REFLECTION JOURNAL
https://journal-center.litpam.com/index.php/RJ
reflectionjournal21@gmail.com

June, 2024 Vol. 4, No. 1
e-ISSN: 2808-1501
pp. 23-36

Development of Guided Inquiry-Based LKS on the Concept of Borax to Develop Students' Food Safety Knowledge and Skills

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Accepted: June 2024; Revised: une 2024 Published: June 2024

Abstract
The misuse of borax in food is a critical issue due to its significant health risks. This research aimed to develop guided inquiry-based student worksheets (LKS) on the concept of borax to enhance students' knowledge and skills in food safety. The study employed the 4-D development model, which includes defining, designing, developing, and disseminating stages. Conducted with 30 eighth-grade students at SMPI Sabilal Muhtadin NW Lopok, the research utilized validation sheets, questionnaires, knowledge tests, observation sheets, and documentation for data collection. Validation results indicated that the developed LKS is highly feasible with a 92.5% feasibility score. Teachers and students provided positive feedback, rating the LKS as highly feasible in material quality, presentation, and attractiveness. The knowledge test scores averaged 81.97, indicating a significant improvement in students' understanding of food safety. Additionally, the skills assessment showed an average score of 85.2, categorizing students as highly skilled in food safety practices. The findings demonstrate that the guided inquiry-based LKS effectively enhances students' food safety knowledge and skills. However, the study highlights the need for individualized learning approaches to address varying student abilities. The research concludes that innovative teaching tools like guided inquiry-based LKS are effective in improving educational outcomes. Recommendations include further development and use of such LKS in other subjects to provide meaningful and engaging learning experiences. Future research should consider broader participant demographics to enhance generalizability.

Keywords: Borax, Student Worksheets (LKS), Guided Inquiry, Food Safety, Student Knowledge

***How to** Cite:* Evita, W., Kurnia, N., Khaeruma, K., & Nurhazlinda, N. (2024). Development of Guided Inquiry-Based LKS on the Concept of Borax to Develop Students' Food Safety Knowledge and Skills. Reflection Journal, 4(1), 23–36. https://doi.org/10.36312/rj.v4i1.2082

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INTRODUCTION

Food refers to anything derived from biological sources and water, whether processed or unprocessed, intended for human consumption. This includes food additives, raw food materials, and other substances used in the preparation, processing, or production of food and beverages (Ministry of Health RI, 2014). Food is a basic necessity for human survival and must be adequately provided (Nurcahyo, 2018). To maintain and improve health status, food consumed must be nutritious. However, an equally important aspect and a prerequisite for food to be consumed is food safety (WHO, 2022).

Food safety encompasses the conditions and measures necessary to prevent food from being contaminated by biological, chemical, and other hazards that can interfere with, harm, or endanger health (Ministry of Health RI, 2013). Food safety is a fundamental need for society because food that is guaranteed safe can protect people from various diseases and other health problems. The term "food safety" is used in the context of ensuring food that does not cause illness or injury to consumers (Surono et al., 2016). Food safety is influenced by various technical factors, including water quality, oxygen levels, pH, temperature, handling (impact and friction), and storage time (Hariyadi, 2010). One of the targets in food development is ensuring that food is free from types of food that are hazardous to health (Ministry of Health RI, 1996).

The misuse of borax in food has become a critical issue because borax is a chemical that poses significant health risks. Borax, or sodium tetraborate ($NaBO_7 \cdot 10H_2O$), is commonly used as a wood preservative, a component in plant fertilizers, and in glass manufacturing. In food, borax is prohibited due to its potential to cause damage to the central nervous system, liver, and kidney functions. Common

symptoms experienced by individuals who consume borax-contaminated food include nausea, vomiting, diarrhea, abdominal cramps, skin irritation, and seizures (Lestari et al., 2018). The danger of borax in food is exacerbated by the fact that its adverse effects are not immediately apparent; instead, borax accumulates in the body over time, leading to long-term health issues and even death.

Cilok meatballs are one of the foods particularly susceptible to the addition of borax. As a popular snack among children, cilok meatballs are made from beef and come in various forms such as mixed with noodles and broth, grilled like satay, or served with eggs and sauces (Muharrom et al., 2017). Besides microbiological hazards like bacterial contamination, there are chemical hazards due to irresponsible individuals intentionally adding dangerous substances like borax (Putri et al., 2022).

In 2021, the Food and Drug Supervisory Agency (BPOM) in Mataram City intensified the monitoring of hazardous substances. This was conducted on 206 vendors from 10 markets in Lombok Island, including the Mandalika Bertais Central Market in Mataram City. Rapid tests on 353 food samples revealed that 191 samples (54.11%) met the safety requirements, while 162 samples (45.89%) did not meet the requirements/contained hazardous substances. The most common hazardous substance found was borax, present in 126 samples (77.78%) of foods such as meatballs, crackers, and wet/yellow noodles (BPOM, 2021). Additionally, a BPOM-facilitated KIT test on May 24, 2023, at the Masbagik market, East Lombok, found that crackers contained hazardous borax (BPOM, 2023).

Preliminary studies at SMPI Sabilal Muhtadin NW Lopok, Central Lombok, showed that 70% of students had never heard of borax, 47% did not know that borax should not be used in food, 29% did not know the health impacts of borax, and 100% could not identify the characteristics of borax-contaminated food. Knowledge and skills in identifying borax-contaminated food are essential to protect consumers, especially children, from health hazards.

Student worksheets (LKS) can support the acquisition of knowledge and skills in food safety. LKS, as printed teaching materials, contain guidelines for students to understand process skills and the concepts of the material being studied (Astuti & Setiawan, 2013; Prastowo, 2013). A well-designed LKS can facilitate independent learning, enabling students to acquire meaningful knowledge and improve literacy and process skills in science (Lydra et al., 2023; Rahmawulan et al., 2016).

One form of LKS that can effectively foster students' knowledge and skills is guided inquiry-based LKS. Guided inquiry-based LKS positions students as scientists, giving them the responsibility to formulate hypotheses, design experiments, make predictions, select variables, analyze results, identify underlying assumptions, communicate findings, and draw conclusions from the data (Atmi, 2019). In this approach, the teacher no longer serves as the information provider; instead, the teacher plans the learning activities or experimental steps, while students conduct experiments or investigations to discover the concepts predetermined by the teacher (Sanjaya, 2008).

This research aims to develop guided inquiry-based LKS on the concept of borax to enhance students' knowledge and skills in food safety. Unlike previous studies that focused on general LKS usage, this study emphasizes guided inquiry-based LKS specifically on the concept of borax, its use in food, and its health impacts. The scope of this research includes the development of LKS that covers the material on borax, methods to identify borax-contaminated food, and preventive measures. The limitation of this research is its focus on junior high school students at one school in Central Lombok, so the results may not be generalizable to all education levels or other regions.

METHOD

This research is a type of development research (Research and Development) as it aims to produce a specific product. The development model used in this study adapts the 4-D model (four D model) developed by Thiagarajan (1974). This model consists of four stages: defining (define), designing (design), developing (development), and disseminating (disseminate). The research was conducted with eighth-grade students at SMPI Sabilal Muhtadin NW Lopok, Central Lombok, during the 2023/2024 academic year. The 4-D model ensures a systematic approach to developing effective educational tools, which in this case, focuses on creating guided inquiry-based student worksheets (LKS) on the concept of borax to enhance students' knowledge and skills in food safety.

The study involved a sample of 30 students from class VIII at SMPI Sabilal Muhtadin NW Lopok. The sample size was determined based on purposive sampling, selecting students who were available and willing to participate in the study during the designated period. The selection process ensured a representative sample of the student population in terms of gender, academic performance, and socio-economic background. The chosen students provided a diverse range of perspectives and abilities, crucial for assessing the effectiveness of the developed LKS in various learning contexts.

Instruments used to collect data in this study included validation sheets, teacher and student response questionnaires, food safety knowledge tests, food safety skills observation sheets, and documentation. The validation sheets were employed to ensure the content accuracy and relevance of the LKS, while the response questionnaires gathered feedback from teachers and students on the LKS's usability and effectiveness. The food safety knowledge tests measured students' understanding of borax and food safety concepts, and the observation sheets assessed students' practical skills during activities. The instruments underwent a thorough validation process involving subject matter experts to ensure content validity. Reliability testing was conducted using statistical measures, and the instruments were deemed reliable with a high consistency score.

Data analysis involved both quantitative and qualitative methods. Quantitative data were obtained from test scores and questionnaire responses, which were then converted to quantitative values using the formula:

$$\text{Mark} = \frac{Score\ obtained}{Maximum\ score}\ x\ 100$$

The LKS was considered theoretically feasible if the score exceeded 51 (Sugiyono, 2017). Qualitative data were derived from observations and documentation, providing contextual insights into the implementation process and student engagement. Data were analyzed using descriptive statistics to summarize the findings and inferential statistics to determine the significance of the results. The analysis was conducted with reference to relevant empirical and theoretical studies, ensuring the research findings were grounded in established scientific principles and previous research outcomes.

RESULTS AND DISCUSSION

The results of this study include a guided inquiry-based student worksheet (LKS) on food preservation. This worksheet serves as a support for students in learning about borax and food preservation. The development of this student worksheet utilized Thiagarajan's 4D model, which involves four stages: definition, design, development, and dissemination. However, due to time and budget constraints, the development did not reach the dissemination stage. Here are the explanations for each development stage:

Definition Stage

The results of the analysis in the definition stage are as follows:

a. Front-end Analysis Based on the analysis, it was found that the learning activities used worksheets published by Graha Printama Selaras, authored by Rosi Pravita Dewi. These worksheets had several shortcomings, such as thin paper, non-colored images, no discussion on borax, and no experimental instructions.
b. Learner Analysis At this stage, information from the pre-research questionnaire indicated that students did not understand borax. A preliminary study conducted at SMPI Sabilal Muhtadin NW Lopok revealed that 70% of students had never heard of borax, 47% did not know borax should not be used in food, 29% were unaware of the health impacts of borax, and 100% could not identify food containing borax.
c. Task Analysis This task analysis included analyzing the content structure sourced from the Basic Competencies, which serves as the foundation for preparing food safety knowledge instruments, and analyzing the learning process models to be integrated into the worksheet.
d. Concept Analysis In this stage, the researcher interviewed educators to identify the key concepts to be taught, examining in detail the concepts that should be taught to students. This stage involves organizing and arranging the main concepts in order according to the basic competencies. The basic competencies are as follows:

Table 1. The basic competencies are as follows:

Basic Competencies	Competency Achievement Indicators
3.6 Explain various additives in food and drinks, addictive substances, and their health impacts	1. Explain the definition of borax (C2). 2. Identify characteristics of food containing borax (C2). 3. Identify borax content in food samples (C3). 4. Describe the negative impacts of using borax in food (C1). 5. Mention natural preservatives that can be used in meatballs and tofu (C4). 6. Know how to preserve food with natural preservatives (C1).
4.6 Conduct experiments to test borax content in food	Conduct experiments on borax content and food preservation

e. Specifying Instructional Objectives At this stage, learning objectives were formulated to design the teaching materials in the form of worksheets based on the basic competencies established in the concept analysis. The learning objectives for the worksheets are presented in Table 2.

Table 2. learning objectives for the worksheets are presented

No	Learning Objectives
1	Students can correctly explain the definition of borax.
2	Students can identify characteristics of food containing borax.
3	Students can identify borax content in food.
4	Students can describe the negative health impacts of borax in food.
5	Students can mention natural preservatives for meatballs and tofu.
6	Students can understand how to preserve food using natural preservatives.

Design Stage

After the definition stage, the next step is the design stage. In this stage, the researcher designs the guided inquiry-based student worksheet, consisting of the following steps:

a. Questionnaire Preparation In this step, the researcher prepares the pre-research questionnaire and the research instruments. This involves drafting questions that will help gather data on students' prior knowledge and understanding of borax and food preservation. The questionnaires are designed to identify gaps in students' knowledge and to tailor the learning activities to address these gaps effectively.

b. Media Selection Media selection involves choosing the appropriate practical tools based on the school conditions and aligning the student worksheet with the learning objectives. The selected media include simple practical materials and tools that are accessible and relevant to the students' environment. For instance, the worksheet might include common household items that can be used in experiments to understand the properties of borax. The development of the student worksheet was done using Microsoft Word and Canva, ensuring that the materials are visually appealing and easy to understand.

c. Format Selection The format used for designing the guided inquiry-based student worksheet is tailored to the students' needs, the guided inquiry steps, and the writer's capabilities. The format includes the following sections:
   1. Cover or Title Page: This section includes the title of the worksheet, the subject, and relevant details such as the school name and the grade level.
   2. Preface: A brief introduction explaining the purpose of the worksheet and what students can expect to learn.
   3. Learning Instructions: Guidelines on how to use the worksheet effectively, including any specific instructions for completing the activities.
   4. Competencies to be Achieved: A clear outline of the learning objectives and the skills or knowledge students are expected to gain.

5. Main Content: The core material covering the topic of borax and food preservation, presented in an engaging and informative manner.
6. Work Steps and Exercises: Step-by-step instructions for conducting experiments and exercises to reinforce learning. This section encourages hands-on learning and critical thinking.
7. Assessment: Tools and criteria for evaluating students' understanding and mastery of the topic, including quizzes, practical tests, or reflection prompts.

d. Initial Design After completing these steps, an initial design of the product is created according to the chosen format. All components of the product, such as learning materials, images, work steps, and exercises to be included in the student worksheet, are gathered and organized. This initial design serves as a prototype that can be reviewed and refined based on feedback from educators and students to ensure it meets the educational objectives and is user-friendly.

Development Stage

After completing the design stage, the next step is the development stage. In this stage, the researcher undertakes the following steps to develop the student worksheet (LKS):

1. Creation of the LKS

The creation of the LKS begins with drafting the worksheet using Microsoft Word 2010, comprising two learning activities. Each learning activity follows the steps of the guided inquiry model. Based on the initial design, the LKS is divided into three main sections: the introduction, content, and conclusion.

2. Introduction Section:
   a. Cover Page: The cover page includes the title of the worksheet, the subject, and other relevant details such as the school name and grade level.
   b. Preface: A brief introduction explaining the purpose of the worksheet and providing an overview of what students will learn.
   c. Basic Competencies: Outlines the fundamental skills and knowledge that students are expected to acquire.
   d. Learning Instructions: Provides guidelines on how to use the worksheet effectively.
   e. Learning Indicators: Lists specific indicators that will be used to measure students' understanding and progress.
3. Content Section:
   a. Borax Material: Provides detailed information about borax, including its properties, uses, and potential health impacts.
   b. Guided Inquiry Learning Steps: Presents the learning activities following the steps of the guided inquiry model, encouraging students to explore and discover information through structured inquiry.
   c. Experimental Activities: Includes hands-on experiments for students to perform, enhancing their understanding through practical application.
   d. Competency Tests and Assessment: Contains questions and activities designed to assess students' comprehension and mastery of the material.
4. Conclusion Section:
   a. References: Lists the sources and references used in the worksheet.
   b. Back Cover: The final page of the worksheet, often including additional notes or acknowledgments.

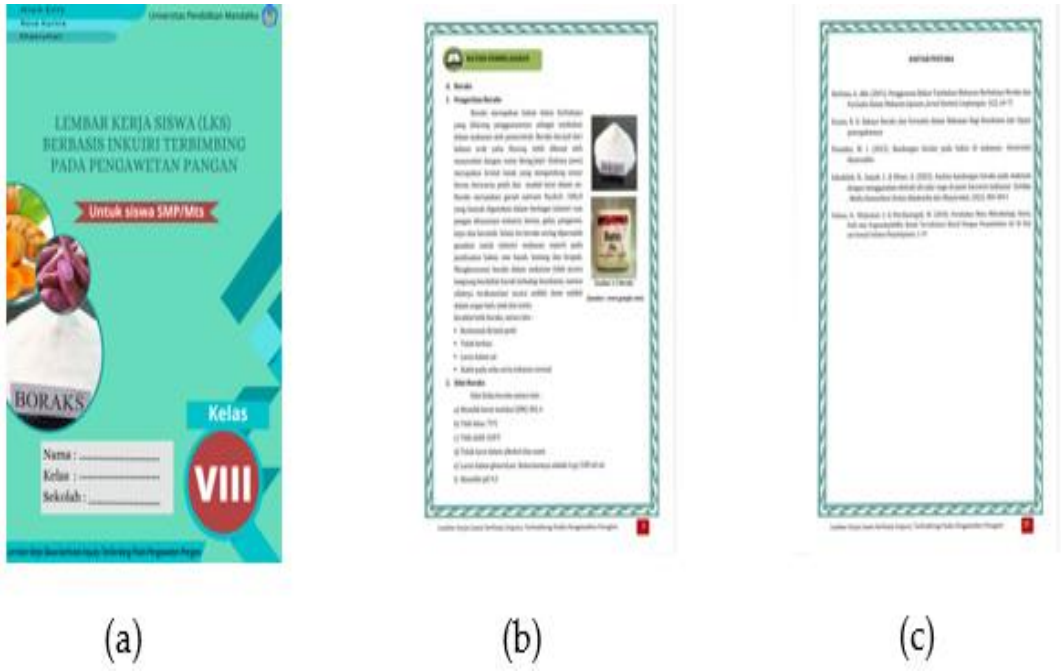


Figure 1. Appearance of (a) Cover, (b) Contents, (c) Closing
The developed LKS

Validation of the LKS

The validation of the LKS (student worksheet) developed for the guided inquiry-based learning model involved a thorough assessment by two validators. The assessment focused on three main aspects: material quality, language quality, and design quality. The results from these assessments are crucial in determining the feasibility and effectiveness of the LKS in a real classroom setting.

Table 3. LKS Validation Results

Aspects of Assessment	**Validator 1**	**Validator 2**
Material Quality	46	43
Language Quality	18	19
Design Quality	11	11
Total	**75**	**73**
Average		**74**
Feasibility Percentage		**92.5%**
Feasibility Criteria		**Highly Feasible**

The results indicate that the developed LKS is highly suitable for use as teaching material. The overall scores given by the validators were 75 and 73, respectively, for the two validators. These scores were broken down into material quality, language quality, and design quality. The average score from both validators was 74, which translates to a feasibility percentage of 92.5%. According to the established criteria, this places the LKS in the "Highly Feasible" category.

Material Quality: The material quality was evaluated based on how well the content met the educational objectives and its relevance to the topic of borax and food preservation. Validator 1 gave a score of 46, and Validator 2 gave a score of 43. These scores reflect that the material included in the LKS is comprehensive and effectively covers the necessary concepts. It ensures that students can understand the properties, uses, and health impacts of borax through guided inquiry-based activities.

Language Quality: Language quality was assessed to ensure that the language used in the LKS is clear, precise, and appropriate for the students' level. Validator 1 rated the language quality at 18, while

Validator 2 rated it slightly higher at 19. These scores indicate that the language used in the LKS is understandable and accessible to the students, making it easier for them to engage with the material and complete the tasks effectively.

Design Quality: The design quality of the LKS was evaluated to ensure that the layout and presentation of the worksheet are attractive and user-friendly. Both validators gave the design quality a score of 11. This uniform score suggests that the LKS has a well-organized structure, with a clear layout that guides students through the learning activities in a logical and engaging manner. The use of tools such as Microsoft Word and Canva in developing the LKS contributed to creating a visually appealing and functional educational resource.

The guided inquiry-based LKS adheres to the necessary components and systematic structure required for effective learning materials. According to the Ministry of National Education (Depdiknas, 2008), a well-developed LKS should include a title, learning instructions, competencies to be achieved, supporting information, assignments, work steps, and assessment. The developed LKS incorporates all these components, ensuring it meets educational standards and provides a comprehensive learning experience for students.

Moreover, the LKS aligns with the findings of Erryanti & Poedjiastoeti (2013), who emphasized that a systematic LKS typically contains a title, introduction, objectives, tools and materials, work steps, observation column, and questions. By following this structure, the developed LKS not only adheres to academic standards but also supports the guided inquiry learning model, which encourages active learning and critical thinking among students.

The validation results demonstrate that the developed LKS is highly feasible and suitable for use in teaching about borax and food preservation. Its comprehensive content, clear language, and well-designed layout ensure that it effectively supports the guided inquiry-based learning model, providing significant benefits to students' learning experiences.

LKS Revisions

Table 4. Validator Comments and Changes Made to LKS Development

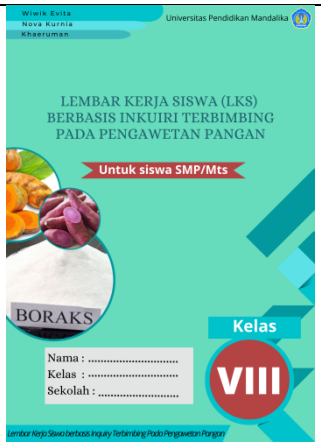
Validator	Comments	Changes Made
V1	Improve the images and include sources for the images	Images were improved, and sources were added to each image
V2	Improve the title of the borax concept section and standardize the font to a single type	The title of the borax concept section was improved, and the font was standardized

Based on the validation results, there were several comments from the validators that needed to be addressed for the improvement of the LKS. The first validator suggested enhancing the images and including sources for each image used. This is important to ensure that all images have clear and reliable references, as well as to improve the visual quality of the LKS.

The second validator recommended improving the title of the borax concept section and standardizing the font to a single type. Improving the title is necessary to ensure that it is more informative and relevant to the material discussed. Consistency in font usage is also crucial to give a neat and professional appearance to the LKS, making it easier for students to read and understand the content.

By considering both validators' feedback, revisions were made to the LKS to enhance the quality of the material, visuals, and overall presentation. These revisions are expected to make the LKS more effective as a learning tool that supports guided inquiry-based learning.

Table 5. Example of Revised Substance in LKS

Before revision	After revision
	
Title section before revision	Title section after revision

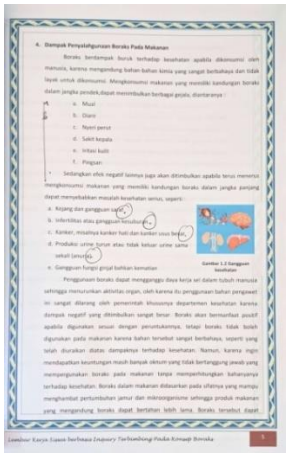
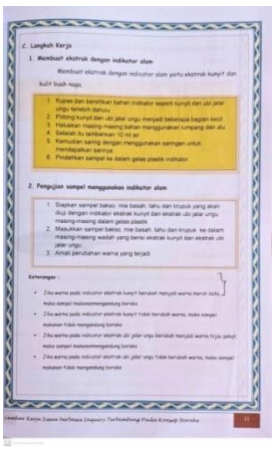
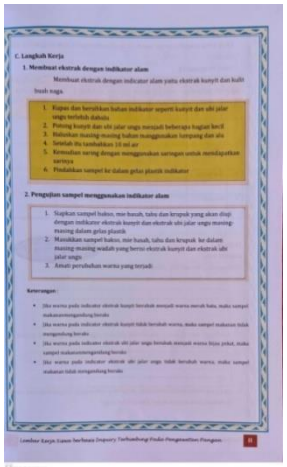



Image section before revision	Image section after revision
	
Font section before revision	Font section after revision

Development Testing

The responses from both teachers and students were gathered to evaluate the effectiveness of the guided inquiry-based LKS. The teacher's response to the LKS was highly positive. According to the results presented in Table 6, the teacher evaluation scores were as follows: for material quality, a score of 100 with a criterion of "Highly Feasible"; for presentation, a score of 96.4 with a criterion of "Highly Feasible"; and for attractiveness, a score of 94.5 with a criterion of "Highly Feasible." The overall average score from the teacher's questionnaire was 96.9, which falls under the "Highly Feasible" category. These

results indicate that the LKS received a very positive response from the science teacher at SMPI Sabilal Muhtadin, who provided positive comments as well.

	Assessment Criteria	Score	Criterion
1	Material	100	Highly Feasible
2	Presentation	96.4	Highly Feasible
3	Attractiveness	94.5	Highly Feasible

Similarly, the student response to the LKS was also highly positive. As shown in Table 7, the evaluation scores from 18 students were as follows: for readability, a score of 91.06 with a criterion of "Highly Feasible"; for attractiveness, a score of 90.60 with a criterion of "Highly Feasible"; and for presentation, a score of 88.88 with a criterion of "Highly Feasible." The overall average score from the student questionnaire was 90.18, which is also in the "Highly Feasible" category. These results demonstrate that the LKS facilitated the learning of borax and food preservation concepts, captured the students' attention, motivated them to engage in learning, encouraged precision in activities, and provided relevant real-life experiences.

	Assessment Criteria	Score	Criterion
1	Readability	91.06	Highly Feasible
2	Attractiveness	90.60	Highly Feasible
3	Presentation	88.88	Highly Feasible

The positive student responses align with Djamarah's (2011) assertion that interest significantly influences learning activities. Students who are interested in a subject are more likely to study it diligently and enthusiastically. Interest is not only expressed verbally but also through students' engagement in activities, leading to satisfaction with their learning outcomes.

The guided inquiry-based LKS received highly positive feedback from both teachers and students. The high scores across various criteria reflect its effectiveness as a learning tool, making it a valuable resource for teaching concepts related to borax and food preservation.

Test students' food safety knowledge and skills

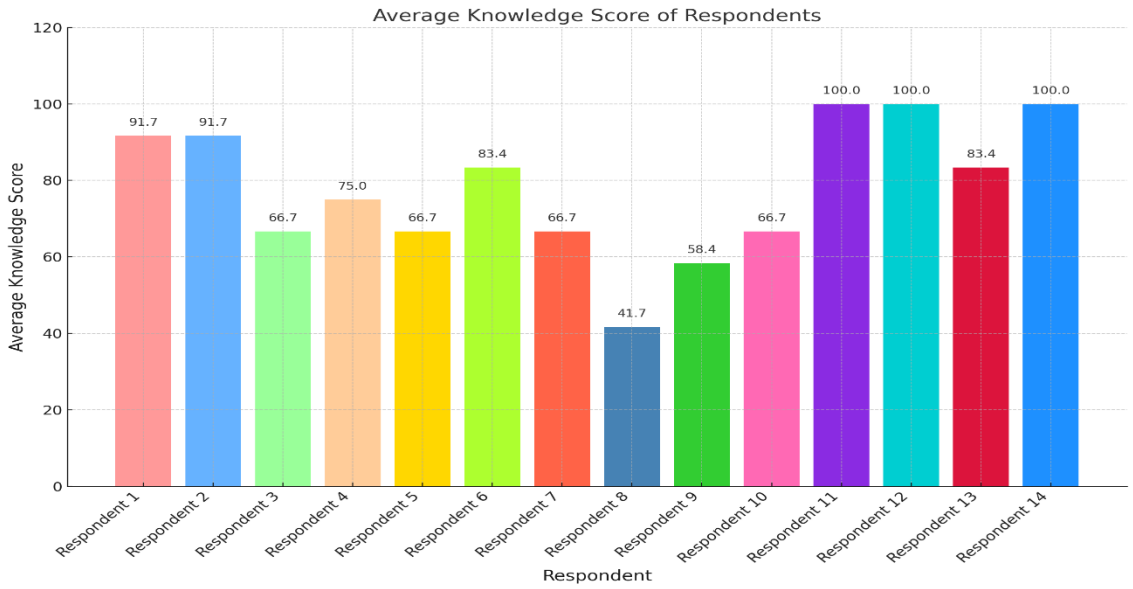


Figure 2. Test students' food safety knowledge and skills

Figure 2 presents the knowledge test scores of students, with an average score of 81.97, classified as very high. This result indicates that the developed Student Worksheet (LKS) effectively enhances students' knowledge of food safety. This finding aligns with the research by Maypalita et al. (2018), which

showed that using guided inquiry-based LKS on buffer solutions improves students' learning outcomes. The LKS encourages active student participation, includes complex knowledge dimensions, cognitive process levels, and a scientific approach. Consequently, students are more directed in discovering chemical concepts and tend to be more active and enthusiastic in the learning process.

Pardjono (2009) also supports this finding, stating that students given problems during the learning process experience an increase in their cognitive domain, particularly in analytical skills. The implementation of guided inquiry-based LKS provides students with opportunities to actively participate in learning, discover concepts independently, and develop critical thinking skills.

The graph shows that some students achieved perfect scores (100), demonstrating that the LKS is highly effective for most students. However, a few students scored below the average, such as scores of 41.7 and 58.4, indicating that not all students could achieve maximum results. This discrepancy may be due to individual differences in understanding the material or varying levels of motivation.

Overall, the high average score indicates that the developed LKS successfully achieved its educational objectives. The implementation of this LKS provides an interactive and in-depth learning experience, enabling students to grasp food safety concepts well. A well-designed LKS can contribute positively to improving the quality of education, particularly in developing students' knowledge.

The graph also highlights the importance of varied and innovative teaching approaches in enhancing student learning outcomes. Guided inquiry-based LKS, for instance, allows students to explore and understand lesson materials more deeply. This approach helps students develop critical and analytical thinking skills, which are crucial in understanding and applying learned concepts.

In the context of teaching food safety, the developed LKS can cover various essential aspects, such as identifying food hazards, maintaining hygiene and sanitation, and safe food storage methods. By understanding these concepts, students not only gain theoretical knowledge but also practical skills applicable in daily life. This aligns with the holistic education goal of developing students' full potential, including cognitive, affective, and psychomotor aspects.

A key aspect of the LKS's success is the guided inquiry approach, which provides students the freedom to explore while still receiving structured guidance from the teacher. This approach allows students to feel more engaged in the learning process, thereby increasing their motivation and interest in learning. Additionally, the inquiry approach fosters high levels of curiosity, which is a critical factor for success in education.

This research also demonstrates that using a well-designed LKS can address some challenges in traditional learning, such as the lack of interaction between students and teachers and the lack of opportunities for students to think critically and creatively. With LKS, learning becomes more interactive, and students actively participate in the learning process, positively impacting their learning outcomes.

However, some students still scored below the average, indicating the need for a more individualized approach to learning. Each student has different abilities and learning styles, making it important for teachers to recognize and understand the individual needs of students. Differentiated instruction can be a solution to this problem, where teachers provide tasks and activities that match each student's abilities and needs.

To bridge the gap in learning outcomes among students, various strategies can be implemented, such as providing additional tutoring or using more diverse instructional media. Additional tutoring can help students struggling to understand the material, while diverse instructional media can increase students' interest and motivation to learn. Consequently, all students can achieve optimal learning outcomes.

This research shows that the developed LKS effectively enhances students' knowledge of food safety. It proves that innovative and interactive teaching approaches, such as guided inquiry-based LKS, are highly effective in improving students' learning outcomes. This research also provides recommendations for teachers and educators to continue using and developing LKS in other subjects, providing more meaningful and enjoyable learning experiences for students.

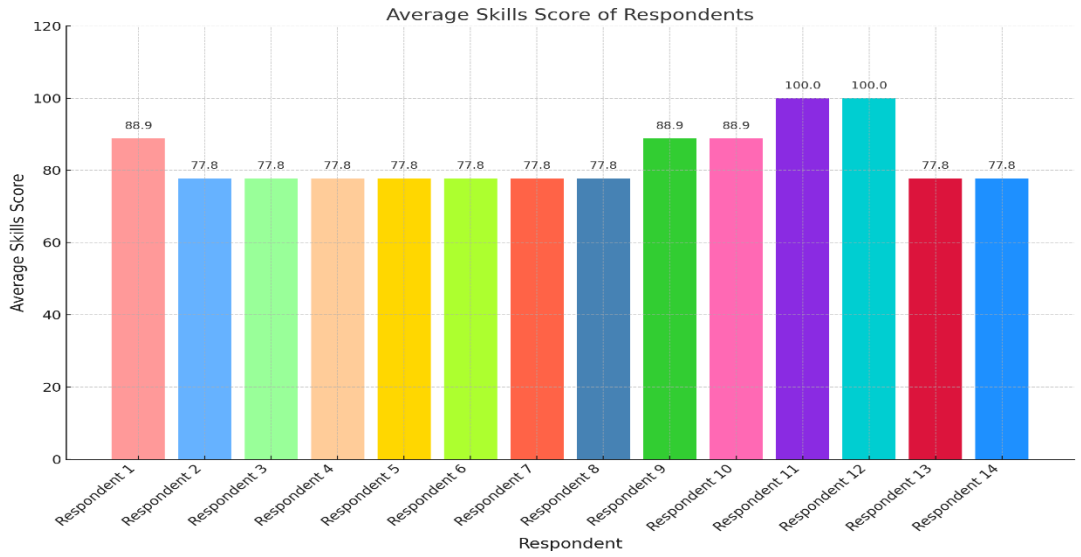


Figure 3. Student skills graph

The skills assessment of students' food safety proficiency shows an average score of 85.2, categorizing the students as highly skilled. This outcome indicates that the guided inquiry-based Student Worksheet (LKS) developed is effective in enhancing students' food safety skills. The students' food safety skills were evaluated using observation sheets involving 18 students from SMPI Sabilal Muhtadin, divided into 5 groups. The aspects of food safety skills assessed include observation, using tools and materials, formulating hypotheses, collecting experimental data, analyzing data, and drawing conclusions.

Figure 3 demonstrates that the overall food safety skills of students are above 76. This indicates that students' food safety skills can be considered proficient, as the overall percentage is 82.5%. Students' skills in formulating problems are good, as they can correctly formulate problems based on the given discourse. The ability to formulate hypotheses is also commendable, with students able to create hypotheses as questions that serve as temporary answers to the formulated problems. However, there are two aspects that need further attention and training: formulating temporary answers and drawing conclusions, indicating that students are still not fully proficient in these areas.

This finding is consistent with the research conducted by Damayanti et al. (2020), which found that guided inquiry-based practical LKS on the topic of protein identification in food has excellent potential for developing critical thinking skills. The indicators and sub-indicators of critical thinking skills analyzed showed significant improvement.

Students' observation skills are fundamental in food safety as they enable them to identify potential hazards. The high scores in this area suggest that the LKS effectively guides students in systematically observing and recording data, which is crucial for accurate analysis and conclusions. The ability to use tools and materials correctly is essential in food safety practices. Students' high scores indicate proficiency in handling and using various tools and materials necessary for food safety experiments. This skill is critical as it ensures accurate results and prevents contamination.

Formulating hypotheses is a critical thinking skill that involves predicting outcomes based on initial observations. The results show that students are adept at this, indicating a strong foundation in understanding the scientific method. However, further refinement is needed to enhance their ability to formulate more precise and detailed hypotheses. Data collection is a meticulous process requiring attention to detail and accuracy. Students' proficiency in this area suggests they can systematically gather relevant data, a crucial step in ensuring the reliability of their experiments and findings.

Analyzing data involves interpreting the collected data to make informed conclusions. The high scores in this area demonstrate that students are capable of critically examining their data, identifying patterns, and understanding their implications in the context of food safety. Drawing conclusions from experimental data is the culmination of the scientific process. While students show proficiency, there is

room for improvement in formulating comprehensive and accurate conclusions. This skill is essential as it reflects their ability to synthesize information and apply it to broader contexts.

The high average score of 85.2 and the proficiency across various skills indicate that the guided inquiry-based LKS is an effective tool for teaching food safety. The interactive and hands-on nature of guided inquiry allows students to actively engage with the material, promoting deeper understanding and retention of knowledge. This approach not only enhances their practical skills but also fosters critical thinking and problem-solving abilities.

Despite the overall success, the need for improvement in formulating temporary answers and drawing conclusions suggests that additional focus should be placed on these areas. Educators can incorporate more targeted exercises and feedback to help students develop these skills. For instance, providing more opportunities for students to practice hypothesis formulation and conclusion drawing in varied contexts can reinforce these skills.

This research also demonstrates that using a well-designed LKS can address some challenges in traditional learning, such as the lack of interaction between students and teachers and the lack of opportunities for students to think critically and creatively. With LKS, learning becomes more interactive, and students actively participate in the learning process, positively impacting their learning outcomes.

However, some students still scored below the average, indicating the need for a more individualized approach to learning. Each student has different abilities and learning styles, making it important for teachers to recognize and understand the individual needs of students. Differentiated instruction can be a solution to this problem, where teachers provide tasks and activities that match each student's abilities and needs.

To bridge the gap in learning outcomes among students, various strategies can be implemented, such as providing additional tutoring or using more diverse instructional media. Additional tutoring can help students struggling to understand the material, while diverse instructional media can increase students' interest and motivation to learn. Consequently, all students can achieve optimal learning outcomes.

This research shows that the developed LKS effectively enhances students' knowledge of food safety. It proves that innovative and interactive teaching approaches, such as guided inquiry-based LKS, are highly effective in improving students' learning outcomes. This research also provides recommendations for teachers and educators to continue using and developing LKS in other subjects, providing more meaningful and enjoyable learning experiences for students.

CONCLUSION

The development and implementation of guided inquiry-based student worksheets (LKS) on the concept of borax have demonstrated significant improvements in students' knowledge and skills regarding food safety. The study, conducted with eighth-grade students at SMPI Sabilal Muhtadin NW Lopok, revealed that the LKS is highly feasible with a 92.5% feasibility score from validators. Teachers and students rated the LKS positively in terms of material quality, presentation, and attractiveness. The average knowledge test score of 81.97 indicates a substantial enhancement in understanding food safety concepts. Additionally, the skills assessment score of 85.2 reflects students' proficiency in practical food safety practices. The findings underscore the effectiveness of guided inquiry-based LKS in fostering critical thinking and practical skills among students. However, the variability in individual student performance suggests the need for more tailored instructional approaches. Overall, the study confirms that innovative, interactive educational tools like guided inquiry-based LKS can significantly improve learning outcomes in science education, particularly in understanding and applying food safety principles.

RECOMMENDATION

Based on the findings, it is recommended that educators and curriculum developers integrate guided inquiry-based student worksheets (LKS) into science education, particularly in topics related to food safety and chemistry. Such tools have proven to enhance both knowledge and practical skills, promoting a deeper understanding of scientific concepts. To address the variability in student performance, teachers should consider differentiated instruction, providing additional support and tailored

learning activities to meet individual needs. Further, expanding the use of guided inquiry-based LKS to other subjects can provide students with comprehensive and engaging learning experiences across the curriculum. Future research should involve a larger and more diverse sample to validate the generalizability of these findings. Additionally, exploring the long-term impact of guided inquiry-based LKS on students' academic performance and critical thinking skills can offer deeper insights into their effectiveness. Finally, professional development for teachers on implementing guided inquiry-based learning can enhance the overall quality of education and ensure the successful adoption of such innovative teaching tools.

ACKNOWLEDGMENT

This research was carried out well because of the support from the chemistry education study program, Faculty of Engineering and Applied Science, Mandalika University of Education.

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