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The Exploration of the Mathematics Knowledge of the People in Sangihe Regency

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Abstract. This article will give depiction of the long-term purpose of the society's participation in the learning process of children in Sangihe regency. This purpose is related to the principle of democratic learning, which highlighting that learning process has to correspond with the children's experience and needs. The learning material and activity have to integrate the students' knowledge and skill and they gained inside and outside the classroom. The learning source, both the object and the subject of learning, and especially the society, should be involved actively in the learning process. The society has some special knowledge about Mathematics and the knowledge should be explored in order to strengthen the regular learning at school, and also to strengthen the context related to skill and value. This research will cover some stages of identifying Mathematics learning process in the society, planning the instructional material in the form of thematic assignments, and implementing the instructional planning with the society as the facilitator or the learning partner for students. The related Mathematics concepts are the slope of the land based on the concept of trigonometry, and the model of function graph in an event happening on the field. This learning-research plan is open to variety of material and learning activity that will develop in the learning process, as a result of democratic learning.

1. Introduction

A child gets early knowledge from parents and then gains more knowledge from the society when the child communicates and interacts with the society. The early knowledge is knowledge that leaves deep impression which will always be inside the child's brain. The knowledge from the society covers the components of knowledge and culture of the society which are connected to each other [10]. Children's learning experience outside the class, and also inside the class, has a potential to develop the critical attitude and curiosity further. The classical Mathematics knowledge has a strong root in the society [3], and is a power and cultural capital against the critical attitude of students and their curiosity for learning.

This critical attitude that is driven by knowledge and the wish to understand further about the nature and social and culture phenomena in the society has to be responded positively through formal education at school. Teacher has to develop the knowledge about the social movement, history, culture, and socio-politic strength locally and globally which will affect the students [6]. If the teacher has various basic-knowledge in society-Mathematics, the teacher will be able to develop critical thinking and direct the students to do critical learning and accumulate the experience [4].

As well as socio-culture society, the physical environment affects the students' attention, curiosity, and seriousness strongly in learning Mathematics. Learning process based in group activity will encourage the students to share idea and experience which will strengthen the students' common



knowledge. Environment-based learning (physical and socio-culture) has to be planned well to activate the role of all students. [5] stated that in learning the environment, students need togetherness. In some particular time the students need to study alone to stay away from conflict with another student [11], but in the other time the students need to share their ideas and study together with group or partner. Grouping or partnering the students is arranged not only to make them interested in the material but also to encourage sharing idea, to enable higher thinking process [7]. Generally, if the membership of the group is varied in the academic ability, the material should be planned to have various level of difficulty to enable communication within group and lead to common knowledge [2]. Teacher has a very important role in developing the student's Mathematics identity [6]. Teacher can help students to develop a thorough relationship of the solution-strategy where Mathematics idea becomes the key point [12].

The challenge of learning policy which demands learning creativity and productivity by the school is confronted with the teacher's difficulty in planning and developing lesson plan. The availability of conceptual and procedural formula in the society as the learning resource for students inside and outside the class can also be an example of developing lesson plan for teacher. The lesson plan which produced and developed through this research can also be sample material of learning Mathematics which synchronizes the lesson in the class with the assignment outside class. The lesson plan in form of assignment outside the class will confront the students with fact, experience, and needs to solve problems in daily life, including in mathematical aspect. The condition of the environment and socio-culture of the people in Sangihe is specific, so this lesson plan will also have specific characteristic, although it is possible to be adopted and developed in other places as well. The lesson plan will also include the role of parents and society in the in the children's learning process. The role of parents and society can be optimized through material discussion, observation, and measurement. Parents and the society can be facilitator (for the material planning and discussion) in the learning process or the children's study partner. This will also increase the students' motivation (both individual and group) to learn about Mathematics from the society and also to apply it in the context or theme about their environment. This research result (and also other similar research) will be feedback in developing reliable management-model in democratic Mathematics-learning based on theme and material from their environment (physical and socio-culture). The role of the implementers of learning process (teacher, parents, society) needs to be managed well to build such a conducive and productive learning-process. The coordination and control of those components are very important in determining the success of children's education completely. The control system of learning quality as a part of learning management also needs to be examined to produce the format and mechanism which can guarantee an excellent and productive learning process, and it will also create democratic learning atmosphere.

2. Research Method

2.1. Research Procedure

This research is an open developing-research according to the spiral of material development and learning process. The development of the society's Mathematics-knowledge is integrated with the open thematic-tasks to adopt the principles of democratic learning, that is both material and the learning activity will be adjusted to students' experience and needs. The stages of the research are as follow:

- a. Planning basic thematic-assignment instruction by the researcher
- b. Identification of local society (Sangihe)'s Mathematics knowledge. Identification of the society's knowledge about the measurement of land slope using rope, and determining distance using wheel.
- c. Material development: integrating Mathematics society into the plan of instructional thematic-assignment. Mathematical concepts that will be developed and applied through thematic assignments are distance and slope measurements, measuring the width of plane, function, and

graph. The condition of nature/physical environment and socio-culture of the society will be included in the material development, as well as the number and the experience of the teachers and the support potential of the parents in the learning process.

- d. Implementing the cross-level instructional plan. The thematic assignments will be done in groups with the involvement of parents and the society. Assigning thematic assignments to group students will encourage them to develop the idea of the nature of Mathematics [2,9], the critical Mathematics procedure [4,12]. The students groups will be randomly selected and based on the students' initiative. The vexisting local fact will enable the students to develop a complete science-development process such as doing observing, analysis measuring, data/information serving, and evaluating. The evaluation of the cross-level process will be related to the concept between subjects based on the theme context of thematic-assignment instruction.

2.2. *The variable, the Indicator of the Research and the Instruments of Data Collection*

The variable of the students' learning process with the indicator as following: (1) students who attend group activity, (2) students who attend tutorial activity, (3) students who ask questions in relevance to the material or assignment, (4) students give correct answers to the questions from teacher or from another student, (5) students give correct answer to the questions from parents/society, (6) students actively involved in more than 80% of the observation, (7) the number of groups that submits the assignment on time, (8) the number of activity variation developed by the students groups based on the material and scenario of thematic assignments, (9) the number of relevant context formulated by groups, (10) the frequency of learning activity outside the scenario as the group's initiative in mastering the context or the procedure of the assignments.

The variable of concept mastering consists of: the number of groups that answer correctly to the concept of plain width and the appliance to determine the volume of sediment in the pipeline, (2) the number of group that answer correctly to the instruction about how to measure the volume/capacity of the water tunnel, (3) the number of group that answer correctly to the steps of determining the capacity of infiltration, (4) the number of groups that answer correctly to the instruction of energy-floods concept and energy-change graph, (5) the mean score of the group's test result in trigonometry-concept, movement in inclined plane, energy floods, and the function of the root, (6) the variants of the group's test result in trigonometry-concept, movement in inclined plane, energy floods, and the function of the root, (7) the number of students who answer correctly to the question about trigonometry-concept, movement in inclined plane, energy floods, and the function of the root.

Understanding the relation of concept and the context: (1) the number of group that does the proper steps of measuring the slope of the land based on trigonometry concept, (2) the number of groups that can identify and compare the landslide chance based on measuring and identifying the affecting factor in the field, (3) the percentage of student who can explain the procedure of measuring the slope of the land using trigonometry concept, (4) the percentage of student who can explain the phenomenon of the land-mass movement, rumbling sound, and vibration with the energy change in floods.

Understanding the relationship between fields based on the relevant concept in the theme: (1) the percentage of students who can explain the relation of trigonometry concept and the movement in inclined plane, (2) the percentage of students who can describe the function-graph model in energy-component change in floods, (3) the percentage of students who can explain the relation of root system and the land friction in floods.

3. Result and Discussion

The data analysis will use the combination of quantitative and qualitative analysis. Quantitative analysis is related to identifying the role of learning-process implementer (students, researcher, teacher, parents, and society). Quantitative analysis will be used to describe the indicator of learning process and the progress from the early activity to the final one. The relation of the process and the students' achievement in integrating the context with the concept, analyzing the relation of understanding Mathematics concept and science, using the correlation of system level.

The research result that will be discussed in the article is the planning and implementation of thematic-assignments plan in Sangihe isle.

- a. The instructional activity of thematic assignment in landslide. The students' involvement in communicating their experience about landslide integrated with the material and thematic assignment showed that 60% of the students involved actively, and this encouraged the enthusiasm for studying and also developing positive perception to the plan and learning activity, including the advantage of Mathematics. The attendance during the field activity was also very high. Students' activity and productivity through discussion was also well. The interview result with the students about the participation and productivity in learning is motivated by Mathematics appliance and the students were encouraged to solve problems using mathematical procedure in the field. This result is in line with the research result of [1], [2], [9]. The mean and variant of understanding Mathematics concept in comparing the right triangle's side in determining the slope of the surface are 7.9 and 0.8; the procedure of determining and measuring the altitude of height and slope of the surface are 7.6 and 0.82; the procedure of determining the width of plane and inclined surface are 7.8 and 0.75; the procedure of determining flat projection of the inclined surface's width are 8.3 and 0.82. Understanding the concept with the context of landslide (in determining landslide potential, theoretical cause, and the fact on the field) shows the system-level coefficient in 0.78. This result shows that the concept and procedure of Mathematics can strengthen the student's understanding about landslide, its potential of occurrence, and the comparison of field condition.
- b. The instructional activity in thematic assignment about floods. Students' learning process based on the learning activity and productivity. The students' attendance during field activity was very high. The percentage of students who asked relevant questions to the material was increasing each meeting. However, the percentage of students who gave correct answers to the other students or teacher's questions from each meeting was various. The percentage of students who gave correct answers to the parents' questions was also increasing due to the attendance of parents on the field activity. The number of groups that submitted the assignment on time was high as well. The number of activity variation was developed based on the material and scenario of thematic assignment and no variation was developed by the students. The usage of Mathematics concept in measuring water channel's volume was good as well.

4. Conclusion

Students' learning process from the beginning to the end in implementing the instructional plan of thematic assignment went on actively and productively since it was able to increase student's activity in doing field activity and discussion. Democratic learning based on thematic assignment in students group facilitated by teacher, researcher, and parents/society was able to increase students' interaction in studying. The relation of understanding Mathematics concept with the context and the concept relation between Mathematics, Physics, and Biology was strengthening students' understanding through the thematic assignment.

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