Designing of realistic mathematics learning based on ethnomathematics and plane figure

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Abstract. The goal of this research is to make the design of multimedia based on mathematics learning using Java. This research method is research and development. The method of this research is research and development (RnD). The location of the researches is at elementary school which based culture in Purwakarta Regency. Then the team conducted a SWOT analysis and designed “plane” applications with realistic approaches mathematics education based ethno mathematics. The material used is plane figure using a realistic mathematical approach. The result of this research is the design of mathematics learning which will be used as the material of making application which used in the process of learning mathematics in elementary school.

1. Introduction
Following the broad, modern acceptation of the root ethnos, we use the term ethnomathematics (ethno + mathema + tics) for the art or technique of understanding, explaining, learning about, coping with, and managing the natural, social, and political environment through processes like counting, measuring, sorting, ordering, and inferring-processes that result from well-identified cultural group [1]. The development of mathematical knowledge, and in particular the development of ethnomathematical knowledge as a basis of math education, has proceeded gradually in accordance with social, economic, political, and cultural changes [2]. Ethno-mathematics defined as cultural anthropology of mathematics and mathematics education [3].

There were several key substances of the DAPIC problem-solving process as it is a mathematical and scientific problem-solving process which could be used to solve problems occurring both inside and outside class rooms, as well as problems related to real life. There were five key elements as follows: 1) Define: to determine or define problem clearly; 2) Assess: to assess problem situation; 3) Plan: to plan how to solve the problem; 4) Implement: to implement the desired plan and to develop the plan more appropriately; and 5) Communicate: to analyze and to evaluate the imple- mentation outcomes, as well as to communicate the results to others [4].

Learning Mathematics is a part of students’ activity; like learning Physics and other disciplines that involve mental, emotional and intelligence [5]. Using unique and amusing learning media can be one of the ways to empower and strengthen mathematics concepts [6]. This unique thing that researchers provide is to form of merging technology with the local discernment in making media learning math. Especially on the plane subject used props that available around the environment. Realistic
cultural based mathematics learning integrate between contextual learning in cultures and mathematics subjects [7]. Therefore, it is necessary to develop mathematics learning applications using technology and based on the culture of local discernment in “plane” subject.

2. Method
The method of this research is research and development (RnD). The location of the researches is at elementary school which based culture in Purwakarta Regency. Then the team conducted a SWOT analysis and designed “plane” applications with realistic approaches mathematics education based ethno mathematics. The design is carried out based on the result of observations area, which is really needed by the school in developing technology based learning media with the substance of local discernment.

3. Result and Discussion
3.1 Designing

Designing is the stage where the design process is done. The figure above is a system design through the flowchart view with a navigation structure used to facilitate the preparation of page in the main menu. Flowchart system describe the phase of the learning process of the introduction of plane figure, begins with the user must first login to be able to enter into the application. On the main page there are 3 menus: Material, Problem, Training and About. There are 2 pages in the material namely Calculate Area and Calculate Circumference, each of them contain 7 calculations for the plane figure. In the material on each plane that is inserted is a realistic mathematics learning based on ethno mathematics. Examples of objects that have similar shape to plane figure and still in a culture that exist in Purwakarta area. An example is a "hidid" that resembles a square, "tampah" that resembles a circle and so forth. And “ketupat” that resembles a square.

![Flowchart View](image-url)
3.2 Use Case Diagram
Use Case Diagram is used to describe the interaction between system, external system, and user. Use case diagram describes the relationship between actors and activities that can be done with the application. Use Case Diagram Plane Figure Learning is shown in the following figure:

![Use Case Diagram](image)

**Figure 2** Use Case Diagram

3.3 Form Login Display

![Form Login](image)

**Figure 3** Form Login
The login menu display is used to get access rights to run the menus on the home page. We create login menu to avoid just anyone can access this application.

3.4 Home Display

On the Home page there are menus to run this application, including:

1. Material. Used to view material about plane figure. In the material menu we can choose to access and calculate the area or calculate the circumference for the existing 7 plane figure. In addition to the menu of this material there are other materials related to plane figure, such as its characteristics, the nature of the plane figure, and various - kinds of shapes that can be found in real life.

2. Exercises. Used to train the user’s ability for plane figure material that has been studied. In the Exercises menu, if the user has finished answering all the questions, the score will appear which can be used as a reference for the ability of the user.

3. About. Contains an explanation of this application. Which contains ownership and description of the created app

Used to measure the ability of users. The exercise of the given problem is a multiple choice. There are 3 buttons in this form, including: 1. Process button. Used to process user answers whether true or
false. And by pressing the button of this process, after the known user's answer, it will automatically move to the next problem. 2. Reset button. Used to reset the exercises back from the beginning, and 3. Exit button. Used when the user wants to quit the exercise forms on this subject and return to the main menu.

Many researchers have tried to improve pupils’ realistic word problem solving, with varying success [8]. Therefore to improve students’ ability in mathematics is given a learning media that can improve students' ability in solving mathematical problems by using a realistic mathematics approach education bases ethnomathematics. Construction of knowledge will be easier if it departs from the real experience close to the students, related to reality, easy to imagine, tangible activities and habits that are often done in the neighborhood or the surrounding area [9]. The main reason for this situation is that students are not passive knowledge receptors but they actively participate in the learning activity and they learn through mathematizing and doing mathematics [10]. It is expected that with this application can improve the ability and understanding of mathematical plane figure for elementary school.

4. Conclusion

Based on the result of the research and discussion above, it’s expected that the design of this applications can be especially useful for elementary student. Teachers can also provide material by using this learning media so as to facilitate teachers in presenting teaching material using the media so those students are expected to be more passionate in studying mathematics.

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