solfema, S., Miaz, Y., & Zen, Z. (2025). Development of Student Worksheets (LKS) Guided Inquiry-Based Science and Technology Materials in Elementary School. *Jurnal Penelitian Pendidikan IPA*, *11*(11), 323–329. https://doi.org/10.29303/jppipa.v11i11.8854

et al. (2020) LKS is a learning support by exploring students' abilities and finding a concept.

According to Ummah (2021) the objectives of the LKS are: Teaching students to be active in the learning process. Meanwhile, according to Zubainur (2020) the purpose of the LKS is to improve students' interest in learning. According to Prastowo (2014), this LKS has the following objectives: Provide a lot of knowledge, attitudes and skills that are necessary for students. According to Laksana et al. (2020), Student Worksheets function for teaching materials to make it easier for students to understand the material provided. The functions of student worksheets (LKS) according to Prastowo (2014) are as follows: As teaching materials that will minimize the role of educators, but activate students more. Meanwhile, according to Septantiningtyas (2021), LKS serves to facilitate the student learning process. Provides learning tasks to students in an integrated manner. Meanwhile, according to Karwono & Mularsih (2017), the function of LKS is as a learning resource to increase educational productivity. According to Prastowo (2014), states the elements of LKS, namely: teaching instructions, competencies to be achieved, supporting information, exercises, work instructions, evaluation. According to BSNP from the book Muslich (2016) are as follows: Feasibility of LKS Content. The suitability between the Learning Outcomes and the Teaching Module, the accuracy of the LKS material, the learning support material, the currency of the material. According to Panggabean (2020) there are several advantages of LKS, namely that it can be used as independent teaching material for students, increasing student activity in participating in learning activities, the price is affordable, the material in the LKS is more concise and has covered the entire material.

According to Trianto (2012) inquiry is a strategy of a series of learning activities that involve all students' abilities to find and find a way out of a problem systematically, critically, logically, analytically. Meanwhile, according to Sani (2019), inquiry is an investigation of ideas, questions, and problems. This inquiry approach provides opportunities for students to learn to develop their intellectual potential in the fabric of their own activities to find something (Iru & Arihi, 2012) the application of the discovery process is the ability to formulate problems, design and conduct experiments, collect data, analyze data, and draw conclusions. Hasmayati (2018) says that inquiry learning is a learning model that trains students to learn to find problems, collect, organize, and solve problems. So here students are expected to be able to think critically.

Ilhamdi et al. (2020) stated that critical thinking must be based on the thought process of each student to analyze and bring students' insights to each problem. Meanwhile, Syahputra (2020) states that critical thinking is a process of thinking by expressing opinions with firm reasons regarding the activities that have been carried out. According to Fauzan et al. (2021) to achieve the expected learning outcomes, students must have a systematic attitude and way of learning in their learning activities.

The purpose of the inquiry-based model itself is to support integrative science learning that involves (Samarapungavan et al., 2017). According to Anam (2017) the purpose of inkuri is: Students can understand about finding and finding solutions to problems, students can become brave and creative individuals in imagination. The use of the inquiry learning model is to develop the ability to think about systematically, logically, and critically, or develop intellectual abilities as part of the mental process (Sidiq, 2019).

The inquiry method is a method that requires students to think critically as well as students being able to analyze, find problems and find their own solutions to these problems (Apri & Widharyanto, 2018). Meanwhile, according to Yohanes (2021), the inquiry method is a learning method used by the teacher by giving problems to students so that they are motivated to find and analyze problems. This inquiry learning can provide assistance to students in developing the necessary knowledge and skills by solving problems and getting answers to existing problems based on the curiosity of students (Topic Offirstson, 2014). So, inquiry is a method that prepares students to conduct research by seeing the conditions that occur so that they have the desire to do something, ask questions and look for the answers themselves and then combine their findings with other students as a comparison (Mulyasa, 2021). According to Septantiningtyas (2021) the characteristics of the inquiry method are: Students are asked to be active in learning activities, especially in searching and finding. According to Utami & Sri (2019) the characteristics of the inquiry strategy are as follows The inquiry strategy emphasizes maximum student activity to seek and find.

According to Apri & Widharyanto (2018), guided inquiry is an inquiry process where students are required to be able to find concepts in learning through necessary instructions, with guiding questions from the teacher. In accordance with what is stated by Ngurah & Arya (2020) that the guided inquiry learning process requires students to find concepts from instructions from the teacher in the form of questions that guide students. According to Septantiningtyas (2021) the application of guided inquiry is to make it easier for students to have the opportunity to expand their knowledge. According to research by Rahayu et al. (2013), guided inquiry-based LKS contains task sheets like LKS in general, it's just that here it focuses more on the guided inquiry method, Selection of high quality images will make students happy and enthusiastic about learning activities. Fitria.

(2018) stated that the guided inquiry learning model can have a positive impact on improving students' creativity skills. A learning model that can encourage students to be actively involved in the learning process is the guided inquiry model. By applying inquiry-based LKS, students are able to solve problems and interact with others (Hilyana, 2017). Students will actively engage in their mental processes through observation, measurement, and data collection activities to draw a conclusion (Nurdyansyah & Eni, 2016). In addition, this guided inquiry method can provide many opportunities for students to reflect on their learning, have a better understanding of the concepts of learning according to students' wishes with better critical thinking (Anam, 2017).

According to Hanafi et al. (2018) the advantages of this guided inquiry method, namely: Provides space for students to learn according to their learning style. According to Azizi et al. (2022), educators need creative efforts in carrying out the learning process to help students learn more. By using LKS, it will be able to provide direct experience to students because students are in search of information. LKS directs students to think critically and understand the material in depth, students are invited to explore direct information and students work together with their study groups (Heriyanti et al., 2025). According to Heriyanti et al. (2025), the learning motivation of each student is different, some are high and some are low. So, with the LKS that will be made, it is planned to make students more excited and enthusiastic in learning so that they will be interested in doing IPAS questions. Guided inquiry learning is learning that states that the role of an educator in the teaching and learning process is very large, because an educator in this case has a role that can guide students in making discoveries. With this inquiry-based LKS, it will be able to make students learn fun, interesting and challenge students to think and reason, for this reason the author wants to develop.

## Method

The research used is Research and Development. Research and development are the activity of collecting, processing, analyzing, and presenting data systematically and objectively and accompanied by activities to develop products to solve the problems at hand. The research population is class IV in Gugus II Baso District, namely: SDN 21 Koto Tuo, SDN 15 Simarasok, SDN 15 Kampeh. The purpose of Research and development is to produce new products to improve existing products and can be accounted for. This research is a study using a design research model by developing a product. This developed product is an Inquiry-based IPAS LKS for grade IV Elementary School.

The research and development model used by researchers in this study is the Plomp model. Rochmad (2012) states that the Plomp Model consists of a preliminary investigation phase, a design phase, a realization/construction phase, and a test, evaluation and revision phase, and implementation. The product developed is an Inquiry-based IPAS worksheet for grade IV elementary school. The development procedure carried out in the form of stages carried out in each development carried out. The collection of expert judgment is done using an instrument in the form of a questionnaire and also a validation sheet. Validation that will be carried out includes content validation and construct validation. Content validation is carried out to see whether the product designed is in accordance with the IPAS curriculum for grade IV SD and in accordance with the principles of inquiry. Prototype 1 which has been revised in accordance with the suggestions given by experts is called prototype 2. Prototype 2 was then evaluated to see its practicality. Evaluation of prototype 2 was carried out by conducting a one-to-one evaluation, namely by asking students to give their comments on prototype 2 (inquiry-based LKS) that had been designed. This one-to-one evaluation was conducted using a questionnaire instrument and interview guidelines. The results of the one-to-one evaluation were used as input for the improvement of prototype 2. Prototype 2 which has been revised according to the results of the one-to-one evaluation is called prototype 3. Prototype 3 was also evaluated to see its practicality.

The evaluation was carried out by conducting a small group evaluation by practicing the LKS that had been designed to a group of 5 students. Based on the evaluation results of prototype 3, revisions were made to this prototype. The results are analyzed and if not practical, then revisions are made to get a practical product. In more detail, the indicators of practicality can be seen in Table 1.

**Table 1.** The indicators of practicality

| Aspects assessed | Collection Methods | Instrument |
|---|---|---|
| Ease of use of LKS in learning | Observation of learning implementation | Observation sheet |
| Time effectiveness<br>Ease of reading and understanding each sentence<br>Students' attraction/interest in the LKS | Questionnaire completion student interview | Inquiry Interview guidelines |

*Practicality of Inquiry-Based Worksheets*

The data collection instruments used in the study were questionnaires, interview guidelines, and observation sheets. All instruments before use were

validated by experts. The instrument used to collect data at the preliminary analysis stage is an interview guide. The data to be analyzed in this study are validation result data, practicality trial result data, and effectiveness trial result data. The data analysis of this research was carried out using descriptive statistical analysis techniques. Descriptive statistics to analyze critical thinking test results, observation sheets, and questionnaires. While descriptive techniques to analyze the results of interviews. The type of data analysis carried out is the validity of the LKS based on guided inquiry based on the assessment of validators who are experts in their fields.

The validators who will assess the guided inquiry-based LKS are lecturers in each field of expertise. The guided inquiry-based LKS is said to be valid if the LKS validity coefficient is > 0.60. Expert assessment includes several aspects, namely: Media, including: orderliness of design, clarity of printing letters and images, suitability of selection of types and sizes of letters and numbers, color gradation, ease of use, and attractiveness of appearance. Material, including: the suitability of the title, the suitability of the material with the learning objectives and basic competencies, the truth of the material concept in terms of scientific aspects, the suitability of the level of maturity of student thinking, the suitability of the guided inquiry stages, the clarity of the work steps and the completeness of the guided inquiry LKS components. Language, including: language standardization, language conformity with EYD, language politeness, language support for ease of understanding the flow of guided inquiry, and the absence of sentences that cause double meaning. Practicality analysis is known based on the analysis of student response questionnaires that refer to Prasetyo (2012). The LKS developed is said to be practical if the average student response is more than ≥ 60% or the interpretation of practicality shows high or very high. Before analyzing the response data, first calculate the number of respondents through the answer choices on each statement item. Then the questionnaire score value per item is sought by multiplying the number of respondents and the answer choice score according to the criteria for positive and negative statements. The guided inquiry-based worksheets developed are said to be effective if after participating in learning by using guided inquiry-based worksheets, students are classically complete or greater than 65% of the number of students in the class (Astuti et al., 2011). Students are said to be complete if they get a score greater than or equal to the KKM applied by the school which is 70.

## Result and Discussion

First of all, observations were made of the implementation of the lesson. This is the purpose of see the use of LKS that has been designed in the learning process. Observation is carried out by the researcher. LKS that has been declared practical, then tested on class IV SD Negeri 21 Koto Tuo Baso District to see its effectiveness. The assessment stage is carried out to evaluate the effectiveness of the product (inquiry-based LKS) that has been designed. This effectiveness evaluation is centered on evaluating whether this inquiry-based LKS IPAS can be used to achieve effective goals in increasing student activity, learning outcomes and developing students' critical thinking. The effectiveness of the inquiry-based LKS that has been designed is seen from the results of observations of student activities during learning by using inquiry-based LKS and student learning outcomes tests.

This validation was carried out on four indicators, namely: the suitability of the material in the LKS with the indicators, the clarity of the problem formulation presented in the LKS, the suitability of the problem with the learning objectives, and the clarity of the activities contained in the LKS. This validation was assessed by four of the five validators. The average result of content validation is 4.43 with a very valid category. The results of the validation of the indicator of the suitability of the material in the LKS with the indicator are 4.25 with a very valid category. Then, the results of the validation of the clarity indicator of the problem formulation presented in the LKS are 4.5 with very valid criteria. The average overall LKS validation results in this study were 4.35 with a very valid category.

A product is said to be valid if the average score obtained from the assessed aspects is more than 3.40. These results indicate that the LKS that has been designed is declared valid or has been appropriate and as expected and can be used for grade IV elementary school students. This practicality test was conducted to reveal how easy it is to use the LKS, the suitability of time with many and forms of tasks, the attractiveness students in the LKS and the readability of the LKS by teachers and students. The practicality test was carried out through several activities, starting from one-to-one evaluation, small group, and field test. After one-to-one evaluation, the practicality test was continued with a small group trial. The activities observed to determine the effectiveness of this research product are oral activities, namely students answering or asking (to the teacher or friends) about IPAS material, students delivering work results (presentations), students responding to friends' work, mental activities, namely students solving problems on the LKS, and writing

activities, namely students working on tests or evaluations. This can be seen from the analysis of the observation results which show the percentage of students who do this activity which is 58.3 and 50% respectively.

In the next student activity, there was an increase. The percentage of student activities answering or asking questions has increased from 87.5% with very many criteria to 100% with the criteria that there are still a lot of students doing this activity. Then the percentage of student activities conveying work results has increased from 58.3% with many criteria to 70.8% with the criteria that there are still many students who do this activity. In this second meeting, one student did not solve the problem in the LKS given. For the percentage of student activities responding to their friends' work, it has increased from 50% with few criteria to 75% with the criteria that many students have done this activity. At this meeting all students worked on test or evaluation questions.

In the third meeting, student activity also increased. The percentage of student activity answering or asking questions has decreased from 100% with very many criteria to 95.8% with very many criteria for doing this activity. Then the percentage of student activities conveying work results has increased from 70.8% with many criteria to 83.3% with the criteria that a lot of students do this activity. In this third meeting, it can be seen that all students solve problems from their friends' work has increased from 75% with many criteria to 79.2% with the criteria that a lot of students have done this activity. At this meeting all students have also worked on test or evaluation questions.

In the fourth meeting, the percentage of student activity answering or asking questions decreased from 95.8% with very many criteria to 92% with very many criteria for doing this activity. Then the percentage of student activities conveying work results has decreased from 83.3% with very many criteria to 72% with the criteria that many students do this activity. In this fourth meeting, it was seen that all students solved the problems in the LKS given and worked on the evaluation test questions on the LKS. For the percentage of student activities responding to the work of their friends has decreased from 79.2% with very many criteria to 72% with the criteria that many students have done this activity.

The fifth meeting, it was seen that all students solved the problems in the LKS given and worked on the evaluation test questions on the LKS. For the percentage of student activities responding to their friends' work, it has increased from 72% with many criteria to 80% with the criteria that a lot of students have done this activity.

At the sixth meeting, student activity also increased. The percentage of student activity answering or asking questions has increased from 92% with very many criteria to 100% with very many criteria for doing this activity. Then the percentage of student activities conveying work results has increased from 76% with very many criteria to 83.3% with the criteria that a lot of students do this activity.

At the seventh meeting, student activity also increased. All students were seen to be able to answer or ask questions, solve problems on the LKS and work on evaluation test questions on the LKS. The percentage of student activity conveyed has increased from 83.3% with very many criteria to 87.5% with the criteria that a lot of students do this activity. The percentage of student activity responding to their friends' work has increased from 87.5% with very many criteria to 91.7% with the criteria that a lot of students have done this activity. The effectiveness of this product is also seen from the student learning outcomes test. Based on data analysis, 91.17% of students scored above the KKM, namely 70 and the class average was above the KKM, namely 82.17. Thus, the inquiry-based IPAS worksheet can be said to be effective because it can increase student learning activities and results.

## Conclusions

The development research that has been carried out by researchers produces inquiry-based IPAS LKS for grade IV SD. Several stages of development were carried out by researchers, starting from the preliminary analysis stage, design and assessment stage. At these stages, many steps are taken so that this research produces valid, practical, and effective products. The results of this product development received a positive response from students. The results of observations, questionnaires, and interviews show that the LKS is practical with the characteristics of being easy to use, in accordance with the set time, easy to read, and can increase students' attractiveness in learning. In addition, the LKS developed has also been effective in increasing student learning activities and results with a student learning completeness rate of 91.17%. Based on these results, it can be concluded that the inquiry-based IPAS worksheet developed for grade IV elementary school students is valid, practical, and effective.

**Acknowledgments**

Thanks to the supervisor who has encouraged and motivated the author to complete this article. Thanks, are also given to the schools in Gugus II Baso Subdistrict, which have provided their participation for this research.

**Author Contributions**

This article consists of four authors roles in this study is divided into executing and providing input in improving this article, E.S., S., Y.M., and Z.Z.

**Funding**
This study research received no external funding.

**Conflicts of Interest**
Both authors have no conflicts of interest.

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