

DEVELOPMENT OF GUIDED INQUIRY-BASED STUDENT WORKSHEETS ON ELEMENT, COMPOUND, AND MIXTURE MATERIALS

Putriyani¹, Masriani², Ira Lestari³

^{1,2,3}Program Studi Pendidikan Kimia Fakultas Keguruan dan Ilmu Pendidikan
Universitas Tanjungpura Pontianak
E-mail: putriyani424@gmail.com

Journal info

Jurnal Pendidikan Glasser

p-ISSN : 2579-5082

e-ISSN : 2598-2818

DOI : 10.32529/glasser.v8i1.996

Volume : 8

Nomor : 1

Month : 2024

Keywords: LKPD; guided inquiry; elements, compounds, and mixtures.

Abstract.

In science learning activities, learning objectives can be achieved if students are active in learning activities. The form of student activity in learning can be seen from the skills of asking questions and finding (looking for) answers that originate from their curiosity. Therefore, teaching materials are needed that can make students active, as a tool in the learning process and can be used as a learning resource. One of them is the Student Worksheet (LKPD). However, the LKPD circulating in school emphasizes more on questions and filling in questions without explaining how the process of obtaining answers to these questions. In addition, the LKPD used looks monotonous, unattractive, and difficult to understand so that students are less motivated to study and understand the contents of the LKPD. Therefore, it is necessary to develop LKPD which aims to find out the stages in making guided inquiry based LKPD to determine the feasibility of LKPD to be used as teaching materials, and to determine student responses to guided inquiry-based LKPD on elements, compounds and mixtures in class VII SMP. The form of research used is research and development (R&D) which adopts the 4D development model (Define, design, develop, disseminate) by Thiagarajan. The subject of this study was a guided inquiry based LKPD on elements, compounds, and mixtures which were tested on 24 students of class VII at junior high school 12 Pontianak with high, medium, and low abilities. The data collection instruments used were the feasibility assessment and student response questionnaires. The result so data processing show that the developed LKPD is suitable for use in learning in terms of content feasibility with a percentage of 82%, 90% presentation, 77% language 86% graphics. The result so student response trials to the product obtained student responses with a score of 82,06% with very high interpretations.



This is an open access article under the [CC BY-SA](https://creativecommons.org/licenses/by-sa/4.0/) license.

A. INTRODUCTION

Natural Sciences (IPA) is one of the subjects that requires a deep understanding of concepts. (Elisa, 2012) argues that the IPA subject is considered difficult to comprehend due to the abundance of scientific concepts and terminology. One of them is the material on

elements, compounds, and mixtures. This material is abstract, concrete, and contextual in nature. Therefore, the learning process requires the provision of direct experiences. The purpose of providing direct experiences is to develop competencies for exploring and understanding nature scientifically. This aligns with Zulfiani's

opinion (Zulfiani et al., 2009) that science education is directed towards inquiry and action, thus helping students to gain a deeper understanding of their surrounding environment.

Based on the results of interviews conducted with the Science teacher of Grade VII at SMPN 12 Pontianak, it is known that the teacher has never implemented a scientific approach through activities such as observation, questioning, experimentation, reasoning, and presentation, especially in the topics of elements, compounds, and mixtures. Subsequently, further observations were carried out on the learning process of Grade VII at SMPN 12 Pontianak, revealing that the teaching process still revolves around the teacher, and the students' activities appear to be less active and tend to be passive. As a result, students face difficulties in understanding the science lessons, particularly in the topics of elements, compounds, and mixtures. Based on the observations of students' grades, it was found that some students are still receiving grades below the Minimum Passing Grade (KKM), as shown in Table 1

Tabel 1: The Completion Learning Percentage of Students on the Topics of Elements, Compounds, and Mixtures for Grade VII Academic Year 2017-2018

Chemistry Content	Completion Percentage (%)				Average (%)
	VII A	VII B	VII C	VII D	
Element, Compounds and Mixture	7,8	28,2	10,53	0	11,6
$\sum X =$ Number of Student	38				

In Table 1, it is indicated that the daily review of the material on elements, compounds, and mixtures has an achievement rate of 11.63%. The low percentage of students who have achieved the required level is attributed to several factors, originating from both teachers and students, as well as environmental factors. Other elements influencing learning include the suboptimal use of facilities and infrastructure. To enhance the quality and efficiency of science education in the elements, compounds, and mixtures topics, the development of teaching materials is essential.

Teachers in schools typically use ready-made printed teaching materials, such as Student Worksheets (LKPD), purchased directly from book agents. These materials often focus more on questions and problem-solving rather than explaining the process of obtaining answers to these questions. Consequently, students face limitations in improving their competencies. However, LKPD is an integral part of teaching materials designed to enhance students' abilities in the learning process.

Andi Prastowo (2013) argues that not all teaching materials are suitable for the school and students' conditions. Based on interviews with several seventh-grade students at SMPN 12 Pontianak, it is observed that the LKPD used appears monotonous, less engaging, and challenging to understand. This situation results in students lacking motivation to learn and comprehend the content of the LKPD. The use of LKPD is crucial in the subject of Natural Sciences conducting experimental activities. In the material on elements, compounds, and

mixtures, experimental activities are required. Therefore, the development of worksheets (LKPD) in the form of guided inquiry-based LKPD is necessary. The guided inquiry model is a suitable learning model for junior high school levels. Isworini (2015) argues that the guided inquiry learning model is one of the models based on the constructivist learning paradigm. This learning model suggests that the learning process should actively involve students in learning activities. If the knowledge construction process is done well, students will be able to enhance their understanding of the material being studied. According to (Ertikanto, 2016) the general objective of guided inquiry learning is to help students develop intellectual skills and other skills, such as asking questions and finding (searching for) answers that arise from their curiosity. Fathurrohman (2016) states that guiding questions can be presented not only directly by the teacher but also through questions created in student activity sheets (LKPD) or modules.

Minawati (2014)) argues that Inquiry-Based Guided Learning Modules (LKPD berbasis inkuiri terbimbing) are also considered appropriate and effective for use in education. This is supported by Minawati's (2014) research findings, which show a significant improvement in post-test results, with 90.9% of the 33 students completing the learning objectives. The Guided Inquiry-Based Learning Modules provide students with the opportunity to actively engage in the learning process, enabling them to discover and understand the concepts being taught. It is expected that these modules can

enhance students' mastery of the subject matter, as students are motivated to explore things they already know. The text discusses the topic of the user, specifically regarding everyday life issues. Based on the description above, the objectives of this research are (1) to determine the feasibility of Inquiry-Based Practicum Worksheets (LKPD) on the subject of elements, compounds, and mixtures for Grade VII Junior High School, and (2) to determine the students' responses to the Inquiry-Based Practicum Worksheets (LKPD) on the subject of elements, compounds, and mixtures for Grade VII Junior High School.

B. RESEARCH METHOD

The research design employed in this study is research and development (R&D). The development model utilized in this research is based on the 4D model by Thiagarajan. The subjects of this study are Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures. The trial subjects consist of 24 Grade VII students from SMPN 12 Pontianak for the academic year 2018/2019. The selection of trial subjects uses purposive sampling.

Research Procedure:

The research procedure follows the 4D model by Thiagarajan (1974) comprising four steps: Define (definition), Design (designing), Develop (development), and Disseminate (dissemination). The Disseminate stage is not conducted.

Stage 1: Define (Definition) In the definition stage, the analysis includes front-end analysis, student analysis, tasks, concepts, and

learning objectives. Front-end analysis involves identifying gaps in the implementation of science subject learning, outlining Basic Competencies (KD) based on Core Competencies (KI), and developing teaching materials based on the scope. Student analysis is conducted through questioning about students' learning difficulties and learning styles.

Task analysis is conducted by analyzing the subtasks of the stated Core Competencies (KD), indicating their relevance to abilities such as abstract thinking, logical reasoning, and drawing conclusions from available information. This analysis is aligned with the guided inquiry model to be used. Concept analysis is based on the scope of the teaching material, which will be formulated into learning objectives and adjusted to the characteristics of the material and students' learning experiences.

Stage 2: Design The initial activities in the design stage involve determining the instructional media used during or outside class hours but still related to the scope of learning objectives. The formulation of indicators is adjusted in the development of the instructional tools, aligned with the guided inquiry-based learning indicators. The material format used optimizes issues related to elements, compounds, and mixtures in everyday life according to the guided inquiry model. The instructional material developed is the Inquiry-Based Practicum Worksheets (LKPD), involving the characteristics of the guided inquiry model stages.

Stage 3: Develop During the development stage, formative evaluation is conducted by

experts or specialists involved in the validation process. The revised product based on expert assessments then serves as the basis for the implementation of the development trial. The development trial in this research is conducted with a limited group, each consisting of 6 students from classes VII A, VII B, VII C, and VII D, totaling 24 students. The trial is conducted with Grade VII students from SMPN 12 Pontianak to assess their response to the Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures. Subsequently, a response questionnaire is given to the students after the product validation by experts

Data collection techniques and tool

The data collection technique employed in this research is an indirect communication technique. The data collection method utilizes questionnaires or surveys as its tool.

Data Collection Tool

The questionnaire used in this research consists of two types: a teaching material feasibility questionnaire and a student response questionnaire. The teaching material feasibility questionnaire is given to experts. The results of the questionnaire are used as a basis for the evaluation and revision of the developed product, ensuring that the product is suitable for testing in the learning process. The teaching material feasibility assessment questionnaire does not need to undergo a validation process because its compilation aligns with the feasibility evaluation standards provided by the Ministry of National Education (Depdiknas, 2008). The statements used are adjusted to the

research needs. The components of the teaching material feasibility evaluation include content feasibility, language feasibility, presentation feasibility, and graphic feasibility. The validation criteria and the percentage of validity for the feasibility of the Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures are presented in Table 2.

Table 2. Criteria for Validity Level

interval	Kriteria
81-100	Very High / Very Suitable
61-80	High / Suitable
41-60	Sufficient/Fairly Suitable
21-40	Low / Not Eligible
0-20	Very Low / Very Inadequate

The student response questionnaire is used to understand the students' responses to the Guided Inquiry-Based Practicum Worksheets (LKPD) after implementation. This questionnaire is provided to the students after they have participated in the limited group product trial. The research questionnaire employs a Likert scale with four assessment scales (criteria), namely SS (Strongly Agree), S (Agree), TS (Disagree), and STS (Strongly Disagree). Before being given to the students, this questionnaire is first validated to ensure its appropriateness as a research instrument. In this study, validation was conducted by two chemistry education lecturers. Data collection was carried out using the student response questionnaire, assessed in terms of material aspects in content, language aspects in reading the content, and construction aspects related to the appearance of the Guided Inquiry-Based Practicum Worksheets (LKPD). The validation

criteria for the readability percentage of students in the Guided Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures using the student response questionnaire can be seen in Table 2

C. RESULTS AND DISCUSSION

The Results of the Feasibility Test for Practicum Worksheets (LKPD)

The assessment of the feasibility of Guided Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures involves experts or specialists. The evaluation of the LKPD includes aspects of content feasibility, presentation feasibility, language feasibility, and graphic feasibility.

Expert Content Validation

The assessment results for the content feasibility of the product obtained an average of 82%, indicating a very high criterion and suitability for field testing with revisions. Meanwhile, the overall presentation feasibility percentage is 90%, also with a very high criterion, making it suitable for field testing with revisions. Expert League Validation

The language feasibility assessment of the product obtained an average score of 77%, indicating a high criterion and suitability for field testing with revisions.

Expert Graphic Validation

The results of the graphic feasibility assessment by graphic experts obtained an average score of 86%, indicating a high level of feasibility, and it is deemed suitable for field testing with revisions.

Trial of Students Responses

The results of the student response questionnaire to the Guided Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures, in the trial involving student responses, indicate that the percentage for each aspect, namely material content, language in reading the LKPD content, and construction of the LKPD content display, is 78.82%, 84.72%, and 82.64%, respectively. The results from each aspect are averaged, resulting in a trial response from students to the Guided Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures at 82.06%, which is considered very high and highly suitable for use.

According to Riduwan (2013), when the obtained data have a very high interpretation criterion, then the Guided Inquiry-Based Practicum Worksheets (LKPD) product, based on the readability trial, is highly suitable for use, as shown in Table 3.

Tabel 3. The Results of Readability Testing

Assessment Aspect	Hasil Penilaian	
	Average Score (%)	Criteria
Content Aspect	78,82	High
Language Aspect	84,72	Very High
Construction Aspect	82,64	Very High
Average Percentage of Aspects	82,06	Very High

Teaching Material Feasibility Test

Based on the validation conducted, it is known that the average feasibility for each criterion, including content, presentation,

language, and graphics, falls under the criteria of being suitable for use in the field with revisions. According to the National Education Standards Agency ((BSNP, 2017)), teaching materials must meet four criteria: (1) content feasibility, (2) presentation feasibility, (3) language feasibility, and (4) graphic feasibility, to be considered suitable for use in the learning process. According to Monica & Qurrotaini (2019), the assessment of feasibility is crucial to ensure whether teaching materials are appropriate for use in learning. Based on the expert validation results for the Guided Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures, it can be used in the educational activities for Grade VII students at SMPN 12 Pontianak.

Content Validation

Based on the expert's advice regarding the content and presentation aspects, the parts that need improvement include creating tables highlighting the differences between metal elements, non-metal elements, and semi-metal elements. This is intended to make it easier for students to understand the distinctions between these elements. Furthermore, another area for improvement is in constructing sentences that are more precise in order to avoid any misunderstandings among the students..

Language Validation

Based on the language expert's advice regarding the language aspect, the parts that need improvement are sentence structure and the bibliography. Errors in sentence construction can lead to dual meanings for readers. The correct way to write book titles according to the

APA Style (American Psychological Association) is to italicize the title, including subtitles, and followed by a period.

Graphic Validation

Based on the advice from the graphic expert regarding the graphic aspect, the part that needs improvement is the cover. According to the expert, the background color of the cover should be changed to a brighter red to create a more natural impression. Additionally, the term "SMP/MTs" should be added, and the example image of an element should be replaced with a photo from daily life. The black-colored compound image should be removed. This is done to make the cover more attractive and less conspicuous. Sitepu (2005) states that the physical appearance of a book can motivate students to read and study it. Therefore, the book's appearance should be appealing and not monotonous with only text.

Student Respon Trial

1. Content Aspect

The content aspect discusses the material presented in the Guided Inquiry-Based Practicum Worksheets (LKPD). The obtained average percentage result is 78.82% with a high assessment criterion. Looking at the specific response, the delivery of material in this LKPD is related to daily life, as indicated by the student response of 80.21%, categorized as a very high assessment. The illustrations (pictures) and examples of elements, compounds, and mixtures encountered in everyday life contribute to making the material more understandable. Consequently, it motivates students to study the topics of elements, compounds, and mixtures.

This aligns with the opinion of Gilliland (1972) who states that attractiveness is related to the reader's interest.

2. Language Aspect

In terms of language, it covers aspects such as sentences, paragraphs, language, and font used in the Guided Inquiry-Based Practicum Worksheets (LKPD). The calculation results for the language aspect of LKPD yield an average score of 84.72%, indicating a very high assessment criterion. Based on the analysis of statement items in this language aspect, it is stated that the sentences, paragraphs, language, and font used can make students read the content of this LKPD clearly. Because this LKPD does not use too many combinations of font types, decorative fonts are not employed, and the font type aligns with the book's content. The font size used facilitates students in reading and understanding the content. This is consistent with the opinion of Gilliland (1972), who states that readability is related to the clarity of writing (form and size of writing). The language used is appropriate for the intellectual level of students (imaginatively conceivable by students). The sentences used in this LKPD are simple and align with the understanding level of junior high school students. This is in line with the opinion of (Gilliland, 1972)), who states that understandability is related to the characteristics of words and sentences, such as their length, frequency of word or sentence usage, and paragraph structure.

3. Construction Aspect

In terms of the construction aspect in this Guided Inquiry-Based Practicum Worksheets

(LKPD), it covers the overall appearance of the LKPD. The calculation results for the construction aspect of this LKPD yield an average score of 82.64%, indicating a very high assessment criterion. Based on the analysis of statement items from this construction aspect, students expressed that the appearance of the LKPD is attractive, not boring, and motivates them to study it. The use of harmonious color variations enhances clarity for specific functions. The composition and size of the layout elements used are proportional, balanced, and in harmony with the content layout pattern. This aligns with the opinion of Gilliland (1972), who stated that attractiveness is related to the reader's interest.

D. CONCLUSION

Based on the development research, the analysis of data and discussion results in the conclusion that the Guided Inquiry-Based Practicum Worksheets (LKPD) on the topics of elements, compounds, and mixtures have excellent validity criteria. The responses from experts and students indicate that the developed LKPD can be easily used in the learning process. This is evident from the validation results and student responses that meet excellent criteria. The developed LKPD is more easily understood and motivates students to study it. This is reflected in the average percentage of readability trial results and student responses, demonstrating its suitability for use in the learning process.

Suggestion

Based on the research findings, there are several discoveries that can be suggested for future research. The recommendations are as follows: (1) Inquiry-Based Guided Practicum Worksheets (LKPD) in chemistry can be used as a subject for further research on the effectiveness of using these guided inquiry-based LKPD in learning. (2) Subsequent studies are expected to address and improve any shortcomings present in the developed LKPD.

E. REFERENCES

- Andi Prastowo. (2013). Pengembangan Bahan Ajar Tematik. . Diva Press.
- BSNP. (2017). Badan Standar Nasional Pendidikan. Jurnal Administrasi Pendidikan, 4(2), 40.
- Depdiknas. (2008). Perangkat Pembelajaran Kurikulum Tingkat Satuan Pendidikan Sekolah Menengah Atas. Direktorat Jenderal Manajemen Pendidikan Dasar Dan Menengah.
- Elisa. (2012). Perbandingan Model Pembelajaran Kooperatif Tipe Numbered Head Together (Nht) Dan Role Playing Terhadap Hasil Belajar Dan Aktivitas Siswa Pada Materi Sistem Pernapasan Siswa Kelas Viii Smp Negeri I Semen Kediri. Simki UNP Kediri. 10.
- Ertikanto, C. (2016). Teori Belajar Dan Pembelajaran. Media Akademi.
- Fathurrohman, M. (2016). Belajar Dan Pembelajaran Modern: Konsep Dasar, Inovasi Dan Teori Pembelajaran. . Garudhawaca.
- Gilliland, J. (1972). Readability. . Holderand Stroughton.
- Minawati, Z. , D. (2014). Pengembangan Lembar Kerja Siswa IPA Terpadu Berbasis Inkuiri Terbimbing Pada Tema

Sistem Kehidupan Dalam Tumbuhan Untuk SMP Kelas VIII. UNNES, 3(3).

Monica, W. \Alya, & Qurrotaini, L. (2019). Pengembangan media evaluasi berupa permainan dona (ludo fauna) pada materi daur hidup hewan. SEMINAR NASIONAL PENDIDIKAN, 94–101. <https://jurnal.umj.ac.id/index.php/SEMNASFIP/index>

Riduwan. (2013). Skala Pengukuran Variabel-Variabel Penelitian. Alfabeta.

Sitepu, B. (2005). Memilih Buku Ajar Pendidikan (5th ed., Vol. 4).

Thiagarajan, S. E. Al. (1974). Instructinoal Development For Training Teachers Of Exceptional Children. National Center For Improvement Of EducationalSystems.

Zulfiani, Tonih F, & Kinkin S. (2009). Strategi Pembelajaran Sains. Lembaga Penelitian Uin Jakarta.