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The sustainability concept of Riau cultures through development of mathematics learning devices based on Riau folklore at elementary schools

The sustainability concept of Riau cultures through development of mathematics learning devices based on Riau folklore at elementary schools

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Abstract. This research aimed to develop valid and practical mathematical learning devices. Learning devices were developed with the Realistic Mathematics Education approach (RME) based on Malay folklore of Riau. The method in this research was Research and Development (R & D) using Plomp modification with five phases namely: (1) initial investigation, (2) design, (3) realization or construction, (4) Tests, evaluations and revisions, (5) implementation. Samples in this research were Elementary School Benteng District of Riau Province. Learning tools developed in the form of Planning Learning Implementation Planning (LIP) and Students Activities sheets (SAS). The instruments used were LIP validation sheets, SAS validation sheets, LIP practicality questionnaires (teacher and student responses), SAS practicality questionnaires (teacher and student responses) and questionnaires to assess the implementation of learning. The results of LIP validation acquired value about 83.04% with fairly valid criteria, the practicality analysis result of LIP about 85.29% with very practical criteria, SAS validation result about 83.77% with fairly valid criteria, and SAS practicality analysis result about 84.55% with quite practical criteria. Based on the results of the research it can be concluded that learning devices developed based on Riau Malay folklore have been valid and practical

1. Introduction

Improving the quality of Human Resources (HR) is needed in line with the development of science and technology. One effort to improve human resources can be achieved through education. Education is expected to be able to create a quality generation so that they are able and proactive to respond to the challenges of an ever-changing era. This is stated in the National Education System Law Number 20 the Year 2003 article 1 paragraph 2 that:National education is education based on Pancasila and the 1945 Constitution of the Republic of Indonesia which is rooted in religious values, Indonesia's national culture and is responsive to the demands of changing times.One important component of education is curriculum development. Based on Law No. 20 of 2003, the curriculum development must be based on national culture. This was also explained by the National Education Standards Agency that "the curriculum must be developed by taking into account the socio-cultural characteristics of the local community and supporting the preservation of cultural diversity.

Riau is one of the provinces in Indonesia which is famous as a Malay country that have a lot of customs and cultures such as; folklore, regional game, weaving traditional cloth, traditional music, and

regional cuisine. However, at this time Malay culture slowly disappeared by foreign culture and shifted the local culture. This was revealed by Bungsu [10] that "Riau is currently experiencing a lot of changes and shifts in cultural values within the community due to the advancement of science and technology, which subsequently provides opportunities for the neglect of Malay culture and customs". Andrian, Kartowagiran, and Hadi [5] say that is needed a strategy or way to maintain cultures and customs because the advancement of science and technology make the young generation or student neglect cultures and customs have been had by region. In developing Malay culture, the world education sector is also included by involving cultural elements in school subjects. However, so far only art subjects have involved elements of culture in the learning process.

Based on the results of interviews with the teachers at Benteng and classroom observations there were found problems regarding the learning process, that is; In the learning process, the teacher uses LIP obtained from the internet and is used without repairs/revisions. IP doesn't contain learning indicators yet, teaching materials only contain titles without a brief description of what students will learn, learning activities were still teacher-centered. In addition, there is no time allocation at each stage of the activity. The teacher doesn't use SAS as one of the teaching materials. The teacher only conveys the material and writes the questions on the board then asks some students to complete it in front of the class. Students are less interested in learning because students become passive and only listen to the teacher more than doing activities in the classroom.

Related to the material taught, the teacher also admitted that they rarely associated it with the real life of students, materials haven't arranged in the form of stories yet, the game especially related to Riau Malay culture. In fact, the elementary school students are still at a concrete stage that requires real objects or something close to their environment so that learning for them can run optimally.

Mathematics materials are very important to associate mathematical learning material with everyday life because it is a science that has abstract objects. According to Athar [7] "one factor that becomes a mathematics learning problem is mathematics has an object abstract. Based on the problems have described above, it is necessary to develop educational products that can integrate with Malay folklore to preserve and develop the Malay culture that exists in Indonesia.

Learning mathematics is integrated with culture is an effort on how to balance between culture and education [29]. The activities of teaching and learning can be effective and interesting because students to be more in love with the characteristics and culture of each region [22]. Introducing a culture through education can transform the value of kindness to students [26]. Balancing of both culture and learning mathematics gives effective result because there are two things which run simultaneously and can be developed maximally [5]. the activities of learning that are followed by culture can be maximal. Effort in improving and transferring knowledge about the culture of the region becomes maximal [18;25]. Teacher qualification plays an important role in balancing learning with culture [40]. Learning media has developed by can bridge learning with culture [17].

RME one of learning method that emphasizes a real context which is enabled giving the best contribution in teaching and learning process. RME is a method to become a student to overcome mathematics formal that often was happened in the teaching and learning process [16]. One concept of RME is “realistic situation” where is situation enables teachers must develop the learning tools, and procedures in a real context [19]. In RME Method, the students design a construct and procedure to solve a problem. RME involves the student to an active role in observing the real situation objects being studied because Mathematics is a human activity that involves observing, representing and investigating object or pattern (Barnes,2005). RME will make the teaching and learning become interesting because students adapt directly with a real situation such as culture, society and all element in social life.

2. Method

This research is development research. Development research is a method used to develop educational product and test product effectiveness. Research design used in this research was proposed by Plomp

[3] consists of; (1) initial investigation phase, (2) design phase, (3) realization phase, (4) trial, evaluation, and revision, (5) implementation phase.

2.1. Initial Investigation Phase

Initial investigation phase was done to know basic problem needed to develop learning devices. This activity was carried out at the initial investigation phase was collected and analyzed information, identified problem, investigated learning model, and designed further activity. The activity was done to analysis curriculum about the importance of culture in learning, look facts about lose a culture from young generation who proved by literature review and interview student for knowing student knowledge about culture at their district. Besides that, interview was done with mathematics teachers to know the learning devices used in classroom. The next activity was focus group discussion (FGD). FGD was done by teaching and learning expert, evaluation expert, and practitioners. This FGD is done for getting the opinion and assessment of expert about materials have collected from a lot of resources such as interview of customary institution, regency library, public figure, and literature theory about culture or custom. With FGD, expert will give assessment about accordance of product will be developed with materials have obtained. Expert will give recommendation or suggestion about materials feasibility will be used in developing educational product in form SAS and LIP with Realistic Mathematics Education approach.

2.2 Design Phase

This phase aimed to design the problem solving which found at the initial investigation phase. In this phase, learning devices and instrument was designed in form LIP (learning implementation planning) and SAS (student activity sheet), while the required instruments include LIP and SAS validity sheets, practicality sheets with teacher responses, practicality sheets with student responses and learning implementation sheets. LIP and SAS validity sheets are used to get assessment about validity level of the learning devices from the learning and teaching experts, evaluation experts and practitioners, practicality sheet is used to get information about practicality level of LIP and SAS have developed by researcher from practitioners or teachers have experience more ten years and ever develop the educational product.

2.3 Realization or Construction Phase

The design phase that has been successful will be realized to produce LIP and SAS learning devices with RME based Riau folklore. This phase is also called prototype I. According to Rochmad [24], "prototype is the process of creating an initial version of the final product developed by a researcher".

2.4 Testing, Evaluation, and Revision Phase

In this phase, testing the validity of Prototype I was carried out by a team of experts (validators) and practitioners (Mathematics Teacher who have more ten years in teaching). The validation results areanalyzed and used as a basis for revising the Prototype I to Prototype II. After Prototype 2 is assessed and declared valid by the expert team and practitioners, the next step is to conduct a field trial. The data from the field test results were analyzed as revised material to become the final prototype or product.

2.5 Sample &Sampling Technique

The sample used in this research was students and teachers of Elementary School of Benteng of Indragiri Hilir District of Riau Province. The reason elementary school as participant this research because elementary school are lowest level from formal education which give knowledge about culture in every district of Indonesia. Students with relatively young age are expected to have aspirations in developing regional uniqueness by integrating it with education such as mathematics education.The sampling technique used in this research was purposive sampling. The reason way used purposive sampling is because it can select the samples properly according to purpose of the research will be done [15].

2.6 Instrument

Instruments for collecting data consist of, validation sheet of LIP, validation sheet of SAS, practicality questionnaire of LIP was filled by teachers, practicality questionnaire of LIP was filled by students, practicality questionnaire of SAS was filled by teachers, practicality questionnaire of SAS was filled by students and the questionnaire to measure implementation of product was development by researcher. The validation sheet of LIP is used to assess whether the LIP has developed by researcher is valid. The SAS validation sheet is used to judge whether the learning device in form SAS is valid category. Practicality questionnaire of LIP and SAS are used to judge or assess whether the questionnaires is valid category. Validation sheet of LIP and SAS are filled out by experts and practitioners, while practicality questionnaires of LIP and SAS are filled out by experts, practitioners, and students.

2.7 Validity and Reliability

Validity in this research used formula which proposed by Aiken, namely Aiken's Validity Formula [1]. The instrument have developed by researcher will be assessed by four of experts in education areas (evaluation expert, teaching and learning expert and teachers have experience more ten years in teaching mathematics. From the analysis results can be concluded that instruments have developed to have level validity can be accepted because all of instruments have values 0.4 and 1 with valid category. Based on analysis validity of validation sheet instrument of LIP was acquired value 0.40 to 1.00 with category valid, validation sheet instrument of SAS was acquired value 0.40 to 0.80 with category valid, , practicality questionnaire instrument of LIP was filled by teachers was acquired value of 0.40 to 80, practicality questionnaire instrument of LIP was filled by students acquired value of 0.40 to 1.00, practicality questionnaire instrument of SAS was filled by teachers was acquired value of 0.40 to 0.80, practicality questionnaire instrument of SAS was filled by students was acquired value of 0.40 to 0.80 and the questionnaire to measure implementation of product was development by researcher was acquired value of 0.40 to 1.00.Reliability of instrument in this research used Alpha Cronbach Index. Based on the results analysis can be seen that the instruments have developed to have index Alpha Cronbach Index more 0.7[11;21] so that can be concluded that instrument have reliability index can be accepted. From validity and reliability analysis can make a conclusion that the instrument can be used for collecting good data in field.

2.8 Data Analysis Techniques

Data analysis techniques in this research were used formula for analyzing validity and formula for analyzing practicality of product proposed by Akbar [2]. The formulas were proposed by Akbar can be seen at Formula 1 and 2. The results of analysis from formula 1 and 2 will be converted to the Table 1 and 2.

$$V = \frac{Va_1+Va_2+Va_3+Va_4}{4} = \% \quad (1)$$

Note:

V = Combined Validity
Va_1 = Validity from first expert
Va_2 = Validity from second expert
Va_3 = Validity from third expert
Va_4 = Validity from fourth expert

$$P = \frac{TSe}{TSh} \times 100\% \quad (2)$$

Note:
P = Percentage of practicality
TSe = Total of Score
TSh = Maximal Score Total was Expected

Table 2. The validity criteria.

Range of validity	Level of validity
85,01% - 100%	Very valid
70,01% - 85%	Enough valid
50,01% - 70%	Less valid
01,00% -50%	Not valid

Table 3. The practicality criteria.

Practicality critera	Level of practicality
85,01% - 100%	Very Practical
70,01% - 85%	Enough Practical
50,01% - 70%	Less Practical
01,00% -50%	Not Practical

3. Result

3.1 Initial investigation Phase

At this stage the researcher analyzes the needs of the school, namely the development of learning tools which are components of the curriculum. The curriculum used at elementary school ofBenteng was the 2013 curriculum and KTSP. In implementing learning, a good LIP is needed where the components used were in accordance with national education standards in Indonesia so that learning can run optimally. The SAS is also needed to make it easier for students to understand the material and become active in the classroom. In addition, experts involved in curriculum developers must pay attention to regional characteristics. Therefore, learning devices used such as the LIP and the SAS can be linked to Riau's Malay Folklore. Riau Malay Folklore needs to be introduced to students to preserve Malay culture and link mathematics learning in schools with problems in everyday life.

Based on the FGD was done by the teaching and learning expert, evaluation expert and teachers have experience in teaching and learning process more ten years was obtained the recommendation for developing these device because these devices were never developed by others researcher at Indonesia. Expert and teachers ask researcher to develop the LIP and SAS based on Riau Folklore at the high level of school such as junior high school and senior high school even university level because maintain culture or custom through the learning devices with implemented in the teaching and learning process.

The problems that are analyzed by the researcher was the obstacles faced by students and teachers in learning in the classroom. The obstacles faced were that the teachers have difficulties processing / revising the LIP used from the internet. The LIP used by teachers doesn't yet have indicators of achievement of competence. Teaching materials only contain titles without material explanation, and learning activities were still teacher-centered. Therefore, the LIP used doesn't meet the LIP component according to national education standards in Indonesia and is not in accordance with the principles of drafting LIP in accordance with national education standards in Indonesia.

Regarding teaching materials, teachers only use handbooks and don't make the SAS so they do not involve students actively in learning. In addition to the above, the teacher also finds it difficult to associate the material with the daily lives of students, both in terms of stories, games, etc. This is not in accordance with the characteristics of elementary school students who are still at a concrete stage. The students need learning that directs them to something real or close to their environment.

Therefore, researchers want to develop the LIP in accordance with the components and principles of the LIP according to national education standards in Indonesia. In addition, researchers also developed SAS which links everyday life in learning so that it can activate students in the classroom. The LIP and the SAS which are developed using the RME based on folklore in Riau. With this LIP and SAS, school and government can collaborate to maintain the culture or custom existing in Riau Province.

3.2Design Phase

At this stage, researchers design learning devices to solve problems have found from the initial investigation stage. The devices made were LIP and SAS. The researcher drew a draft of LIP and SAS as well as a grid of data collection instruments derived from theory to test the devices that have been developed. The validation sheet has a grid in the form of aspects of learning objectives, teaching material, learning activities, learning resources, and assessment instruments while SAS validation sheets have content and time aspects, didactics, constructs, and technical aspects. The practicality questionnaire of LIP has a grid of aspects of ease and timeliness while the SAS practicality questionnaire has the same grid with additional aspects of attraction. LIP and SAS drafts and the design of data collection instruments are ready to be realized.

3.3Realization or Constructions Phase

The draft LIP and SAS that have been made are then realized into learning tools that will be tested for validity and practicality. These devices are called Prototype I. Instruments of validity and practicality are also made based on existing grids.

3.*4Trail, Evaluation, and Revision Phase*

Devices that have been made are then tested for validity by the validator. Based on the results of the validation, the averages of LIP were 83.04% with the validity level is enough valid. Based on the results of the analysis in each aspect, the following results were obtained:

Table 4. Validity result of lip based on the assessed aspect.

Component	Percentage of expert assessment	Validity criteria
Formulation of learning objective	82,29%	Enough Valid
Learning Material	87,5%	Very Valid
Learning Activities	83, 61%	Enough Valid
Learning Resources	78,12%	Enough Valid
Assessment Instrument	77,08	Enough Valid
Total	82.72	Enough Valid

Based on Table 4 above, information was obtained that all aspects were valid with minimum criteria that were enough valid. The average SAS validation result is 83.77% with a validity level was enough valid.

Table 5. The result of sas validation based on assessed aspect.

Component	Percentage of expert assessment	Validity criteria
Content	86,11%	Enough Valid
Didactic	79, 69%	Very Valid
Construct	85%	Enough Valid
Technical	85%	Enough Valid
Assessment Instrument	66.67	Less Valid
Total	80.45	Enough Valid

Based on Table 5 above, it is known that the results of the validation are quite varied with the lowest criteria on the aspect of time and the highest on the content aspect. After the devices were validated, evaluated and then revised according to the advice given by the validator. These devices were called Prototype II.

3.5 Implementation Phase

At this stage, the devices that have been validated and revised were then tested at the elementary school in Benteng. After the trial was conducted, LIP obtained an average of 85.29% with level of practicality is very practical, SAS gained an average of 84.55% with a level of practicality is practical. More specifically, the results of SAS practicality are analyzed based on the aspects assessed. This result can be seen at Table 6 and Table 7.

Table 6. The result of LIP practicality based on aspect assessed.

Component assessed	Percentage of score	Level of practicality
Convenience	85.57%	Very Practical
Interesting	83.71%	Enough Practical
Timeliness	86.57%	Very Practical

Based on Table 6, it can be concluded that all aspect were assessed by the teaching and learning expert, evaluation expert, practitioners is in enough and very category. It mean, all aspect were fullfiled the good category standard.

Table 7. The result of SAS practicality based on aspect assessed.

Component assessed	Percentage of score	Level of practicality
Convenience	83.12%	Enough Practical
Interesting	90.34%	Very Practical
Timeliness	68.18%	Less Practical

Based on Table 7 above, it is known that aspect of time usage is in less practical criteria, whereas from the interesting aspect is at the highest criteria, which is very practical. According to expert, the time aspect need to revise because time which used for implementing this SAS not appropriate with predetermined time allocation.

4. Discussion

The discussion is about how to find out more about activities and the practicality of the devices developed. The results of the validation of the LIP has a sufficient average to deliver the validity of the category with a validity level is enough valid. But if analyzed each aspect, there is one of the lowest value but still at a enough level. The validator's note reveals that the assessment of instruments made is not in accordance with the lessons learned, namely based on Riau's Folklore. The LIP was revised according to the expert suggestion. After LIP has been revised, the expert agreed and states that LIP has adjusted with Riau 'Folklore.

The SAS validation results show that the SAS was developed was valid with an enough valid category. Aspect analysis on SAS shows that aspect with the lowest average was the aspect of timeliness. This happened because in Prototype I, the researcher did not include timeliness to strengthen SAS development. The practicality of learning devices obtained very practical criteria for LIP, quite practical for SAS and very practical for the implementation of learning.

The results of SAS practicality questionnaire analysis show that students feel easy to use SAS as indicated by the convenience aspect with an average value of 83.12% or in a fairly practical category. Prastowo [23] explained that by using SAS students can find structured directions to understand the material provided. With the SAS students will be easy to understand the learning material. The convenience referred to in this aspect also includes the ease of using SAS.Practical media can support learning and increase the learning outcomes [13]. Learning media allows students to think how to improve their learning outcomes [12]. The implementation of learning media has developed by education expert can improve learning in the classroom and improve students' skills in using the media with certain technologies. The using of new learning media can get the good result because each student will get difference experience and instructional approaches in teaching and learning process [27].

The next analysis is the aspect of interesting in following the learning. SAS that is developed makes students interested in learning as evidenced by an average aspect of 90.34% or very practical. This means that the SAS developed has been able to make students have high motivation to take part in learning. Learning media can overcome different learning of students, motivate students, increase learning interest, and learning outcomes in classroom [9].

Furthermore, the aspects with the lowest average are aspects of timeliness with an average of 68.18% or less practical. In fact, even though some students find it easy and interested in working on SAS, of course there are some students who find it difficult. In obtaining further information, the researcher interviewed the Fortress Elementary School math teacher regarding several students who felt such difficulties. The results of the interview with the teacher revealed that some students who had difficulty learning mathematics were quiet students and had little activity with their friends both in learning and outside learning. Student who difficult in learning or understanding mathematics will take a long time to understand a conceptual mathematics [14].

This problem researchers associate with the characteristics of RME according to Treffers [20] that one of the characteristics of RME is interactivity where the learning process will be easier if students communicate with each other the results of their work and ideas. In the RME step there are activities comparing and discussing answers in groups and outside groups. Then students must try to communicate the answers with group answers to obtain material understanding. Therefore, students who tend to be quiet in the classroom will certainly have difficulty understanding the learning material so that it will take a long time to work on SAS. Realistic mathematics approach can be defined to explain the events in real life at students, to test students ideas and to take student for making estimations in real-life events [6]. Realistic mathematics is concept properly for developing the learning devices, learning tools, mathematics procedure in real-life [19]. The most important why integration mathematics and Malay Folklore used RME because RME proposed the teaching and learning by traditional approach to mathematics instruction [28].

5. Conclusion

Based on the results of the study, it was obtained information that the mathematics learning device with RME-based Malay folklore in Riau Fort Elementary School had been tested for its feasibility. Feasibility in this study is still at the stage of validity and practicality. Further research is needed to test the effectiveness of mathematics learning devices based on Riau Malay Folklore Elementary School in Benteng.

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