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KAMBUIK KUANTAN SINGINGI CULTURE FOR REALISTIC MATHEMATICS EDUCATION APPROACH

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ABSTRACT

The mathematics learning tools used by teachers today are often less attractive and monotonous. Teachers are rarely objects in their culture. The environment around students can be utilized for the learning process. Many have argued that culture-based learning tools can be used in learning. This study aimed to validate mathematics learning instruments involving Kambuik Kuantan Singingi culture. The learning is intended to bed implemented based on the Realistic Mathematics Education (RME) approach in junior high school. The instrument was developed using the Plomp model. The validation data were collected using a set of questions. For the lesson plan, there were six aspects measured, namely the content, presentation, learning activities, learning resources, and assessment instruments, while for the worksheets, five aspects were included: content, didactic, construction, technical presentation, and time allocation. Three experts in the area were invited as validators. The results suggested that the learning instruments (lesson plans and worksheets) were valid to be implemented at school. It can be concluded that the Kambuik Kuantan Singingi culture can be used as a resource of learning in the RME framework.

Keywords: Instrument, Kambuik Kuantan Singingi, mathematics learning, realistic mathematics education

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INTRODUCTION

Indonesia is a country known for its diversity and rich culture. This cultural diversity is something to be proud of and should be passed down to the younger generation. The diversity also has very important and basic value elements. One of the areas in Indonesia that has cultural diversity is Riau. The province, which is located in the Sumatera island, has a unique cultural diversity in each city and district. One of the districts in Riau which is famous for its cultural diversity is Kuantan Singingi. There are several well-known cultures in Kuantan Singingi district including the annual runway festival, *Randai* dance, traditional *Takuluak Barembai* clothes, *Gelamai*, *Calempong*, etc. Even though this cultural diversity needs to be maintained and preserved by the current generation, in the midst of current changes and development, the culture is somehow neglected.

An effort that can be made to preserve this culture is to instill the concept of culture into learning. The generation of this era thinks that studying culture is very boring, and it is a waste of time (Baihaqi et al., 2018). Therefore, it is necessary to combine cultural values which is fun with subject that is considered difficult and boring, such as mathematics.

The difficulty of connecting mathematics concepts with daily life is the main problem in conducting culture-based mathematics learning. Elements of mathematics contained in the culture

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of a society can be used as a basis in the learning process. Suripah and Retnawati (2019) state that mathematical concepts contained in a culture can be used as a basis and an actual source of data that can be used to link materials being learned and daily life. The cultural element in mathematics can be defined as an approach to the learning process. Besides being used as an approach to the learning process, the cultural element in mathematics can also explain the relationship between environmental culture and mathematics as a unit of knowledge. Marsigit et al. (2018) point out that ethnomathematics or culture in mathematics is able to represent the relationship between culture and mathematics.

Teachers can use RME (Realistic Mathematics Education) approach in mathematics learning by exploring cultural elements. Besides, the RME approach will rely on contextual problems that are close to the daily lives of students (Ananda, 2018). The application of mathematics theory to solve daily problems can provide an opportunity for students to recognize the importance of learning mathematics (Suripah & Retnawati, 2019). With the motivation to learn mathematics, students can gain new experiences from their surroundings, one of which is knowing the cultural values that exist in the students' surroundings.

In this day and age, many students forget and do not know the cultural values that exist around them. The results of an interview conducted with the mathematics teacher and a ninth-grade student of State Senior High School SMP Negeri 05 Sentajo Raya, Kuantan Singingi showed that many students did not know Kuantan Singingi culture although most of them were from the area. Therefore, there was a need to introduce the culture to the students through the mathematics learning process. Among the various types of culture from Kuantan Singingi, one of the cultures that can be applied in mathematics learning is Kambuik. It is one of the handicrafts made from woven pandan or *mesiang* leaves. This handicraft is shaped like a tube with ropes. It looks like a bag used to carry crops from the fields.

The cultural concept of Kambuik can be very well combined with mathematical reasoning material, especially when it is implemented using the RME approach. This approach will make it easier for students to understand the learning materials because it is related to the reality around them. To integrate the concept of Kambuik using the RME approach in mathematics, the teacher needs to develop learning instruments according to the concept. The instruments are expected to make learning more fun, and students can recognize and maintain the local culture around them.

The format of the learning instruments is one of the determining factors for the success of the process of delivering material to students. The learning instruments developed by the researchers were Lesson Plan and Student Worksheet. Lesson plan is important in teaching-learning processes as teachers refer to this guide to teach. Without careful planning, it is impossible to achieve learning objectives optimally (Bararah, 2017).

Meanwhile, student worksheet is useful for increasing student learning activities, as well as guiding students well in terms of concept development (Rewatus et al., 2020). Although several previous studies have developed mathematics learning instruments using the RME approach, including the research conducted by Fauziana et al. (2020), Indriyani et al. (2012), and Retnowati et al. (2021), no one has developed a mathematics learning instrument using the RME approach to the Kambuik from Kuantan Singingi.

It was expected that after the instruments were developed, students could preserve the Kuantan Singingi culture, especially those related to Kambuik. This study aimed to use a valid Realistic Mathematics Education (RME) approach to produce mathematics learning instruments consisting of lesson plans and student worksheets on Kambuik Kuantan Singingi culture for junior high schools.

METHOD

This study employed a quantitative method to generate validation results of a developed learning instruments. The main objective is to inform whether the developed learning instruments based on Kambuik in Kuantan Singingi, Riau, Indonesia, based is applicaple for a Realistic Mathematics Education (RME) approach. The procedure to develop it followed the Plomp model. Plomp development model, as used by Rochmad (2012), is a systematic and flexible development model. The Plomp development model consists of five stages, namely (1) preliminary investigation; (2) design; (3) realization/construction; (4) test, evaluation, and revision; and (5) implementation. This study was developed based on Plomp research procedure that was adapted

from Rochmad (2012) and Akker et al. (2013). However, due to the Covid-19 pandemic, the implementation phase could not be carried out. Since conducting the online trial for the instruments would make it difficult for students to understand the learning instrument developed, researchers did not try out the instruments. Therefore, only four stages were carried out in this study. The stages of the development carried out are presented in Figure 1.

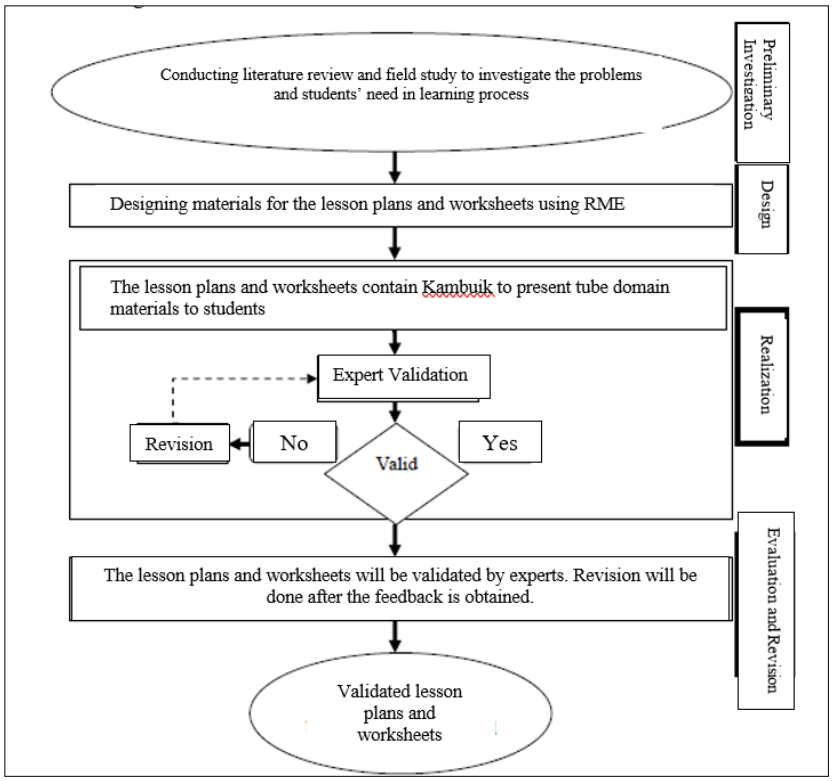


Figure 1. Research Procedure

This study used a questionnaire validation sheet for assessing the developed lesson plans and worksheets. On the lesson plan validation sheet, there were six aspects measured, namely the content, presentation, learning activities, learning resources, and assessment instruments. The indicators of each aspect are presented in Table 1. On the worksheet validity sheet, there are five aspects to measure the content, didactical, construction, technical, and time allocation aspects. The indicators of each aspect are presented in Table 2.

Scores and assessment categories on the lesson plan and worksheet validation sheets were developed based on a Likert scale with four categories, namely (4) Very Good, (3) Good, (2) Fair, and (1) Poor (Sugiyono, 2019). Before the validation sheets were distributed to the validators, the questions were validated by the experts. The input and suggestions from experts became the references to revise the questionnaires. Data obtained from the instrument were in the form of qualitative and quantitative data. Qualitative data analysis was performed based on the suggestions obtained from validators and teachers when assessing the readability of learning instruments.

Meanwhile, the quantitative data analysis was performed based on the validator's assessment score on the developed learning instruments. The analysis was carried out using percentage of all validator's score. The results of validating the learning instruments by experts were then categorized based on the criteria presented Table 3 (Akbar & Holid, 2013).

Table 3. Validity Criteria

No.	Validity Criteria	Validity Level
1	85.01% - 100.00	Highly valid, no revision is needed
2	70.01% - 85.00%	Valid, minor revision is needed
3	50.01% - 70.00%	Less valid, major revision is needed. Product is not recommended to be used
4	0% - 50.00%	Invalid, no possibility to be used

Table 1. Blueprint of the Lesson Plan Questionnaire

Aspect	Indicator	Item Number
Content	1) The indicator of students' learning outcomes is in line with the basic competence.	1
	2) Verbs used in formulating indicators are correct.	2
	3) The indicators are formulated based on student development.	3
Learning Goals	1) The learning goals are in accordance with the learning outcomes.	4
	2) The learning goals are developed based on time allocation.	5
Presentation	1) The lesson plans are logical and systematic.	6
	2) The learning stages are in line with Realistic Mathematics Education (RME) approach.	7
	3) The language used in the lesson plans is based on the Indonesian spelling system, is easy to understand, and is communicative.	8,9,10
	4) The time for learning is properly allocated.	11,12
Learning Activities	1) The stages of learning activities are correctly arranged.	13,14
	2) The implementation of learning activities with a Realistic Mathematics Education (RME) approach encourages students to play an active role in learning.	15,16
Learning Resource	1) The learning resources used are in line with the learning materials.	17
	2) The learning resources used are in accordance with the student development.	18
Assessment Instrument	The instruments used to assess are in accordance with the learning goals.	19

Table 2. Blueprint of the Worksheet Questionnaire

Aspect	Indicator	Item Number
Content Aspect	1) The worksheet components are complete.	1
	2) The problems presented are in line with the learning goals.	2
	3) The stages of learning activities are correctly designed to motivate students.	3
	4) The worksheet is presented in accordance with students' daily lives, and it can introduce Kambuik.	4,5
Didactical Aspect	1) The materials in the worksheets are arranged systematically.	6
	2) The worksheet may foster students in experiencing learning.	7
	3) The worksheet can facilitate students in understanding contextual problems and conveying their ideas to solve the problems presented.	8,9
	4) The worksheet can facilitate students to develop communication skills and the ability to draw conclusions from the learning process that has been carried out.	10,11
Construction Aspect	1) The sentences used in the worksheet are clear, concise, and have a simple structure.	12
	2) The questions in the worksheet are presented in the appropriate language.	13
	3) Sentences in the worksheet are in accordance with student development and easy to understand.	14
	4) The language used is in accordance with the Indonesian spelling system.	15
	5) The worksheet is completed with pictures and illustrations and provides sufficient space for students to express their opinions in accordance with the instructions given.	16,17
TechnicalAspect	1) The font, type, and size of the letters in the worksheet are correctly selected.	18
	2) The worksheet has a good layout.	19
	3) Each sentence in the instructions is varied.	20
	4) The images in the worksheets are in the appropriate size.	21
Time Allocation Aspect	The time provided to finish each task in the worksheet is well allocated.	22

RESULTS AND DISCUSSION

This study developed learning instruments using RME. Kambuik Kuantan Singingi became the basis of developing the materials on tubes for the grade nine of junior high school. This study also measured the validity of each instrument developed. The learning instruments were developed in accordance with the Plomp development procedure. The results of this study are further explained in the following.

Preliminary Investigation

The preliminary investigation was the first stage of the research procedure. This stage was carried out by conducting literature studies and field studies. These activities aimed to analyze initial information about the students' problems and needs, students' characteristics during the learning process, and learning instruments designed by the teacher and used in the learning process. Literature studies were carried out by looking for relevant studies so that this research and development has a basis.

The field study was conducted by interviewing a grade IX math teacher and a grade IX student at SMP Negeri 05 Sentajo Raya on December 2, 2020. Based on the activities that had been carried out, the results of the preliminary analysis obtained were: (1) the teacher had never used Realistic Mathematics Education (RME) approach in the learning process, (2) the provided worksheets were monotonous and colorless, (3) the majority of students came from Sentajo Raya District, Kuantan Singingi Regency, Riau Province, (4) the lesson plan and worksheets used by the teacher did not include culture, especially the culture around the students' environment, such as Kambuik. Based on the results of the analysis, it was found that students and teachers need more attractive learning instruments so that students can understand the concepts of local culture better from more fun learning materials.

Design

At this stage, the learning instruments and research instruments needed during the research were designed based on the school's needs and the problems found in the previous stage. An overview of what lesson plans and worksheets to develop was obtained. In addition, the instrument to measure the validity of the product being developed was designed. The worksheet was made to improve students' skills in solving problems with the help of Kambuik to learn about the concept of tubes. The topics of the first meeting were the definition of tubes, tube nets, and tube elements. In the second meeting, the concept of tube surface area was introduced. At last, in the third meeting, the lesson was focused on the tube volume.

Realization/Construction

At this stage, the learning instruments and research instruments were developed. The activities in lesson plans were made based on RME approach. The lesson plans were for three meetings. The lessons were focused on materials on tubes and its standard of competence. Meanwhile, the student worksheet developed in this study contains contextual problems related to the student environment. Before working on the problems, students were first instructed to read information about the Kambuik in order to make them attracted in learning more about it. The student worksheet was used as a guide for students to carry out activities during the learning process on the curved side of the tube.

Evaluation and Revision

The developed lesson plans contain learning steps that were adjusted to RMS and standard of competence. Meanwhile, the worksheet contains the definition, picture, and explanation of Kambuik. In addition, the worksheet includes materials on tubes. In the next page of the worksheets, there activities that focus on contextual problems (observe), how to solve contextual problems (ask and collect information), how to compare and discuss answers (communicate), and how to conclude (draw conclusions). The design and activities in the worksheet are presented in the Figure 2 and Figure 3.

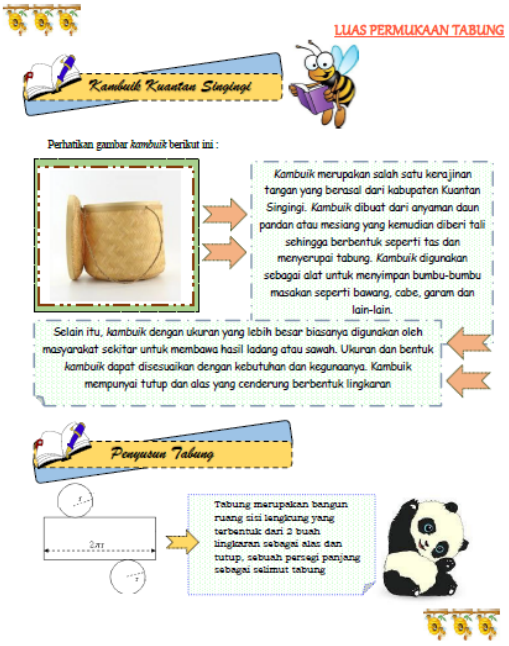


Figure 2. Front Page of the Worksheet

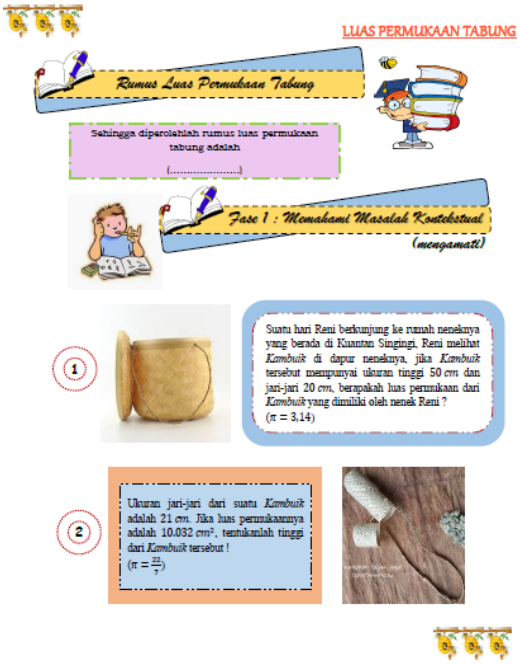


Figure 3. Activities in the worksheet

The first draft of the lesson plans was validated based on the contents, presentation, learning activities, learning resources and assessment instruments. Meanwhile, the worksheet draft was validated based on content, didactical, construction, technical, and time allocation aspects. Both learning instruments were validated by three validators consisting of two lecturers of mathematics education at UIR and one mathematics teacher at SMP Negeri 5 Sentajo Raya. In the validation process, the validators gave comments and suggestions. The results of the validation were used as the basis for revising the learning instruments. Suggestions and improvements for the first draft are presented in Table 4 and Table 5.

Table 4. Suggestion and revision on the lesson plan draft

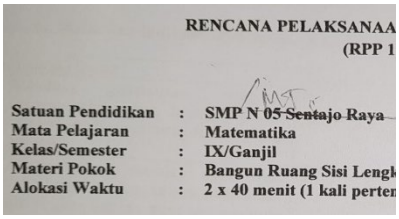
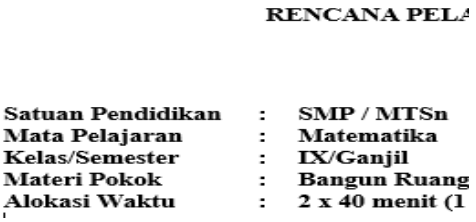
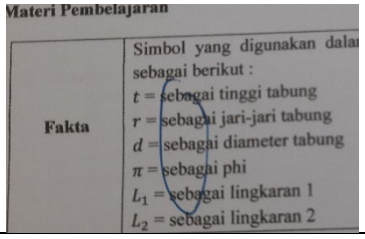
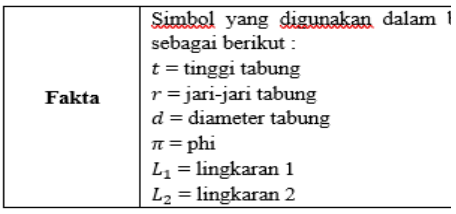
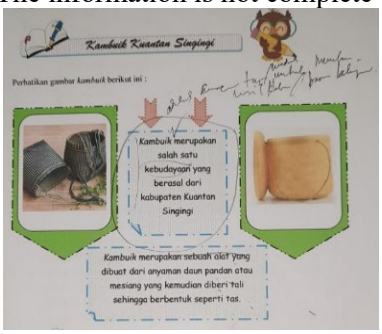
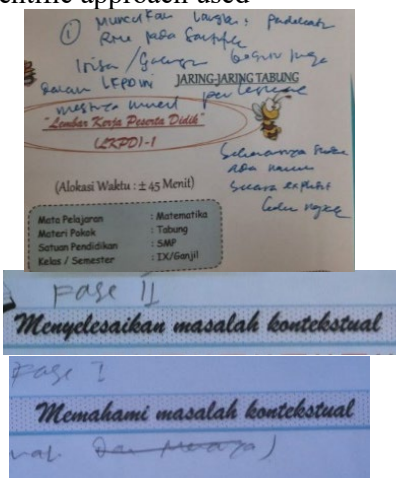
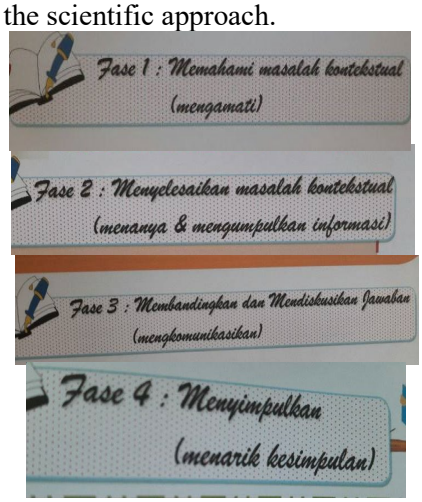
Lesson Plan	
Before Revision	After Revision
1. More information should be added in the school's name.  RENCANA PELAKSANAA (RPP 1 Satuan Pendidikan : SMP N 05 Sentajo Raya Mata Pelajaran : Matematika Kelas/Semester : IX/Ganjil Materi Pokok : Bangun Ruang Sisi Lengk Alokasi Waktu : 2 x 40 menit (1 kali perter	1. Revision made by the researchers  RENCANA PEL Satuan Pendidikan : SMP / MTSn Mata Pelajaran : Matematika Kelas/Semester : IX/Ganjil Materi Pokok : Bangun Ruang Alokasi Waktu : 2 x 40 menit (1
2. Inefficient words are used.  Materi Pembelajaran Fakta Simbol yang digunakan dala sebagai berikut : t = sebagai tinggi tabung r = sebagai jari-jari tabung d = sebagai diameter tabung π = sebagai phi L_1 = sebagai lingkaran 1 L_2 = sebagai lingkaran 2	2. Some words are omitted.  Fakta Simbol yang digunakan dalam sebagai berikut : t = tinggi tabung r = jari-jari tabung d = diameter tabung π = phi L_1 = lingkaran 1 L_2 = lingkaran 2

Table 5. Suggestion and revision on the worksheet draft

Worksheet	
Before Revision	After Revision
1. The information is not complete  Kambuk Kuantan Singingi Perhatikan gambar kambuk berikut ini : Kambuk merupakan salah satu kebudayaan yang berasal dari kabupaten Kuantan Singingi Kambuk merupakan sebuah alat yang dibuat dari anyaman daun pandan atau mesiang yang kemudian diberi tali sehingga berbentuk seperti tas.	1. More information is added  Perhatikan gambar kambuk berikut ini : Kambuk merupakan salah satu kerajinan tangan yang berasal dari kabupaten Kuantan Singingi. Kambuk dibuat dari anyaman daun pandan atau mesiang yang kemudian diberi tali sehingga berbentuk seperti tas dan menyerupai tabung Kambuk digunakan sebagai alat untuk menyimpan bumbu-bumbu masakan seperti bawang, cabe, garam dan lain-lain. Selain itu, kambuk dengan ukuran yang lebih besar biasanya digunakan oleh masyarakat sekitar untuk membawa hasil ladang atau sawah. Ukuran kambuk dapat disesuaikan dengan kebutuhan dan kegunaanya. Selain itu kambuk juga cocok dijadikan sebagai kantong belanja pengganti plastik.
2. There is no RME approach in the scientific approach used  JARING-JARING TABUNG "Lembar Kerja Peserta Didik" (LKPD)-1 (Alokasi Waktu : ± 45 Menit) Mata Pelajaran : Matematika Materi Pokok : Tabung Satuan Pendidikan : SMP Kelas / Semester : IX/Ganjil Fase II Menyelesaikan masalah kontekstual Fase I Memahami masalah kontekstual	2. Stages of doing RME approach are added in the scientific approach.  Fase 1 : Memahami masalah kontekstual (mengamati) Fase 2 : Menyelesaikan masalah kontekstual (menanya & mengumpulkan informasi) Fase 3 : Membandingkan dan Mendiskusikan Jawaban (mengkomunikasikan) Fase 4 : Menyimpulkan (menarik kesimpulan)

The questionnaire filled in by the validators were then analyzed to find the level of validation criteria of the learning instruments. The results of lesson plan validation from each validator are presented in Table 6.

Table 6. The results of validation of the developed lesson plans

Lesson Plan	Percentage of Validity (%)			Mean (%)	Level of Validity
	V1	V2	V3		
RPP-1	75	90.27	90.27	85.18	Highly Valid
RPP-2	75	88.89	90.27	84.72	Valid
RPP-3	75	88.89	90.27	84.72	Valid
Average Mean Value				84.87	Valid

Based on the mean value presented in Table 6, it is indicated that the lesson plans are valid and minor revision is needed. This proves that the developed lesson plans are in line with the competency standards. The results of worksheet validation are presented in Table 7.

Table 7. The results of validation on the developed worksheet

Worksheet	Percentage of Validity (%)			Mean (%)	Level of Validity
	V1	V2	V3		
LKPD-1	78.57	90.45	92.86	87.29	Highly Valid
LKPD-2	78.57	89.29	92.86	86.91	Highly Valid
LKPD-3	78.57	91.67	91.67	87.3	Highly Valid
Average Mean Value				87.17	Highly Valid

Based on Table 7, the worksheet is highly valid. Although the final draft of the worksheet is highly valid, some revision had been made in the first draft. The revisions were on misspelling, sentences, and RME stages. Based on the recommendation and suggestions from the validators, the researchers revised the first draft. The high average mean value indicates that the worksheet does fit the format of the Realistic Mathematics Education (RME) approach.

Ethnomathematics is a program that aims to examine how students understand, collect, communicate, process, and ultimately use ideas to solve problems related to their daily activities (Fajriyah, 2018). Ethnomathematics raises cultural wisdom so that it can attract the interest and motivation of students during the mathematics learning process. Mathematics is a science in which its structure is considered abstract by some students and involves a number activities, geometric patterns, calculations, and so on (Anderha & Maskar, 2020). The application of ethnomathematics in the learning process can improve students' mathematical abilities. Sarwoedi et al. (2018) state that through the concept of ethnomathematics, students find it easier to understand math problems because these problems are related to common problems, such as counting, retrieving data, processing data, and interpreting data.

Kambuik is a part of the culture that contains mathematical concepts. Ajmain et al. (2020) argue that mathematical concepts are very close to culture. This cultural concept should be preserved through a learning process, considering that the current generation is starting to forget the local culture around them.

Besides Kambuik, there are several crafts whose concepts can be used in the mathematics learning process. Among them are the traditional Sasak crafts which were presented in Fauzi and Setiawan (2020) research. The crafts contain geometric concepts, such as squares, circles, triangles, etc. Moreover, Widada et al. (2019) conducted research on the analysis of ethnomathematical concepts in woven bamboo crafts that are cones and circles in shape. These studies are motivated by the researchers' concern about losing their cultures. As civilization advances, the young generation prefers instant products Widada et al. (2019), and leaves the ethical crafts behind. Therefore, the exploration of mathematical concepts using crafts and cultures needs to be done. Similar to other studies, this study aims to support the mathematics learning process and help students become more acquainted with the local culture around them.

Several mathematical concepts existing in our culture contribute to learning processes at school. According to the research by Astuningtyas et al. (2017), Ethnomathematics can motivate and stimulate students during learning, so they do not feel bored when learning mathematics. In

addition, Rahmawati and Muchlian (2019) point out that the concept of ethnomathematics is very necessary for the mathematics learning process to make mathematics learning more meaningful, by linking abstract mathematical concepts with cultural contexts in the society.

Therefore, it is clear that the concept of Ethnomathematics exists in the culture of the community. When combined with RME, the concept of Ethnomathematics can highlight contextual problems around students. In this study, the contextual problems were associated with the Kambuik which is originated from Kuantan Singingi. Astuningtyas et al. (2017) explains that some of the advantages of applying RME approach in the learning process are (1) teaching starts from problems that exist in the real world so that it is easier for students to understand, (2) students are more motivated because the material will be focused on their daily lives, and (3) through RME approach, students are encouraged to be more active in learning. RME approach can be easily combined with cultures, for example, Kambuik that brings a mathematical concept of tubes.

Based on the results of the validation of the developed lesson plans and worksheet. The lesson plans developed are valid because the average mean value is 84.87. This indicates that lesson plans are in line with the standards of competence of mathematics materials. Likewise, the results of validation on the developed worksheet show that they are developed based on the tube domain materials to instill the cultural values of Kambuik. The average value obtained from the validation is 87.17. The use of RME approach in the lesson plans and worksheets is expected to make students understand the learning materials more easily. Moreover, the learning instruments developed in this study are expected to preserve the culture. At last, instilling culture in learning processes will make learning more meaningful, and it can improve students' thinking skills.

CONCLUSION

The results of this research showed that the learning instruments are valid and highly valid. It can be conluded that the Kambuik Kuantan Singingi culture might be used as a resource of learning in the RME framework. These learning instruments are particularly suitable for learning geometry, such as the cylinder. However, to test whether this learning instrument is empirically effective for achieving mathematics performance, a further research should be conducted. Further study can also focus on other mathematics materials from other contexts of cultures.

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