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https:/doi.org/10.29408/jel.v9i1 .6969 **Development of** collaborative based inquiry **learning** tools **using** local wisdom **context** 10

to improve students metacognitive Sri Supiyati *, Muhammad Halqi, Edy Waluyo, Ahmad Rasidi

Mathematics Education Study Program, Hamzanwadi University, West Nusa Tenggara, Indonesia *Correspondence : sri.supiyati@ **hamzanwadi.ac.id** 17

Abstract Geometry is one of the essential materials for students. However, geometry material, especially the concept of geometry, still needs to be made more accessible for students. Models and media are needed, and the proper context in learning mathematics in geometric material. Therefore, this research aims to develop valid, practical, and effective learning using the Collaborative Based Inquiry learning model based on local wisdom to improve students' metacognitive abilities. This study is Research and Development (R & D). There were five stages in this study: to analyze the developed product, develop the initial product, expert validation and revision, small-scale field trials and product revisions, and large-scale field trials and final products. Based on the results of the study obtained, several research conclusions, including that the learning device was valid. From the limited test, the results of the five ability test questions were obtained metacognitive is also valid and reliable. Developed learning plans as well practicals from the side of teachers and students. Moreover, the average value of students' metacognitive abilities in the experimental class is classified as effective to increase students' metacognitive abilities. That way, learning mathematics design with Collaborative Based Inquiry based on local wisdom can improve students' metacognitive abilities.
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. 246 Introduction Mathematics in the school curriculum contains several material topics, and geometry is one of the essential topics (Alex & Mammen, 2012; Clements & Sarama, 2011). The Indonesian education curriculum also studies geometry from elementary to high school. Therefore, students need to be able to master geometry material. However, several studies state that the level of geometric thinking of elementary and secondary school students still needs to be at the expected level (Alex & Mammen, 2012; Serin, 2018). Students' difficulty in geometry material is because the basic concepts that must be mastered are more abstract than other learning fields (Adelabu et al., 2019). One of the geometry materials that students still need help finding is the area and volume of prisms and blocks.

Several factors that cause students' difficulties with geometric materials are the delivery of material by the teacher that is difficult for students to understand, the limited use of concrete media used by **the** teacher, and **the** 7

less meaningful learning process (Herawaty et al., 2018). A critical factor in achieving learning objectives is the learning approach and model used by the teacher in the classroom (Rizi et al., 2013). In line with the problems above, teachers need to design learning that is more meaningful and involves students more in discovering concepts. One learning model that can support more meaningful learning and involve students optimally in learning is the Collaborative Based Inquiry learning model based on Sasak local wisdom. Collaborative Inquiry-Based learning on local culture

is built on the premise that students, before carrying out the learning process, already have initial conceptions (schemata), namely, the concepts students have about matters related to the learning that is **being carried out** besides that **learning will** also **be** more **meaningful** 2

and embedded in the memory of students' brains when students in learning can

see, observe and hold learning objects directly by utilizing the potential that exists around their homes (**Dahar** , 2006). **The** 2

context that is applied in this study is traditional Sasak buildings and traditional Sasak art tools (Gamelan), which are one of the cultural traditions of the Sasak people in Lombok. Using context as a starting point for learning Geometry, especially spatial shapes,

is expected to make it easier for students to understand concepts and love **their** own **culture** 22

. It is in line with research results (Supiyati et al., 2019) stated that learning that implements local culture can lead students to love communal areas. The efforts to develop device learning help stimulate students' conceptual understanding of geometric shapes and improve students' metacognitive abilities based on grade levels. Metacognitive skills are believed to strongly predict learning success (Dunning et al., 2003). Students with good metacognitive skills show better academic performance than their peers with less metacognitive skills (Jayapraba & Kanmani, 2014). It is because students with good metacognitive skills have the ability to be more strategic in their learning process (Everson & Tobias, 1998). This strategic learning is characterized by several indicators, i.e., (1) students have self-regulation skills when facing various academic tasks, (2) students have skills to be oriented toward the goals to be achieved, and (3) students have skills to evaluate their learning process. Metacognition plays a role in collaborative learning. It

enables learners to control and adapt their cognition, motivation, emotion, and behavior at individual and group levels (Järvelä et al., 2021 12

).

The collaborative-based inquiry learning model effectiveness testing can improve students' **metacognitive abilities** 23

(Hastuti, 2020). Based on this background, it is necessary to develop Collaborative Based Inquiry learning tools based on local wisdom in providing opportunities for

students to build knowledge and develop their potential according to their regional **characteristics. Students can achieve** their **learning goals** 18

while still being guided by their regional cultural values so that they will become individuals with high character in society. This research's innovation is applying the Collaborative Based Inquiry learning model and developing learning tools with the Collaborative Based Inquiry model based on local culture to form

students who are more skilled **in** developing **their ideas** . Therefore, **the purpose of this** study **is to** 15 develop learning tools that are valid, practical, and effective using local culture-Based Collaborative Inquiry learning models to improve students' metacognitive abilities. Methods This research was Research and Development (R & D) research that is developing learning tools and Collaborative Based Inquiry based on local culture to increase the ability of the students' metacognitive. Stages in research using development methods that have been adjusted by the Central Team Educational Policy and Innovation Research, i.e.: (1) Analyzing the product to be developed, (2) Developing the initial product, (3) Expert validation and revisions, (4) Small-scale field trials and product revisions, (5) Large-scale field trials and the final product (Puslitjaknov, 2008). The resulting learning device product is said to have good quality if it fulfills three aspects: validity, practicality, and effectiveness (Dewi et al., 2013). We collected data in this study using validation sheets and instrument tests. Validity device learning concerning content and construct validity using lesson plans and module validation sheets teach. Whereas practicality devices obtained from observation implementation of device learning results, questionnaire teacher, and questionnaire response student to device learning. Validity and practicality of device learning Collaborative Based Inquiry based on local culture were analyzed using descriptive analysis qualitative and quantitative. For analysis, descriptive qualitative was conducted with classified information from qualitative data in the form of input, feedback, criticism, and suggestions for improvement contained in the validation sheet. The results of this analysis are then used to revise the further developed product. Quantitative descriptive analysis for validation instrument tests uses calculation N- Gains. While the analysis of the descriptive quantitative sheet validation lesson plan and module teach was conducted by converting the average total score to quantitative values with the following scale. Table 1. Interval criteria for the validity of learning devices (Dewi et al., 2013) Interval Score Information 3,5 ≤ Sr < 4,0 Very Valid/Practical 2,5 ≤ Sr < 3,5 Valid/Practical 1,5 ≤ Sr < 2,5 Invalid/Practical 0,5 ≤ Sr < 1,5 Very invalid/practical Description: Sr = average score Testing the product's effectiveness is done by looking at the metacognitive ability test scores. The product effectiveness indicator is determined by the minimum criterion that 80% of students given the test get a metacognitive ability score of 75. While testing the potential effects of learning tools in improving abilities, students' metacognitive was tested by looking at the mean increase of the metacognitive abilities using the One Group Pre-test and Post-test design. Results Products resulting from the design of developing Collaborative Based Inquiry learning tools based on local culture could be utilized by students to study and practice questions independently or in groups. In study development device learning Collaborative Based Inquiry based on local culture consists of 5 stages which are described in detail as follows: The first stage is the developed analysis product, identifying the primary skills needed following the curriculum. Activity this addressed identifying academic skills developed in learning to find the surface area and volume of a prism and beam. The products that have been developed are lesson plans and teaching modules. Developing lesson plans and modules requires an analysis of the minimum competency of basic competencies (KD), making Operational Verbs, and then analyzing the knowledge and cognitive dimensions. The second stage is developing the product, beginning with arranging destination learning, method, and the media used in learning. It is then developed into Plan Implementation Learning, module, and instrument evaluation. At the same time, Basic Competence and destination learning can be explained in Table 2 below. Table 2. Basic competency and learning objectives Basic Competence Number Basic Competence

3.9 Distinguish and find **the surface area and volume of flat side shapes (cubes, blocks, prisms and pyramids) 4.9 Solving problems related to the surface area and volume of flat side shapes** 6

Table 3. Destination learning Number Destination Learning 1 Student could find the three-dimensional volume formula (cube cuboid, prisms and pyramids) 2 Student could calculate the three-dimensional volume formula (cube, blocks, prisms and pyramids) 3 Students can

determine the surface area and volume of cubes, beams, prisms, and cylinders **4** 14

Students are able to apply ratio comparisons to the measurement of surface areas and volumes (cubes, blocks, prisms and cylinders) The third stage is design validation aims to assess the feasibility of the device development design and Collaborative Based Inquiry learning based on local culture. After conducting validation design device learning, the weaknesses of the learning device are known. From these weaknesses, the learning tools are improved according to the validator's suggestions so that the learning tools are feasible and ready to be tested on research subjects. At the expert assessment stage (expert appraisal), several experts requested for evaluation of Collaborative Based Inquiry learning tools based on local culture to increase the ability of students' metacognitive. The results of the validation of experts are used as a basis for revising and perfecting Collaborative Based Inquiry learning tools based on local culture. Based on the results of experts' and practitioners' validation, it is known that the feasibility of the product being developed is shown in Table 4 below. Table 4. Validation results by validators Aspects of assessment Overall average Criteria Lesson plans 3.23 Valid Teaching Module 3.41 Valid The learning tools were validated by three material experts and two media experts. From the assessment of material and media experts for lesson plans, an average score of 3.23 was qualitatively included in the valid category. Furthermore, based on the assessment by material and media experts, an average score of 3 25

.41 was obtained with a valid category so that the developed learning module is suitable for use in

distinguishing and finding the surface area and volume of Geometry (cubes, blocks, prisms, and pyramids 13

). According to the revision suggested by each expert. The higher the validity score of a development product, the more accurate the data obtained. Therefore, the quality of research instruments is essential in achieving relevant research results. The Fourth stage is on step test try limited, instrument test piloted to the student who previously obtained the theory surface area and volume of a shape. A limited test was carried out, namely the legibility test of the students' metacognitive ability test instrument, with the five items tested getting an average score of 0.75 and being invalid criteria. Table 5. Results of testing the validity of items testing students' metacognitive ability No Question

Pearson Correlation Interpretation 1 0 .781** Valid 2 0 .508** Valid 3 0 .717** Valid 4 0.518** Valid 5 0 .469** Valid 19

Based on Table 5 above, it can be seen that the 26

five metacognitive abilities are valid. Moreover, after calculating using the Alpha-Cronbach formula, the reliability coefficient of the metacognitive ability test is 0.730, which means that the questions in the tested test have high reliability. The final stage is a field trial used to determine the effect of this developed product on students' metacognitive abilities. Testing was carried out before and after implementing the Collaborative Based Inquiry learning tool based on local Sasak culture began. The results of the implementation of learning using Collaborative Based Inquiry learning tools based on local culture obtained from the teacher's observation sheet obtained

an average score of 3 .6 on a scale of 4 or 94%. The results of the 9

teacher's questionnaire regarding the practicality of implementing teaching modules obtained

an average score of 3 , 8 out of a scale of 4 . It means that the 9

lesson plan and teaching modules developed are very practical. Then after processing the pretest and posttest score data on the aspect of the metacognitive ability,

the N-Gain value is obtained in Table 6 below. Table 6 . Metacognitive ability test results 24

N-Gain N Average (Mean) Pre-test Post test N-Gain % Category 31 39 82 0.80 80 Effective Based on the results of observing the implementation of learning and metacognitive ability tests, the products developed are effective for use in classroom learning based on Collaborative Based Inquiry based on local wisdom. After the implementation of expert trials, revisions, and field trials of Collaborative Inquiry-Based Mathematics Learning Devices based on local wisdom, several things must be maximized from the product, including the following: 1. Preparation of material descriptions must be more communicative, creative and student centered. 2. Placement of additional resources not only in the form of learning videos would be better if it was added with examples of various questions ranging from low difficulty levels to high Order Thinking to build students' habits in solving a problem. Discussion When the lesson plans and teaching modules were implemented, the research results showed that students whose learning used Collaborative Based Inquiry based on local culture had high metacognitive abilities. It was consistent with research results (Nainggolan, 2022) stated that student learning outcomes using the Collaborative

Based Inquiry are higher than the direct instruction model. Furthermore, Langgeng et al. (2017) stated that local potential-based collaborative inquiry models can significantly improve higher-order thinking skills compared to baseline learning. The syntax in the stages of the Collaborative Based Inquiry learning model is 1) orientation, 2) problem, 3) prediction, 4) exploration, 5) analysis, 6) evaluation, and 7) monitoring. Explanation of each stage of the inquiry learning model developed by Hastuti et al. (2020).

In collaborative inquiry learning, students work together in a learning environment , conduct **experiments, and** use experimental **results** to build **shared knowledge (Jong, 2006** 1

). Combining

collaborative learning with inquiry learning can support students ' discovery processes **and improve their learning performance** 1

. When students collaborate,

they can exchange ideas by asking questions , providing **explanations, and negotiating** 1

(Dekker & Elshout-Mohr, 1998; King et al., 1993).

In a collaborative inquiry learning environment, students can make decisions together about how **to** 1

solve problems. Collaborative Based Inquiry learning tools were developed to improve students' metacognitive abilities. This learning device consists of teaching modules, student worksheets, and test instruments.

Etymologically, local wisdom consists of two words, namely wisdom and local. Local wisdom 21

is the potential of an area and the result of human thought and the work of humans, which is

passed down from generation to generation so that it becomes **the** 16

characteristic of an area (Shufa, 2018).

Almost all indigenous and tribal cultures in this **country are inspired by values and ideas rooted in beliefs that live in society, religious** 3 **and** spiritual ethical values **that** influence **behavior** in **socio-cultural and** religious life. **The**

research discipline that explores the relationship between mathematics and culture is ethnomathematics (Supiyati et al., 2019). The ethnomathematics practiced by the Sasak people can be seen in the measurement methods, designs, and forms of buildings in the Sasak culture, such as triangles, squares, circles, and prisms (Supiyati et al., 2019).

The function of local wisdom is **to anticipate, filter, and even** change **various forms of** outside **influence so that it continues** 3 **to characterize** the **local community**

. Integrating local wisdom in learning can create mathematics learning that is interesting and fun and increases a sense of love for local wisdom in their environment, as well as an effort to maintain the existence of local wisdom amidst the swift currents of globalization 4

.

Local content is part of the curriculum structure and content contained in the Content Standards in the education unit-level curriculum. The 11

learning process uses learning tools and Collaborative Based Inquiry based on local culture. Students can use new ideas, insights, and new concepts. They can integrate local wisdom in learning to create engaging, fun mathematics learning and increase a sense of

love for local wisdom in their environment and as an effort to maintain the existence of wisdom amidst the swift currents of globalization 4

. The products developed are designed so that students are challenged and able to choose their creative ideas for solving problems. Students must be actively involved to stimulate the development of students' metacognitive abilities. The application of learning using the Collaborative Based Inquiry learning model based on local culture can assist students in developing their metacognitive abilities through new ideas and concepts while participating in the learning process. Therefore, the application of this learning tool can assist students in thinking about what has been taught, namely awareness, regulation, and evaluation. Metacognitive engagement can help students solve problems because it can regulate mental processes more effectively. Based on the above, the product being developed, namely learning tools through the Collaborative Based Inquiry model based on local culture, has the potential to help improve and develop students' metacognitive abilities. Conclusion

The development of mathematics learning tools in the form of lesson plan learning 10

designs and Collaborative Based Inquiry modules based on local culture has achieved valid, practical, and effective criteria so that it can be declared feasible to use. Theoretically, mathematics learning tools based on Collaborative Based Inquiry integrated with local culture improve students' metacognitive abilities. The validation process for mathematics

learning tools in the form of lesson plans with the 27

Collaborative Based Inquiry model based on local culture obtained an average for teaching sequences 3.2 and teaching modules 3.4 meaning that the lesson plans and teaching modules are valid. The Collaborative Based Inquiry model is based on local culture. The average result of students' metacognitive abilities is 0.80, meaning that 80% of students have reached the minimum completeness score set at 70. Thus, the mathematics learning tool with the Collaborative Based Inquiry model based on local Sasak culture is valid, practical, and effective. Based on the research results described above, the design of learning mathematics with a collaborative inquiry model based on local wisdom can improve students' metacognitive abilities. This research only develops one learning topic, namely geometric shapes. It is hoped that next, it can be reviewed with other topics by looking at other aspects of ability. Acknowledgment The authors thank various parties which have supported the implementation of this study; the Dean of the Faculty of Mathematics and Natural Sciences, Research Center and Devotion to Public Hamzanwadi University, and Headmaster and mathematics teacher SMP Negeri 1 Sakra, East Lombok.

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; Edy Waluyo: Validation and supervision; Ahmad Rasidi: Validation and supervision. References Adelabu, F. M., Makgato, M., & Ramaligela, M. S. (2019). The importance of dynamic geometry computer software on learners' performance in geometry. Electronic Journal of E-Learning, 17(1), 52–63. Alex, J. K., & Mammen, K. J. (2012). A survey of South African grade 10 learners' geometric thinking levels in terms of the Van Hiele theory. The Anthropologist, 14(2), 123–129. https://doi.org/10.1080/09720073.2012.11891229 Clements, D. H., & Sarama, J. (2011). Early childhood teacher education: The case of geometry. Journal of Mathematics Teacher Education, 14(2), 133–148. https://doi.org/10.1007/s10857-011-9173-0 Dahar, R. W. (2006). Learning & learning theories. PT. Gelora Aksara Pratama. Dekker, R., & Elshout-Mohr, M. (1998). A process model for interaction and mathematical level raising. 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