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Development of LKPD Based on Higher Order Thinking Skills using Canva in Combination Material

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Abstrak

Di era digital saat ini siswa dituntut untuk memiliki kemampuan metakognitif yang erat kaitannya dengan *Higher Order Thinking Skills* (HOTS). Pentingnya mengembangkan Lembar Kerja Peserta Didik (LKPD) berbasis HOTS untuk mendukung kemampuan metagkognitis siswa SMA. Penelitian ini adalah penelitian deskriptif kualitatif untuk mendeskripsikan proses pengembangan LKPD berbasis HOTS pada materi kombinasi. LKPD didesain dengan menggunakan Canva. Tahapan yang digunakan adalah tahapan preliminary dan prototyping. Adapun data dikumpulkan dengan tes dan wawancara. Subjek pada penelitian ini adalah siswa salah satu SMA Negeri di Indralaya Utara dengan kemampuan matematika tinggi, sedang, dan rendah. LKPD berbasis HOTS yang sudah didesain dengan Canva direview oleh expert untuk divalidasi secara konten, konstruk, dan bahasa. Hasil review digunakan untuk merevisi LKPD sampai dengan LKPD dinyatakan valid oleh expert. Setelah itu, LKPD yang telah valid diujicobakan kepada subjek penelitian. Hasil ujicoba dideskripsikan secara kualitatif, untuk melihat kepraktisan LKPD berbasis HOTS. Penelitian ini menghasilkan LKPD berbasis HOTS pada materi kombinasi yang valid dan praktis.

Kata kunci: Canva, deskriptif kualitatif, HOTS, LKPD, kombinasi

Abstract

In the present era of digital technology, students are expected to possess metacognitive abilities that are closely associated with Higher Order Thinking Skills (HOTS). The significance of creating Learning and Teaching Materials (LKPD) based on HOTS to enhance the metacognitive capacities of high school students. This study is a qualitative descriptive research aimed at describing the process of generating LKPD based on HOTS using combination materials. The LKPD was created using Canva. The stages employed are the preliminary and prototyping stages. The data was gathered through the conduct of tests and conducting interviews. The participants in this study consisted of students from one of SMA Negeri in Indralaya Utara who possessed high, moderate, and low levels of mathematical proficiency. The HOTS-based LKPD, created using Canva, undergoes expert evaluation for validation in terms of content, construct, and language. The outcomes of the review are used to modify the LKPD until it is officially validated by the expert. Subsequently, the efficacy of the legitimate LKPD was assessed on the research participants. The trial results are given in a qualitative manner to assess the feasibility of using HOTS-based LKPD. This study generates Higher Order Thinking Skills (HOTS)-based Learning and Teaching Materials (LKPD) that are both valid and practical.

Keywords: Canva, combination, HOTS, LKPD, qualitative descriptive

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INTRODUCTION

Comprehending the concept of combination material is crucial for high school students as it holds significant relevance in both daily life and diverse scientific domains (Allen et al., 2020; Kemdikbud, 2022). Combinations refer to the various arrangements of a set of elements, regardless of their specific sequence (Cao et al., 2021). Combination materials can be employed to enhance the acquisition of problem-solving skills (Dwinata, 2019), as well as their applicability to many scientific domains including computer programming and coding, and the analysis of real-world scenarios involving probability (Wulandari & Pujiastuti, 2020). The study of combination material involves not only the computation of options and arrangements, but also the cultivation of analytical and creative thinking patterns that are crucial for the intellectual growth of pupils (Hafidz & Masriyah, 2020; Lamanna et al., 2022).

The significance of comprehending combination information is negatively correlated with students' learning outcomes (Mahyudi, 2016). Despite this, students continue to have challenges in understanding combinations, and there are prevalent misconceptions around this topic (Fitri & Abadi, 2021; Wafiyah, 2012). Previous research shows that students experience confusion in distinguishing the concepts of permutation and combination, lack of accuracy in calculations, and leading to errors in the application of formulas (Rochim, 2022). Fitri & Abadi (2021) stated the lack of understanding related to mathematical notation and basic principles of combinatorics, as well as insufficient practice and effective guidance are also obstacles for students in strengthening their understanding. In Addition, Mahyudi (2016) stated that in solving combination problems students have difficulty understanding the problem, transforming the problem, transforming in mathematical language, and drawing conclusions.

Several studies have shown that less interactive teaching approaches can make students feel unfamiliar with the subject matter (Amelia & Harahap, 2021; Balalle, 2024; Thornberg et al., 2022; Wijaya et al., 2020). To understand the application of combinations in a broader context, more interactive learning methods are needed to encourage students to actively participate in the learning process (Hafidz & Masriyah, 2020; Latifa et al., 2022). So, it is important to develop innovative and technology-based learning strategies, such as the use of student’s worksheet (LKPD) based on Higher Order Thinking Skills (HOTS) (Sager et al., 2024; Vidergor & Ben-Amram, 2020), so that students can more easily understand and apply the combination concept in various situations.

The use of media, such as LKPD can effectively address challenges related to students’ concept understanding (Wulansari & Nuryadi, 2022). LKPD, short for Learner Worksheets, is an educational tool created by teachers to aid students in the learning process throughout school

(Ulaş et al., 2012). It is aimed to support and enhance the teaching and learning experience (Effendi et al., 2021). The utilization of LKPD in the educational process aims to enhance students' comprehension of the subject matter, offer pertinent assignments, and foster the development of students' creative thinking and problem-solving abilities (Wirawan et al., 2023) The primary objective of LKPD is to enhance students' learning enthusiasm and curiosity, while also aiding teachers in conceptual development.

Previous studies have been utilised to provide LKPD on the topic of permutation and combination. Marlina (2022) asserted that utilising live worksheet to promote LKPD not only enhances students' comprehension of concepts but also enhances their problem-solving skills in tackling permutation and combination problems. Other research that develops learning activities shows that by developing media game puzzle learning activities for combination and permutation materials can increase the activeness of high school students (Latifa et al., 2022). Hafidz & Masriyah (2020) have been asserted that designing student activities using android-based learning media that include permutation and combination content is a good method for enhancing students' comprehension of classical concepts. It can be asserted that the use of LKPD, or learning activities, can enhance students' mathematical proficiency when combined with appropriate materials.

Nevertheless, most existing LKPDs still focus on teaching based on memorization and initial understanding, which does not meet the development of students' critical and creative thinking skills (Feriyanto & Putri, 2020). Emphasizing the importance of HOTS in learning, but existing learning resources have not fully implemented HOTS in learning, especially in combination materials (Edwar et al., 2023; Utari & Gustiningsi, 2021). This causes students to have difficulty in solving problems and applying the combination concept in more complex problems. In addition, the use of technology in designing learning materials is still limited. Many LKPDs have not utilized visual design platforms that increase student engagement. The use of digital tools such as Canva can increase students' motivation, interest and understanding of the material (Bakara et al., 2023; Rahmatullah et al., 2020; Said et al., 2023). However, there are no studies that specifically combine HOTS and design technology in the context of combination learning, thus creating an urgent need for further exploration in this study.

This research addresses a significant gap in the existing literature, as there has been no prior study that develops LKPD based on HOTS utilizing Canva for combination materials. Canva has proven to be an effective tool for designing engaging educational resources, enhancing the quality of mathematics education (Bakara et al., 2023; Hapsari & Zulherman, 2021; Said et al., 2023). By integrating HOTS—an essential competency for 21st-century

learners—this study aims to develop innovative LKPD that not only facilitate understanding of combination concepts but also promote critical and creative thinking among students. The central research question focuses on how to develop a valid and practical LKPD based on HOTS for combination materials using Canva. Ultimately, this research seeks to fill the existing gap and provide a framework for effective technology-based learning strategies in mathematics education.

METHOD

This study is qualitative descriptive research aimed at describing the process of developing LKPD based on HOTS that are valid and practical (Tessmer, 1993; Zulkardi, 2002). The design of LKPD incorporates the learning outcomes of the combination material in Merdeka Curriculum, the Canva application, and the HOTS criteria. Figure 1 below is the research flow chart.

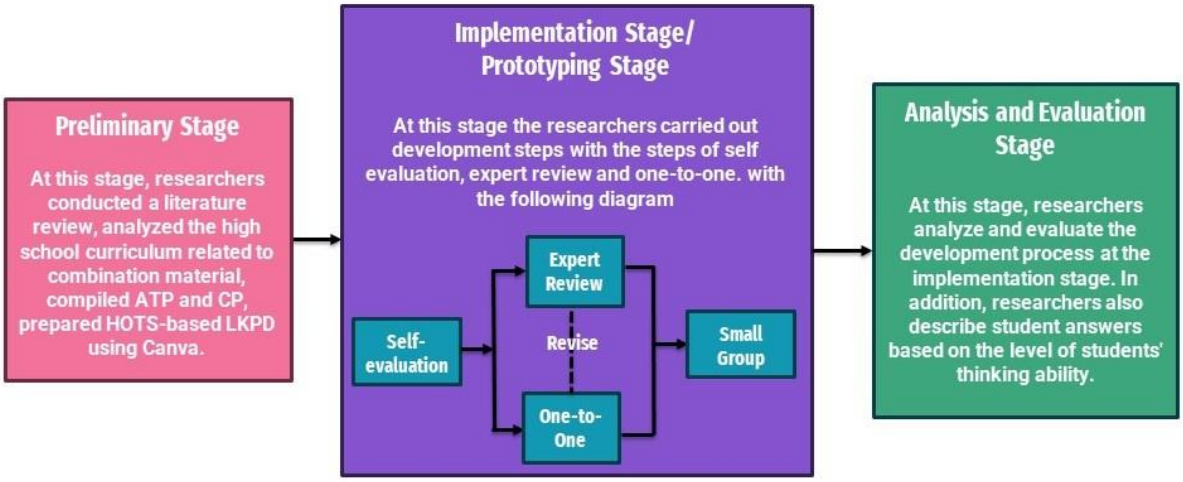

Figure 1. The research flow

Figure 1 is a research flow chart that shows the stages of research consisting of the preliminary stage, implementation/ prototyping stage, and analysis and evaluation stage. Researchers investigated validation of the designed LKPD by consulting an expert review, specifically a lecturer in the mathematics education study programme at the same time two students participated in one-to-one stage. In addition, the research participants were chosen by purposive sampling. Three grade XI high school students of SMA N 1 Indralaya Utara with varying levels of mathematics aptitude, namely high, medium, and low, were selected as participants for participate in small group.

Data was collected using tests, interviews, and video recordings. Tests were used to see students' abilities after working on the LKPD that had been made. Video recordings and interviews were used to see students' thought processes in working on the LKPD. The validity of LKPD is reviewed by experts. Expert reviews LKPD based on content, construct, and language. The expert utilizes a variety of materials, relying on the Merdeka Curriculum that takes consideration of the learning outcomes (CP) and the progression of learning objectives (ATP). The construct is verified using HOTS indications and student ability level. The language used is direct, clear, and utilizes Ejaan Bahasa Indonesia yang Disempurnakan (EYD). The expert review findings serve as a basis for revising the previously created LKPD. Subsequently, the new LKPD is subjected to testing with students. Practicality seen from the process of working on LKPD by students. The student responses are analysed to assess the progression and cognitive approach of students in comprehending and engaging with the LKPD.

RESULTS

The result of this research is LKPD based on HOTS using Canva on combination material used by SMA Negeri 1 Indralaya Utara students. The development of this LKPD consists of two stages, namely the Prelimenary stage (preparation stage) and the Prototyping stage.

Preliminary stage

During the preparation phase, researchers perform a comprehensive analysis of literature review and gather relevant information regarding the curriculum implemented in high schools, specifically focusing on the Merdeka Curriculum. According to the syllabus of the Merdeka Curriculum, the researcher decides to create a composite sub-material that is included in the Opportunity content. The extent to which teachers may implement differentiated learning depends on the capabilities of their students.

The researcher decided to implement a learning approach using LKPD based on HOTS to enhance student learning. Material analysis is employed to ascertain the fundamental competencies (KD) and establish indicators for the combination material. The data acquired during this phase is utilized to create LKPD based on HOTS. The output generated at this phase is a preliminary prototype (initial design). The LKPD based on HOTS developed in this study comprises student activities, student evaluation, and test. The Table 1 described LKPD material.

Table 1. Description of material on LKPD

Name of activity	Learning activity
Student activity I	Students are presented with real-life situation and challenges involving combinations. "Student Council chairman election problem". Students are presented with questions based on HOTS that facilitate the process of reasoning in order to successfully complete the task.
Student activity II	Students are presented with real-life situation and challenges involving combinations. One such scenario is the "Winner of the debate competition". Students are presented with questions based on HOTS that facilitate the process of reasoning in order to successfully complete the task
Student evaluation	Students are required to provide a concise explanation of the concept of combination and what is characteristic of combination issues in this assignment.
Test	Students are provided with HOTS tasks to assess their mathematical abilities.

According to Table 1, there are two learning activities, student evaluation, and a test that is constructed based on Higher Order Thinking Skills (HOTS) requirements and created using Canva. The learning exercises are depicted in Figure 2 on the Canva worksheet.

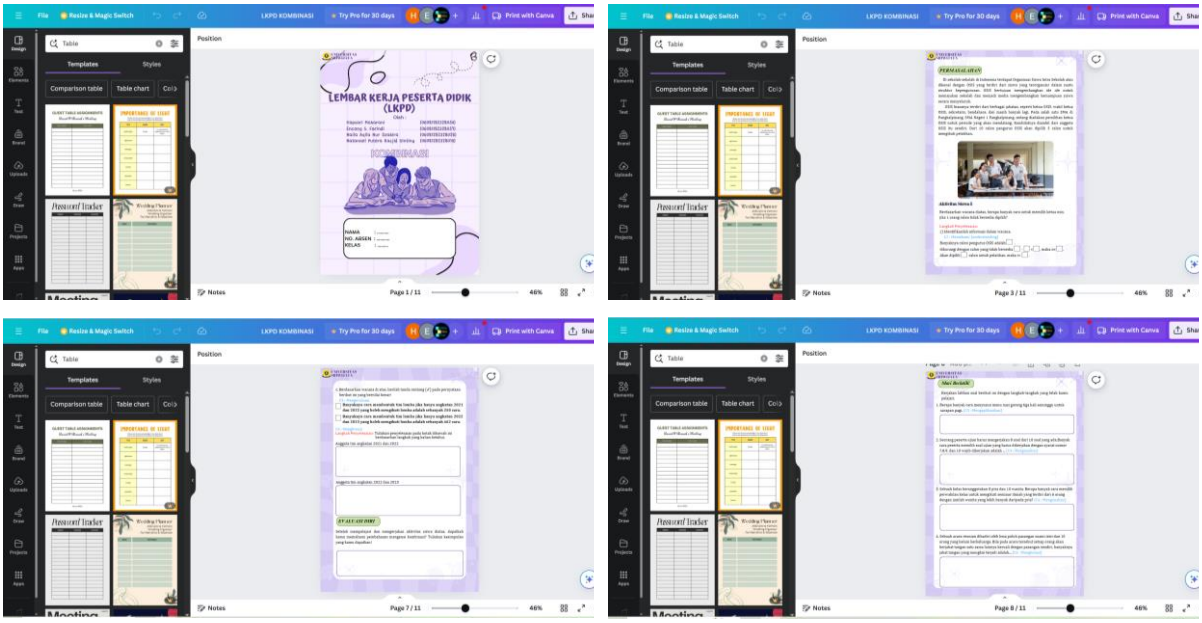

Figure 2. The initial LKPD design on Canva worksheet

The outcome of the initial design of the LKPD based on HOTS is depicted in Figure 1. LKPD went to through a review and then proceed to the prototype stage. The LKPD comprises

several components, such as the LKPD cover, basic abilities section, learning indicators, learning objectives, instructions, student activities, student evaluations, tests, and scoring rubrics.

Prototyping stage

During the prototyping phase, the thing that is done at the self-evaluation stage is to re-read the LKPD that has been made. To check the language, layout, layout, content, and construct of the LKPD. The results of the self-evaluation in terms of language were improved by researchers so as to produce a prototype design that was validated by expert review and one-to-one. An expert, specifically an lecturer in the mathematics education study program, evaluates the initial design of LKPD to assess the appropriateness of its content, constructions, and language in relation to HOTS-based learning. At the same time, two high school students participated in the one-to-one stage to see the clarity of language and the use of LKPD. Table 2 is highlights from the expert review.

Table 2. Comments on expert review and one-to-one stage

The aspect reviewed	Comments/ Suggestions	Decision
Content	• Remove evaluation section number 2 (page 8) as it does not align with the learning objectives/indicators	• The researcher removed question number 2 from the student evaluation.
Construct	• Modify the group identity on the cover page to reflect an individual identity (page 1).	• The researcher modified the person column to include group members, class, and time allocation.
	• Calculate the score for each question item in the answer key section. The current page is page 11.	• The researcher determined the score for each question item on the answer key.
Language	• The phrasing employed in the test questions (page 8) lacks clarity. The query "What is the total number of possible methods to cook fried rice for breakfast three times a week?" should be substituted with "How many ways are there to prepare fried rice three times a week for breakfast?"	• The question sentence was changed according to the expert's suggestion

Table 2 comprises recommendations and expert comments that can serve as reference material for modifying LKPD. The LKPD is revised based on input and feedback provided by expert and one-to-one stage. The revised LKPD was subsequently given back to the expert for

evaluation. At this stage, the expert conducts a comprehensive assessment of the revised LKPD. The expert affirmed that the enhanced LKPD is considered valid in terms of its content, structure, and language. This revised LKPD will be tested on students having low, moderate, and high levels of ability in mathematics.

Description of students answer

The experts decided that certain LKPD to be valid, and these were subsequently administered to three students in class XI, who possessed low, moderate, and high mathematics abilities. Table 3 displays the outcomes of students' responses to activities and questions in the LKPD.

Table 3. The outcomes of students' responses to activities and questions in the LKPD

Activity and question	LMA	MMA	HMA
Student activity I : Identification	F	T	T
Student activity I : Aplication	NA	T	T
Student activity I : Analysis	NA	NA	F
Student activity I : Identification	F	T	T
Student activity I : Aplication	NA	T	T
Student activity I : Analysis	F	T	T
Student evaluation	T	T	T
Test question 1 (Application)	T	T	T
Test question 2 (Analysis)	T	T	T
Test question 3 (Analysis)	NA	F	T
Test question 4 (Creativity)	F	F	T

Description:
LMA : Low mathematics ability
MMA : Medium mathematics ability
HMA : High mathematics ability
T = True, F = False, NA = Not answered

Table 3 demonstrates that students with moderate and high mathematics ability successfully recognized issues in both activity 1 and activity 2. Nevertheless, students with low ability in mathematics still made incorrect identifications of the issues present in the learning exercises. Students with low mathematical ability often encounter difficulties in detecting problems, leading to errors and mistakes when completing mathematical activities and HOTS test questions at the application, analysis/reasoning, and creativity levels.

Students with low ability in mathematics comprehend combination narrative problems when solving them. LMA student struggle with comprehending combination problems,

interpreting the components and order of combinations, applying combination techniques, and analysing combination problems. Figure 3 is LMA student' answer.

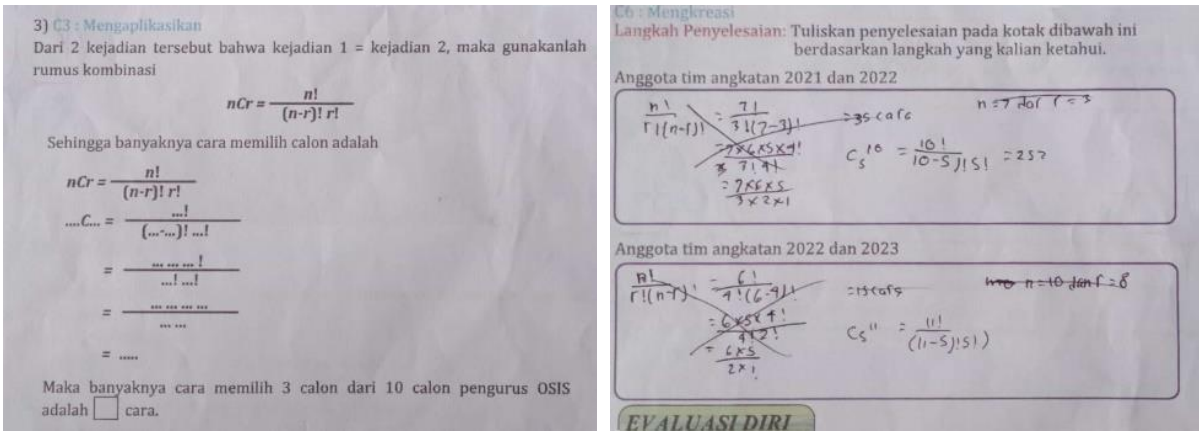

Figure 3. LMA student' answer

As depicted in Figure 3, LMA may encounter difficulties in finding a solution to the problem. This is due to students' lack of comprehension of the notion of combination, their inability to grasp the structure of the question sentence, and their lack of precision in calculations. When it comes to practice problems, students who possess aptitude are able to solve a large number of issues accurately. However, they tend to make errors when it comes to problems that need higher-order thinking skills (HOTS). Consequently, it can be inferred that students with poor ability lack a thorough comprehension of the problem and are unaware of the specific requirements, leading to errors while attempting Higher Order Thinking Skills (HOTS) tasks.

Students with a moderate level of mathematical ability are already capable of identifying issues on LKPD. Nevertheless, students continue to make mistakes when tackling analysis and creative tasks (refer to Table 3). The location of errors made by students with moderate ability (MMA student) can be observed in Figure 4 displayed below.

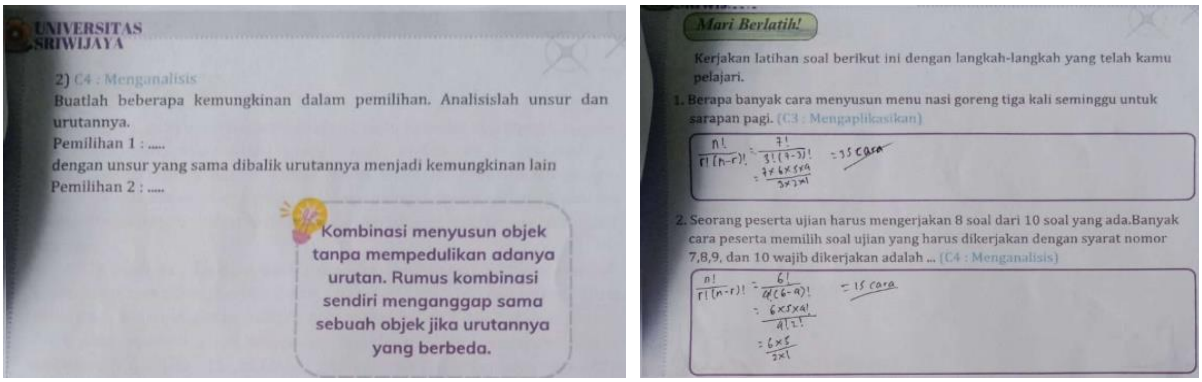

Figure 4. MMA student' answer

Figure 4 demonstrates MMA student in comprehending narrative difficulties involving combinations. Nevertheless, MMA student continues to encounter errors when assessing the elements and sequence of combinations. This is a result of student who have left the LKPD questions unanswered. Following the interview, MMA student had an incomplete understanding of the significance and attributes of the combination. During the test, MMA demonstrates ability in solving problems at the application and analytical levels. However, it falls short in accurately answering HOTS questions that require analysis and creativity. Consequently, it is imperative to provide MMA student with additional support in understanding the concept of combinations, enabling them to effectively handle problems involving analysis and creativity.

Students possessing advanced mathematical aptitude have demonstrated the capacity to identify, apply concepts, and analyse problems on LKPD. Table 3 reveals that students encounter difficulties while attempting to solve issues at the analytical level in student activity I. The study verified that the HMA student encountered challenges when completing the problem. It was discovered that HMA student were less cautious in performing the calculations in the middle, leading to inaccuracies in calculating the final answer. Figure 5 below is the answer from HMA.

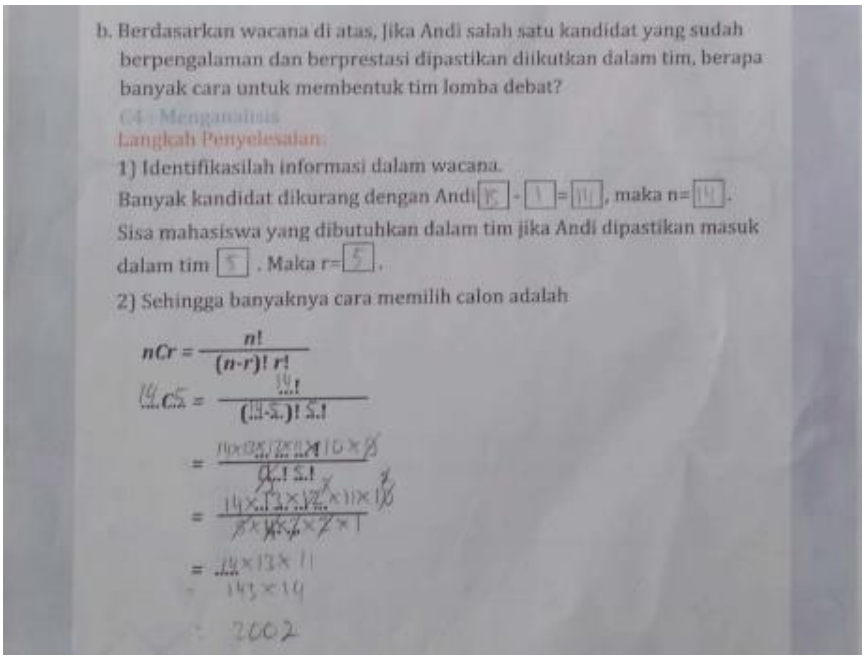

Figure 5. HMA cautious in performing the calculations

Figure 5 displays that HMA committed errors during its calculations, resulting in an error in the final result. This error occurred when HMA concluded the student activity at the analysis level. To ensure an effective outcome, it is imperative to emphasize to HMA the importance of precision and caution in comprehending and interpreting the situation.

The efficacy of a developmental product in the realm of education lies on its ability to cater to individuals with diverse degrees of proficiency, encompassing both those with low, moderate, and high levels of ability. According to the analysis of student responses, it can be concluded that the LKPD based on HOTS created using the Canva application is considered practical, as students are able to effectively utilize this LKPD. Students with varying levels of ability, including low, medium, and high, may comprehend the objective and application of this LKPD. However, when it comes to mathematical comprehension, students with low, medium, and high abilities can all utilize this LKPD.

DISCUSSION

The results of this study suggest that the creation LKPD based on HOTS using the Canva application can be accomplished through preliminary and prototyping stage, even if it is basically to assess the validity and practicality of the LKPD. In the suggested formative evaluation by Tessmer (1993) & Zulkardi (2002), the process involves preliminary and using prototypes for expert review to assess the validity of the instrument. Additionally, testing with purposive sampling, which includes individuals with diverse abilities, can be employed to determine the practically of the LKPD. Sugiyono (2022) asserts that purposive sampling is advantageous for deliberately selecting participants according to population characteristics and research aims. The method of non-probabilistic sampling is extensively employed in qualitative research. In this study, the researcher used the purposive sampling technique to select a sample of students with varying mathematical ability, with the help of mathematics subject teachers.

The results of this study indicate that students with advanced mathematical skills are capable of solving Higher Order Thinking Skills (HOTS) questions up to the level of creativity. On the other hand, students with moderate ability can solve HOTS questions at the level of analysis, while students with low ability are only able to solve questions that require Lower Order Thinking Skills (LOTS). According to Tanudjaya & Doorman (2020) found only a small percentage of students in Indonesia possess the ability to solve HOTS (Higher Order Thinking Skills) issues. Specifically, these students are those with advanced mathematics abilities.

The utilization of the Canva application for the creation of LKPD is interesting. Canva provides a diverse range of layout choices and templates specifically designed for educational products. In addition, Canva provides a range of capabilities that customers can leverage. Canva is a costless application that can be utilized by diverse users. Canva assists researchers in creating teaching materials with HOTS (Higher Order Thinking Skills) attributes, allowing them to efficiently develop comprehensible learning sequences for students. This finding according to research Bakara et al. (2023), Hapsari & Zulherman (2021), & Said et al. (2023) that stated Canva, a highly efficient tool for creating LKPDs and other educational materials, has proven to be highly helpful in improving the quality of mathematics teaching.

CONCLUSION

According to the results of this study, it can be inferred that the LKPD based on HOTS developed satisfies the criteria of validity and practicality. The validity of the LKPD is determined by expert comments and suggestions, which affirm that the LKPD based on HOTS is legitimate in terms of content, construct, and language. This validation process involves a thorough review and revision conducted by experts and researchers. The practicality of LKPD is evident in its ability to be comprehended and utilized by students with various mathematical abilities. The practicality of the LKPD can also be seen from the one-to-one and small group stages, where students can complete the LKPD.

This research is limited as it has yet to be tested in large classes to see the effect potential that may arise from using this LKPD, which involves sampling a greater number of students. In addition, researchers interested in conducting comparable studies can investigate alternative issues at the assessment and innovation levels in order to create different high-order thinking skills (HOTS)-based learning materials that can be effectively utilized by students of all arithmetic proficiency levels.

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