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Student worksheets based on teach Ki Hadjar Dewantara on materials volume of cubes and cuboid fifth grade of elementary school

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Abstract

This study aims to (1) Develop student worksheets based on Ki Hadjar Dewantara Teaching method which is Tri-N (*Niteni*, *Nirokke*, *Nambahi*) with teaching material volume of cube and cuboid. (2) Testing properness, practicability and effectiveness of Student Worksheets. This research using Research and Development method. The model of the development method is ADDIE. This research is limited on the steps of implementation in a minor scale research which has been done in SDN Jogoresan with subject of fifth grade which consist of 19 students. The collecting data technique is using instrument sheet assessment which is validation with using 4 assessment scale, student response questioner and test of student final exam. This research is using analysis technique qualitative and quantitative. The result of this research is: (1) Student worksheets based on Ki Hadjar Dewantara has been generated with material volume of cube and cuboid on fifth grade of elementary school. (2) Gain total validation value form those three expert is 3.47 which can be categorize that student worksheets are "very valid". (3) Result of student response questioner as a test of practically student worksheets is as much as 3.6 which can be categorize "very practice". (4) Gain the value average of the class is 87.89 with percentage of completeness 94% and can be categorize "very effective". The conclusion is that the research of student worksheets is successfully valid, practice, and effective.

Keywords: student worksheet; teaching of Ki Hadjar Dewantara; Tri-N

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1. Introduction

The function and purpose of Indonesia's national education according to Law Number 20 of 2003 is to develop capabilities and form dignified national character and civilization in the framework of educating the nation's life. Aims to develop the potential of students to become human beings who believe in and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. Meanwhile, according to Ki Hadjar Dewantara's thoughts, the purpose of education is to liberate life and the life of children both physically and mentally (Hendratmoko, Kuswandi, & Setyosari, 2018). To realize the functions and objectives of national education, an interactive, inspiring, fun, challenging and independent learning process is needed. One of them can be achieved through learning Mathematics.

Learning mathematics is a series of learning activities given to students to gain knowledge about mathematics that is studied intelligently, therapeutically, and is able to understand well the concepts being taught. Learning mathematics in elementary schools besides aiming to gain knowledge of mathematics itself, is also to develop students' thinking power which is logical, analytical, systematic, critical, creative and develops a cooperative attitude.

Yeni E.M. (2015) reveals that mathematics is considered a subject that is a frightening specter for children and science that is difficult to understand because it is abstract. To make learning mathematics not a frightening specter and support understanding of material concepts, learning strategies and learning resources that are adequate and interesting are needed. One of the learning resources that students can use is teaching materials. According to Pannen (Magdalena, Sundari, Nurkamilah, Nasrullah, & Dinda Ayu, 2020), teaching materials are materials or subject matter that are arranged systematically which are used by teachers and students in the learning process. one of the teaching materials is student worksheets.

Based on the results of observations carried out on September 27 2021 in Class V of SD Negeri Jogoresan regarding the learning strategies and teaching materials used in learning mathematics, it was found that the use of learning strategies was still not optimal. Where in learning mathematics that is done still tends to use the lecture method. In learning activities, students only hold on to the textbooks they have. In addition, the use of teaching materials in the form of student worksheets is still not in accordance with its designation. The learning strategies and teaching materials used by teachers are not optimal, resulting in poor mathematics learning outcomes. It is evident from the results of the mathematics middle semester assessment that has been carried out, the average overall score of students is 37 and only 10% of students have passed the minimum completeness criteria.

Based on these problems, researchers want to develop student worksheets, as teaching materials in the form of sheets that contain material descriptions for students to work on in discovering and understanding the concepts of the material being taught in order to develop cognitive aspects and all other aspects. Student worksheets contain instructions or steps to complete an activity or task so that the ultimate goal is that students can understand the concept of the material being taught. Student worksheets has a function as a tool to help students find and apply material concepts in a concrete, simple and interrelated manner. Besides that, it can also be used by students as learning resources and media. Student

worksheets also has a function to train students to think critically because it contains observation sheets, as discussion sheets and as discovery sheets.

The volume of cubes and blocks is one of the mathematical materials studied in class V SD. The volume of a cube is the maximum amount of space a cube can have. The shape of a cube space consists of sides or edges that are all the same length, so that the cube is called side (s). While the volume of the beam is the maximum amount of space that is owned in a beam. Beams have sides or edges called length(p), width(l) and height(t).

According to (Nisa Ana, Zuhdan Kun, & Istiningsih, 2019), a learning strategy that can be used by teachers in developing critical, creative and independent thinking is to use the Tri-N teachings. Tri-N itself is the teaching of Ki Hadjar Dewantara which consists of three processes namely, *Niteni*, *Nirokke*, and *Nambahi*. *Niteni* means paying attention or listening to what is done by students to understand everything that is explained by the teacher. The *niteni* process is the stage of understanding something through what students see and feel. *Nirokke* means imitating or representing what they have noticed and observed at the *niteni* stage. While *nambahi* means adding or is the stage of developing something that students have understood.

Student worksheets can be developed using the Tri-N teachings of Ki Hadjar Dewantara. The Tri-N based Student worksheets taught by Ki Hadjar Dewantara is a student worksheet in which there are elements of the process according to the Tri-N teachings. Tri-N consists of *niteni* (observing), *nirokke* (imitating) and *nambahi* (adding) processes. According to (Wijayanti, Arigiyati, Aulia, and Widodo (2021) states that Tri-N-based student worksheets provides opportunities or opportunities for students to develop their creativity in an effort to find a concept. By using Tri-N-based worksheets, students can improve their critical, creative and innovative thinking skills. And according to Andayani, Subekti, and Sari (2021), the Tri-N concept (*niteni*, *nirokke*, *nambahi*) is relevant and can be used in learning, especially mathematics.

Based on these descriptions, researchers conducted research on the development of Tri-N-based worksheets based on the teachings of Ki Hadjar Dewantara on the volume of cubes and blocks for class V SD. The student worksheets can be used as additional teaching material for fifth grade elementary school educators. Student worksheets development is carried out to help improve students' critical thinking processes and to support understanding of material concepts. Students can achieve maximum results in mathematics subject matter, especially the volume of cubes and blocks

2. Method

The type of research used is research development or research and development. Development research is an activity to develop a new product or perfect an existing product to produce a product that is better so that it is suitable for use. This research uses the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation) (Sugiyono, 2014). The collection of data and instruments used in this study used validation instrument sheets, namely in the form of an alternative four-answer likert scale questionnaire, student response questionnaire sheets given to all fifth-grade students and documentation in the form of records of events that had been carried out in the form of photographs photos or bookkeeping. The data analysis technique used in this research is qualitative and quantitative analysis techniques.

3. Results and Discussion

Analysis

The analysis stage in this research and development is to analyze or collect information that can be used as material in making or developing a product. The product referred to in this case is the Tri-N based student worksheets (*niteni*, *nirokke*, *nambahi*) taught by Ki Hadjar Dewantara on the volume of cubes and blocks. From the results of observations made on January 18 2022 in class V SD N Jogoresan, the results obtained were that class V SD N Jogoresan applied the 2013 curriculum in the process of learning activities. At this stage, researchers also identified core competencies, basic competencies and indicators used in learning mathematics, especially the volume of cubes and blocks.

Design

The design phase is the next stage after the analysis phase is complete. At this stage, the researcher drew up a design to develop Tri N-based worksheets (*niteni*, *nirokke*, *nambahi*) taught by Ki Hadjar Dewantara on the volume of cubes and blocks. At this stage the researcher prepared a reference book and did product design.

Development

The development stage is the stage of realizing what has been designed in the previous stage, namely making student worksheets based on Tri N (*niteni*, *nirokke*, *nambahi*) teachings of Ki Hadjar Dewantara on the volume of cubes and blocks. The resulting product is then validated by material experts, linguists and media experts. Products that have been validated and have gone through the revision stage are then tried out in schools. The trial was carried out by involving fifth grade students at SDN Jogoresan. The validation results can be seen in Table 1 and Table 2.

Table 1. Material Expert Validation Results

Validation	**Material Expert**			
Assessment Aspect Indicator	LKPD suitability with didactic aspects	LKPD suitability with construction aspects	LKPD suitability with technical aspects	Appropriateness of the material / content
Score Acquisition	32	45	16	61
Score Total		154		
Average		3,85		
Category		Very Valid		

Table 2. Linguist Validation Results

Validation	**Linguist**		
Assessment Aspect Indicator	Language qualification	Directness	The use of the term's symbols and icons
Score Acquisition	6	15	7
Score Total		28	
Average		2,8	
Category		Valid	

Table 3. Media Expert Validation Results

Validation	Media Expert			
Assessment Aspect Indicator	Material Selection Materials	LKPD size	LKPD skin design (Cover)	LKPD content design
Score Acquisition	8	7	22	38
Score Total	75			
Average	3,75			
Category	Very Valid			

Based on the description and Table 3, it can be concluded that the average validation score was obtained from material experts, linguists and media experts. The total average score of all validators was 3.75 and the eligibility of the Tri-N-based student worksheets (*niteni*, *nirokke*, *nambahi*) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid for class V SD N Jogoresan was categorized as very valid.

Implementation

The implementation stage is the stage of application to the product development that has been made. After going through the validation stage by experts and product revisions have been carried out based on comments and suggestions from the validator, then the application is carried out on the product that has been made. The application that will be carried out is in the form of a small-scale student worksheets trial which will be carried out in class V SDN Jogoresan with a total of 19 students.

Learning Outcome Test

Learning Outcomes Test is conducted to find out the effectiveness of the developed LKPD. Students work on evaluation questions that are at the end of the LKPD page individually. The evaluation questions consist of 10 questions consisting of 4 questions about the volume of cubes, 4 questions about the volume of blocks and 2 questions about combinations. The questions presented are essay questions where students answer along with the steps involved.

Based on the Learning Outcomes Test which was carried out on Wednesday, January 27, 2022, the results can be seen in Table 4.

Table 4 Frequency Distribution and Percentage of Learning Outcomes Test

Value	Category	Frequency	Percentage %
91-100	Very high	9	47,3
75-90	High	9	47,3
60-74	Medium	1	5, 4
40-59	Low	0	0,00
0-39	Very low	0	0,00
Total		**19**	**100**

Based on the frequency distribution and percentage of the Learning Outcomes Test, it can be seen that of the 27 students who took the Learning Outcomes Test, there were 9 students (47.3%) who were in the acquisition of scores ranging from 91-100 in the very high category. There were 9 students (47.3%) who were in the 75-90 range with the high category and there was 1 student (5.4%) who were in the 60-74 range with the medium category. In

addition, there were no students who scored in the low and very low categories. Based on the Minimum Completeness Criteria (KKM), which is equal to 75, it can be concluded that as many as 18 students (94.6%) were declared complete in working on the learning outcomes test questions and there was 1 student (5.4%) who did not complete the Minimum Completeness Criteria (KKM).

Student Response Questionnaire

The questionnaire consists of 20 questions containing 15 positive questions and 5 negative questions. Aspects of the assessment response given include media aspects, material aspects and learning aspects. Each student gave a response according to the questions contained in the questionnaire and answered according to the assessment of each student. Based on the student response questionnaire that has been given, the results can be seen in Table 5.

Table 5 Recapitulation Results of Student Response Questionnaire Learning Outcomes Tests

Assessment Aspect Indicator	Average Score Acquisition	Explanation
Media	3,5	Very Practical
Material	3,7	Very Practical
Learning	3,6	Very Practical
Average Total Score Acquisition	3,6	Very Practical

Based on the results of the student response questionnaire recapitulation in the table it can be seen that the average score for the media aspect is 3.5 in the very practical category. The material aspect gets an average score of 3.7 in the very practical category and the learning aspect gets an average score of 3.6 in the very practical category. Overall, the average total score for the student response questionnaire is 3.6 and is categorized as "very practical".

Development of LKPD based on the teachings of Ki Hadjar Dewantara on class V volume of cuboid and cubes

The development of Tri-N-based worksheets (Niteni, Nirokke, Nambahi) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid uses the Research and Development (R&D) development method. The model used in this development research is the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). The research is limited to the implementation stage, namely small-scale trials by conducting learning achievement tests to determine the effectiveness of the developed LKPD. This is in line with previous research conducted by Sari (2019), where small-scale trials in development research carried out can be used to determine the effectiveness of products developed for the scope of students tested and proven effective.

The first stage in the development carried out is analysis, the researcher analyzes several aspects to compile the product to be developed, namely LKPD. The analyzes carried out were curriculum analysis, student needs analysis and concept analysis. The curriculum used is the 2013 curriculum. The needs of the students that the researchers found were that the use of LKPD teaching materials had not been maximized. While the concept analysis obtained is based on the material, namely the volume of cubes and cuboid.

The second stage is design, the researcher designs or designs the developed LKPD product. The design is carried out based on the results of the analysis that has been carried out in the previous stage. Design is done by preparing reference books and preparing product designs.

The third stage is development, according to (Sibyan, 2019: 202) the development of the Tri-N-based LKPD is carried out through the guidance of the supervisor to obtain the LKPD that meets expectations and obtains approval from the supervisor to continue the next stage. At this stage, researchers create and develop product designs covering both the outside and the inside of the LKPD. Furthermore, the products that have been made are then validated by material, language and media experts. Then based on comments and suggestions from the validator, the researcher revised the product so that the LKPD made was valid and feasible to be tested.

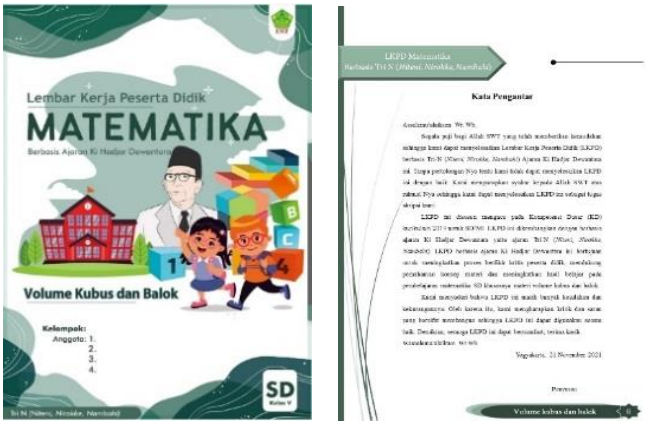

Figure 1. Cover, Preface

As shown in Figure 1, the cover page is designed to consist of a title, pictures and column names. The preparation of the cover is adjusted to the material of the LKPD that is made, namely the volume of cubes and cuboid with the teachings of Ki Hadjar Dewantara. The design is made as attractive as possible according to the characteristics of elementary school students in order to attract students' interest in studying the worksheets that are made. The preface contains an introductory description of the Ki teaching-based LKPD Hadjar Dewantara and the author's hope for readers that the LKPD made can be useful for readers, especially students.

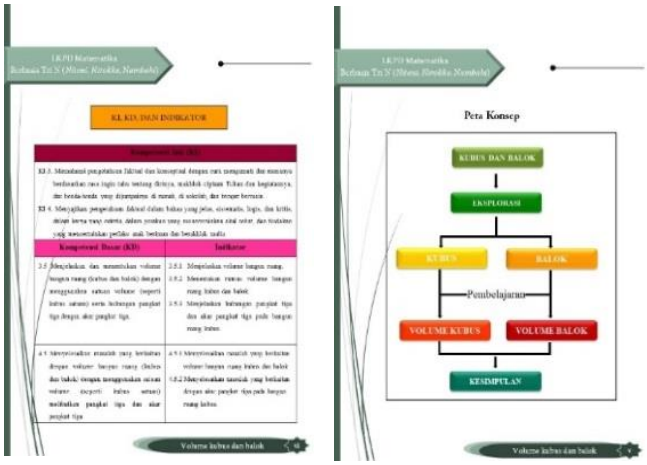

Figure 2. KI, KD, Indicator and Concept Map

Concept maps as shown in Figure 2, are structured to describe the interrelationships of the material concepts discussed in order to make it easier for students to remember the material. Writing KI, KD and indicators aims to teach students to know what must be achieved after using and studying the LKPD made. The preparation of KI, KD and indicators is based on the curriculum used, namely the 2013 curriculum.

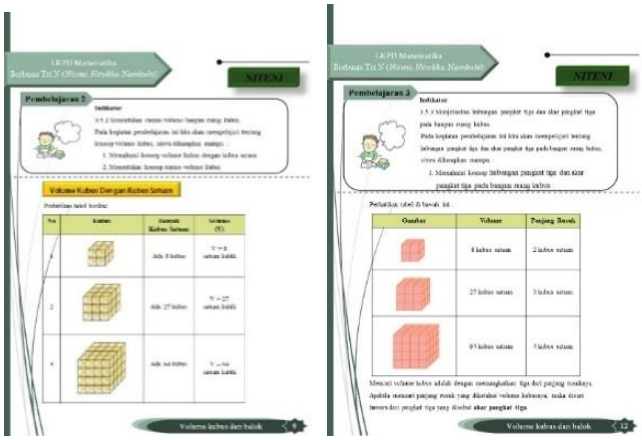

Figure 3. Learning Activities

In this learning activity as shown in Figure 3, the process of learning activities is structured using the teaching method of Ki Hadjar Dewantara, namely Tri-N (Niteni, Nirokke, Nambahi). Learning activities are divided into 4 activities, namely learning 1, learning 2, learning 3, and learning 4. In learning activity 1, it discusses indicator 3.5.1, namely explaining the volume of geometric shapes. Learning activities 2 and 4 describe material regarding indicator 3.5.2, namely determining the volume of cubes and blocks. Whereas in learning activity 3 describes material regarding indicator 3.5.3, namely explaining the relationship of cubes and cube roots in cube shapes.

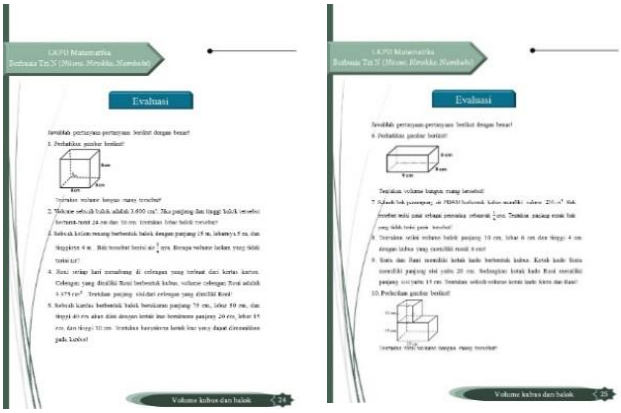

Figure 4. Evaluation

At the end of the lesson, there is an evaluation activity which contains questions to find out how far students understand the material and to find out how practical the developed LKPD is, as shown in Figure 4.

The last stage is implementation, the researcher conducted a small-scale LKPD trial on 19 fifth grade students at SD N Jogoresan. The trial was carried out in 3 stages, namely the first stage of implementing LKPD in learning, the application of LKPD was carried out during the

mathematics learning schedule, namely using the group discussion method. Students are divided into 5 groups, each group consisting of 4 and 3 students. Students complete each step in the LKPD by applying Ki Hadjar Dewantara's teachings, namely Tri-N.

The feasibility and practicality of LKPD based on the teachings of Ki Hadjar Dewantara on volume material of class V blocks and cubes

To find out the feasibility of the developed LKPD, LKPD validation was carried out by material experts, linguists and media experts. The results of the validation carried out by material experts obtained an average score of 3.85 in the category of material eligibility, namely "very valid", the average score of linguists was 2.8 in the category of language eligibility, namely "valid" and the average score of experts' media of 3.75 with the category of media eligibility that is "very valid". Then the total validation average score of the three experts was 3.47 and the feasibility of the Tri-N-based LKPD (Niteni, Nirokke, Nambahi) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid for class V SD N Jogoresan was categorized as "very valid" and could use.

To find out the practicality of the developed LKPD, the researcher gave a student response questionnaire. The questionnaire consists of 20 questions containing 15 positive questions and 5 negative questions regarding LKPD and the learning process using LKPD. Aspects of the assessment response given include media aspects, material aspects and learning aspects. The media aspect obtained a score of 3.5, the material aspect obtained an average score of 3.7 and the learning aspect obtained an average score of 3.6. Based on the score obtained for each aspect of the student response questionnaire, a total average score of 3.6 was obtained and the practicality of Tri-N-based worksheets (Niteni, Nirokke, Nambahi) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid for class V SD N Jogoresan categorized as "very practical" and can be used.

Based on quantitative data analysis by processing the results obtained from expert validation and student responses, it was found that the feasibility and practicality of the Tri-N (Niteni, Nirokke, Nambahi) based LKPD taught by Ki Hadjar Dewantara on the volume of cubes and cuboid for class V SD N Jogoresan. The results of the research conducted by the researchers are in line with the research conducted Andayani et al., (2021) which states that the teachings of Ki Hadjar Dewantara based on Tri-N are relevant and applicable in learning mathematics, especially the volume of cubes and cuboid.

The results of learning mathematics on the volume of blocks and cubes for class V after using the LKPD based on the Teachings of Ki Hadjar Dewantara

Learning outcomes are used to measure the effectiveness of the developed LKPD which is carried out through the Learning Outcomes Test. Effectiveness data analysis was carried out based on the scores obtained by students in the Learning Outcomes Test activities. In the process of the Learning Outcomes Test, students work on the evaluation questions given at the end of the LKPD page and work on them individually. The evaluation questions consist of 10 questions presented in an essay where students answer along with the steps involved.

Based on the frequency distribution and percentage of THB, it can be seen that of the 27 students who took the Learning Outcomes Test, there were 9 students (47.3%) who were in the acquisition of scores ranging from 91-100 in the very high category. There were 9 students

(47.3%) who were in the 75-90 range with the high category and there was 1 student (5.4%) who were in the 60-74 range with the medium category. In addition, there were no students who scored in the low and very low categories. Based on the Minimum Completeness Criteria (KKM), which is equal to 75, it can be concluded that as many as 18 students (94.6%) were declared complete in working on the learning outcomes test questions and there was 1 student (5.4%) who did not complete the Minimum Completeness Criteria (KKM).

Based on the learning outcomes tests that have been carried out, overall an average class score of 87.89 is obtained with a completeness percentage of 94.6%. There were 18 out of 19 students who completely met the Minimum Completeness Criteria (KKM) and there was 1 student who did not complete the Minimum Completeness Criteria (KKM) of 75. It can be concluded that based on the percentage of completeness of students, the effectiveness of Tri-N-based LKPD (Niteni , Nirokke, Nambahi) Ki Hadjar Dewantara's teachings on the volume of cubes and blocks for class V SD N Jogoresan are categorized as "very effective" and can be used. This is in line with the research that has been conducted Dina (2020), where to find out the effectiveness of the LKPD developed, a Student Learning Outcomes Test is carried out and based on the percentage of student completeness in the Learning Outcomes Test activities, the LKPD developed also has a very effective category.

Based on the description above, it can be concluded that the Tri-N based worksheets (Niteni, Nirokke, Nambahi) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid of class V SD N Jogoresan which were developed met the criteria of very valid, very practical and very effective. The development of Tri-N based LKPD carried out by researchers met the same criteria as previous research conducted Sibyan (2019)where the development of Tri-N based LKPD carried out met the criteria of very valid, very practical and very effective. In addition, based on the criteria for the results of the research produced, the product developed is feasible and can be used by students. Where the Tri-N-based LKPD (Niteni, Nirokke, Nambahi) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid for class V can be used by fifth grade students at SD N Jogoresan.

4. Conclusion

Based on the results of the research and discussion that have been described, it can be concluded that: first, this research develops Tri-N-based worksheets (Niteni, Nirokke, Nambahi) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid for class V SD N Jogoresan. The development research method used is Research and Development (R&D) with the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). Research is limited to the implementation stage, namely small-scale trials. The development steps carried out are Analysis (analysis), Design (design), Development (development), Implementation (implementation). Second, the results of the development of LKPD based on Tri-N (Niteni, Nirokke, Nambahi) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid for class V SD N Jogoresan are suitable for use in terms of validity, practicality and effectiveness. It can be concluded that the Tri-N-based LKPD (Niteni, Nirokke, Nambahi) taught by Ki Hadjar Dewantara on the volume of cubes and cuboid for class V SD N Jogoresan which was developed met the criteria of Very Valid, Very Practical and Very Effective.

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