Improving capability of student based on green mathematics through nation character education for caring the environment

D Mayasari, I Natsir and A Munfarikhatin
Department of Mathematics Education, Faculty Of Teacher Training and Education. Universitas Musamus, Merauke, Indonesia.
E-mail: mayasari_fkip@unmus.ac.id

Abstract. This study aims to 1) find out whether learning with green mathematics through the education of national character to love the environment can improve the ability to solve problems to get up flat. 2) knowing whether learning with green mathematics through national character education to love the environment can increase student learning outcomes. The method used is classroom action research through 4 phases of planning, action, observation, reflection. Data retrieval uses the problem-solving ability test and student activity sheet. From the results of the study, it can be seen that in the first round the average value of students decreased from the formative value, where the average formative value of students was 57.41 and the value of the first round was 63.52. Furthermore, the average round II value is 71.15 (an increase in where the graduation rate is more than 75%) and the third round average value is (with a student passing rate of more than 95%). Referring to these results, the researchers concluded that learning through green mathematics through the education of national characters to love the environment can improve students problem-solving abilities.

1. Introduction
Human development is increasingly rapid, resulting in an environment that is not maintained. We can see, with the increasingly dirty atmosphere of our environment. Environmental damage has been getting worse lately, this is indicated by the frequent occurrences of natural disasters adorn the news both in print and electronic media. Forest fires, landslides, floods, and other environmental issues are mostly caused by human hands. Human behavior that is negligent, selfish and irresponsible in exploiting its environment, including the often neglected interest in environmental preservation at the decision-making level, indicates the problem of moral degradation. Bad morality results in increasingly critical environmental conditions and ultimately harms humans themselves. All parties are expected to participate in the rescue and preservation of the environment by developing attitudes, forms of behavior, social abilities and abilities of individuals who love the environment.

Education greatly influences physical development, the power of the social soul and human morality and is the most important tool for maintaining self and maintaining positive values, including environmental values. Of course, with the influence of education, this has an impact on increasing the knowledge and skills of students and will help in forming constructive attitudes in utilizing the
environment and natural resources. Through educational institutions that intentionally transform its cultural heritage, namely knowledge, values and skills from generation to generation, is expected to form positive values for students including loving and aware of the control and preservation of the environment. In line with the program of Adiwiyata schools at the district, provincial and national levels, even Adiwiyata Mandiri, which aims to create school citizens who are responsible for protecting and protecting the environment, one way is to integrate environmental education into classroom learning.

Mathematics as part of the curriculum in schools can also play a role in instilling these environmentally sound values with school citizens through their implementation in learning both on aspects of knowledge (cognitive), awareness or willingness (affective), and actions (psychomotor). For this reason, as an integrated part of the school curriculum and in every level of education, these subjects can participate and contribute to the formation of environmentally sound character.

This research aims to describe how mathematics learning can shape the nation's character to love the environment through green mathematics. The purpose and function of learning mathematics in schools as one part that is integrated into the school curriculum should mathematics contribute to the formation of national character, either directly or indirectly. Based on the national curriculum, the general goal of giving mathematics to elementary and secondary education includes two things, namely: preparing students to be able to deal with changing conditions in life and an ever-evolving world, through training to act on logical, rational, critical thinking careful, honest, effective and efficient. Prepare students to be able to use mathematics and mathematical mindset in everyday life, and in learning science.

From the two things above, it can be concluded that the first general goal, mathematics learning at the level of primary and secondary education is to emphasize the structuring of reasoning and character formation of students. The second objective emphasizes skills in applying mathematics, both in everyday life and in helping to learn other sciences. Furthermore, the function of mathematics subjects is as a tool, mindset, and knowledge or knowledge. The three mathematical functions should be used as a reference in learning school mathematics. By knowing the mathematical functions it is expected that we as teachers or managers of education can understand the relationship between mathematics and various other sciences or life. As a follow up it is highly desirable that students be given.

Green Mathematics as one of the national character education efforts to love the environment an explanation or example of the use of mathematics so that students can solve problems in other subjects, in work-life or in daily life. But, it must be adjusted to the level of development of students, so that it is expected to help the learning process of mathematics at school. Students are given the experience of using mathematics as a tool to understand or convey information such as through equations, or tables of tables in mathematical models which are simplifications of story questions or other mathematical description questions.

Learning mathematics for students is also the formation of a mindset in understanding an understanding and in reasoning a relationship between those meanings. In learning mathematics, students are accustomed to gaining an understanding through experience of the traits that are owned and not possessed by a set of objects (abstraction). By observing examples and not examples, it is expected that students are able to grasp the meaning of a concept. Furthermore, with this abstraction, students are trained to make estimates, guesses, or tendencies based on experience or knowledge developed through specific examples (generalizations). In the reasoning process, an inductive or deductive mindset is developed. But of course, all of them must be adjusted to the development of students' abilities so that in the end it will greatly help the smooth learning process of mathematics at school.

The third function of mathematics is as knowledge or knowledge and of course, mathematics teaching in schools must be colored by this third function. We as teachers must be able to show how mathematics always seeks the truth, and are willing to correct the truth that has been accepted if it is found an opportunity to try to develop discoveries as long as they follow a legitimate mindset. From the goals and
functions of the mathematics mentioned above, we as teachers are made aware of their role as motivators and mentors of students in mathematics learning in schools so that the processes that are passed and concepts encountered in mathematics learning can be developed so as to bring a positive influence on the lives of students and their environment. These guidelines show the best layout for your paper using Microsoft Word. If you don’t wish to use the Word template provided, please use the following page setup measurements.

2. Methods
The method used in this research is Classroom Action Research. It was chosen because researchers want to improve the learning process by identifying problems that occur in the classroom where the researcher teaches to obtain optimal results. This is based on Ebbutt's opinion which suggests that classroom action research is a systematic study of efforts to improve the implementation of educational practices by a group of teachers by conducting learning actions, based on their reflection on the results of these actions.

In this study, researchers acted as teachers who conducted learning through national character education to love the environment by improving students' problem-solving abilities. Besides addition, the teacher also acts as an observer to observe the learning process so that deficiencies that occur in a cycle do not recur in the next cycle and provide suggestions for improving subsequent learning. According to Arikunto, S., Suhardjono, and Supardi, (2008), classroom action research is an examination of learning activities in the form of actions, which are deliberately raised and occur in a class together. Action is given because of a problem that needs to be resolved [1]. While Wardani, et al (2007) say that classroom action research is a translation of Classroom Action Research, that is, one Action Research conducted in class [2].

This research is conducted through a collaborative work process with other parties such as teachers, students, and other schools to create better school performance. Class action research is a problem-solving activity that starts from 1) planning, 2) implementation, 3) collecting data, 4) analyzing data or information to decide the extent of the strengths and weaknesses of the action. The stages of classroom action research that will be carried out are three cycles designed. In each cycle contains 4 steps, namely planning, implementation, evaluation, and reflection. The technique of collecting data is problem-solving ability using formative tests at the end of each cycle, from student answers analyzed using important steps of Polya. Whereas for student activity scores use observation and observation sheets.

Environmental education is education that uses an approach to learning across the curriculum, meaning learning that helps 4 student goals to understand the environment with the ultimate goal so that they have the concern to preserve and preserve the environment and be responsible and nurture and have the skills to preserve the environment in order to create a shared life system [3]. Environmental education integrated mathematics learning is referred to as Green Mathematics Learning. Frudental argues that learning mathematics need to know well what is mathematics? how to learn mathematics? and how should mathematics be taught? Frudental also has the view that mathematics is a human activity and students are not passive receivers of ready-made mathematics. Based on this, green mathematics learning can be included as part of the development of realistic mathematics education where the mathematics teaching and learning process is inseparable from the environment of students [4].

According to Hobri (2009), the characteristics of realistic mathematics education, among others, use contextual problems (the use of context), namely learning begins with using contextual problems as a starting point or starting point for learning. Contextual issues that are the topic of learning must be simple problems that students recognize. In this case, environmental issues can be used as contextual problems to begin learning. Thus, environmental education can be directly integrated in mathematics learning. Teaching and learning interactions in learning. Green Mathematics sought to raise examples of problems
related to environmental education, so students do not feel that environmental education is separate from mathematics teaching [5].

Implementation of Green Mathematics Learning.

One of the most challenging questions faced by a math teacher is what are the benefits of the material being studied? Unfortunately, for some topics, a math teacher can only answer with general answers, such as indicating the benefits of the next topic students will learn. The Mathematical topic can be very creatively developed by a teacher by linking it to things that will build a positive mindset for students, including instilling a caring and loving attitude towards their students. To harness environmentally sound mathematics learning, the creativity of teachers is needed to link topics learned with examples related to environmental sustainability.

As an illustration, the topic of Mathematical Logic in high school class X which provides the concept of compound statement implications can be related to environmental problems, for example, if littering will pollute the environment or office compound sentences such as if many trees are cut down there will be flooded areas. Another example, for example, is the application of the following syllogistic principles.

If the environment is dirty, many mosquitoes fly. If a lot of mosquitoes fly, then the disease outbreak easily spreads. So, from the sentence above, the legitimate conclusion is: If the environment is dirty, then the disease outbreak is easily spread.

A Regarding quadratic function material, mathematics teachers can also provide problems related to environmental concerns such as the following. Problem: One of the renewals of handling paper mill waste.

There are still many other examples and concepts in learning mathematics in schools that can be linked to environmental preservation. In general, the concepts and applications of mathematical questions contain values that are very useful for the formation of a complete (whole) attitude and personality including the formation of an environmentally caring attitude. In the future, a positive attitude like this is increasingly needed because of the increasing number of environmental damage, and the increasing number of people affected by the damage to the environment. Conclusion Mathematics learning as part of the school curriculum can make a major contribution to the efforts of national character education.

The application of mathematical values that are in accordance with the rules and integrated with the realities of everyday life such as those associated with environmental issues are expected to be able to make students who are not only good at mathematics but also have concern for their environment. Thus, learning mathematics will be able to participate and contribute positively to the management and preservation of the environment. Positive character that is built through mathematics learning that is associated with environmental issues requires teacher creativity. Every teaching and learning interaction is either a concept or an example of a problem that is attempted to be associated with environmental values. A maintained environment will avoid disasters and can be used to improve the welfare of the people who manage them.

3. Results and discussion.

3.1 Result

The initial observation activity aims to find problems that will be used as research material. The thing that was done by researchers during the initial observation period was observing students while teaching in class, interviewing students about the learning process of mathematics, difficulties experienced by students, mathematical abilities of students and digging up information from teachers other than mathematics. During the observation, the researcher also observed the level of mathematical abilities of students by looking at the results of practice questions and daily tests. From the results of the observation, the researcher obtained several findings that were considered to be a problem that needed to be resolved. These problems 1) independent students in learning, especially in solving problems and are less aware of
the importance of loving the environment. 2) students are less able to answer questions with the correct procedure. 3) student learning motivation and student awareness in maintaining the environment in mathematics subjects are still lacking. 4) problem-solving ability is still lacking. 5) student completeness from students' daily test results is less than 50%. 6) Information from teachers other than mathematics that the class to be studied in class is a class that is less active in teaching and learning activities compared to the other 7 classes. 7) Conventional methods are less attractive to students. Based on the results of observations, researchers intend to take action on the problems that occur. Based on the teacher's observations and information extracted from colleagues, the researcher finally determined class IX to be the subject of research. The next step that researchers do is compile the learning component.

3.1.1. Preparation of learning components. The next activity after the initial observation is the preparation of learning components to facilitate the learning process that will take place. Preparation of teaching materials and evaluation tools. Teaching materials compiled include lesson plans and worksheets, lesson plans are made for each cycle, worksheets are given every meeting in cycles I, II and III. In addition to the preparation of teaching materials, research instruments were also arranged, namely test instruments and non-test instruments. Test instruments are used to measure the level of problem-solving abilities and student learning outcomes. The test of problem-solving skills and student learning outcomes used is a formative test, in the form of a description test given every end of the cycle. This test aims to analyze the improvement of problem-solving and student mathematics learning outcomes, student learning completeness and reflect on the learning that has been carried out for improvement for the next cycle. Non-test instruments are used to determine student responses to learning that has been carried out. This non-test instrument is in the form of student character observation sheets on the environment, activeness of questions, collaboration, and student independence.

3.1.2. Learning implementation. In this section, the implementation of learning activities will be described which consists of 3 cycles, three meetings. The description in each of the following cycles consists of planning (planning), action learning processes and results of student work (action) and reflection of the learning that has been done (reflection). The process of learning activities carried out at each meeting generally contains the following steps: (1) Review (the teacher gives an apperception and reviews past lessons, discussion homework); (2) Development (presentation of new material or expansion of previous mathematical concepts, explanations, demonstrations, discussions). The teacher demonstrates the resolution of questions related to green mathematics through national character to love the environment followed by discussion, question and answer from the teacher's explanation; (3) Controlled Exercises (forming groups consisting of 3-4 students, students respond to green math-based questions through national characters to love the environment determine problem-solving in many ways, teachers observe collaboration between students in their groups, group presentations; (4) Seatwork (students work on their own to practice or expand concepts), students are given a test for green math-based questions through national character to love the environment, teachers observe the independence of students in working on the problem; (6) Drawing conclusions and reflections

During the controlled exercise students conduct group discussions, the teacher goes around observing the performance of students in each group, helping groups who have difficulty in performing tasks, providing explanations as needed for the questions submitted by students or teachers asking questions that lead to answers to student questions. In this way, it is expected that students are encouraged to think and can express ideas or ideas of the results of their thoughts to their groups, or other groups or the teacher. After the group discussion was completed then continued with the group presentation. When one group presents the results of their work in front of the class, the other groups pay attention to what their friends are saying in front. If other groups disagree with the results obtained by their friends, then they are
asked to write down or submit their group answers. The teacher corrects the results of group work by completing and strengthening the results of group work. Through this discussion students are expected to get the opportunity to criticize and reflect on the results of their work 1). The teacher analyzes the results of observations and test results. Next make a reflection, make a temporary conclusion to the implementation of the cycle, 2). improvement in the action or draft revision based on the results of the analysis of the achievement of these indicators.). At the end of this class discussion, the teacher and students conclude the material discussed.

3.2 Discussion
Based on the analysis of the results of the study, it can be explained the results of the study as follows: there is an increase in problem-solving abilities through green mathematics-based learning through national character to love the environment. The percentage of students in problem-solving increased from 48.9%, 50%, to 61.1% for the first question. While the second question is from 60%, 61.1% to 64.4%. To complete the classical there is an increase from 36.7%, 63.3%, to 73.3%, enough categories. The results of the observation of questioning observation increased starting from 56.7%, 63.3% to 75.7% in the good category, collaboration assessments ranging from 58.3%, 65.0% to 71.7% enough categories, while the independence of students in working on the test items from cycle 1 reached 80.0%, for cycle 2 and 3 students are 100% very good category. From the results of the data analysis, the authors conclude that green mathematics-based learning through national character to love the environment can improve problem-solving skills. Judging from the increase incompleteness, green mathematics-based learning through national character to love the environment can improve learning outcomes.

4. Conclusion
Based on the results of data analysis on the results of formative tests and observations concluded that: Learning based on green mathematics through national character to love the environment can improve problem-solving skills, and improve student learning outcomes. Green mathematics-based learning model through national character to love the environment can be used as an alternative in mathematics learning in schools with relatively similar subject characteristics and with the same subject matter, it is hoped that this research will continue to be developed by making instrument improvements so that they will be more valid better research results, to improve mathematical problem-solving skills are expected to make the questions more varied, and this study can be followed up on research on the effect or effectiveness of green mathematics-based learning models through national character to love the environment towards student learning outcomes.

References
[1]  Arikunto S, Suhardjono and Supardi 2008 Penelitian Tindakan Jelas (Jakarta: Bumi Aksara)
[2]  Wardani I G A K 2007 PenelitianTindakanKelas (Jakarta: Universitas Terbuka)
[3]  Yusuf M 2000 Pendidikan Kependudukan dan Etika Lingkungan (Yogyakarta: Lembaga Studi dan Inovasi Pendidikan)
[4]  Streefland L 1991 Realistic Mathematics Education In primary School (Utrecht: Center for science and Mathematics education, Netherlands)
[5]  Hobri 2009 Model-Model Pembelajaran Invatif (Jember: Center For Society Student)