APEL (Anak Peduli Lingkungan) Program: Mathematics and Science Learning Experience through Natural Environmental Preservation for Grade 1 and 2 Elementary School Students

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Abstract. This paper discusses conceptual studies related to environmental programs for children or APEL program as one of the programs assumed to provide experiences in learning mathematics and science through the preservation of the natural environment. Nature essentially contains various materials that can be used as learning resources for students and one of them can be used in the APEL program. The APEL program is one of the programs in the development of After School Care services for grade 1 and 2 elementary school students. There are three sub-topics that will be elaborated in this paper, including the nature of children’s environmental programs (APEL), types of activities in the APEL program, a general overview of mathematics and science learning for grade 1 and 2 elementary school students, as well as mathematics and science learning experiences. in the APEL program. This article is expected to help readers to find a more comprehensive view of alternative mathematics and science learning for grade 1 and 2 elementary school students that can be done not only in the classroom but also can be done through other interesting activities outside the classroom. The conclusion of the authors in this article refers to the importance of positive experiences in mathematics and science learning for students to support their understanding of the concepts of mathematics and science itself, one of which is through the introduction and preservation of the natural environment.

1. Introduction
Mathematics and natural sciences are one of the important subjects to be taught to students from various levels of education, including in grades 1 and 2 of elementary school (Sriningsih, 2008; Trundle, 2009; Bosse, 2009; Gross, 2012). Various concepts in mathematics and natural sciences can essentially help students to solve problems in their lives, besides learning mathematics and natural sciences at the elementary school level can also be the basis of mathematics and natural science learning in the middle and upper secondary schools. Furthermore, mathemetic and science learning included the natural concept for children. It is an effort to help them finding certain concept and process in life. In other word, mathematic and science learning for children essentially made to become a medium which is used to stimulate development aspect and to maximize children's potency (Sriningsih, 2008; Gross, 2012).
The explanation above implies the importance of mathematics and science learning experience for children in various school levels, including in preschool and elementary school. Unfortunately, mathematics and science learning in these two levels are sometimes not optimal on its implementation. It is usually limited to the activity of direct practice, demonstration and frequently fixated to textbook or students worksheet. The concept taught to children tends to become rigid and less suited with children development stage, so it tends to force children to understand science. Whereas, basically, a good learning for a child is a learning which is able to give direct experience and is able to stimulate children development integrally, not only to develop one aspect (Suyadi & Ulfah, 2013; Santrock, 2007).

The basic aim of mathematics and science learning for children is to develop the development aspect and children potency. Besides, science learning also aimed at developing individual in order to recognize the scope of science itself and capable to use fundamental aspects in solving the problem they face. Thus, the focus of science learning development program is intended to cultivate understanding, interest and appreciation of children of the world where they live, namely the universe (Sumaji, 1988). In addition, Leeper (Nugraha, 2008) also suggested that science learning development in children should enable children to have ability in solving the problem they face through the use of scientific method, so children are helped and become skillful in solving various problems they face, have scientific attitudes and acquire the scientific knowledge and information, including the concept of natural science.

One activity which is able to give science learning experience integrally to children is through Children's Environmental Care Program (APEL program). The Children's Environmental Care program is assumed to provide learning experiences that are fun for children and able to provide stimuli in learning mathematics and science in elementary school.

Based on the explanation above, the author intended to explain further about mathematics and science learning in children through the application of little gardener, with the hope that this paper will be able to give more comprehensive insight for readers concerned with an alternative of creative and meaningful science learning for early childhood.

2. Theoretical Studies

2.1. The Urgency of Mathematics and Science Learning for Children

Mathematics and science learning for children is not only activity of introduction and teaching related to certain math and science concepts for children, but an effort used to stimulate development aspect and to maximize children potency (Nugraha, 2008; Gross, 2012). In other words, in the process of science learning, it is not science concept which is emphasized to be understood by children, but more directed to how the science learning will be able to become a tool to stimulate various aspects of children's development from earlier.

Worms, Shadow and Whirlpools (Halverson, 2007) stated that the advantages of mathematics and science learning for children among others are capable to cultivate children's self-confidence in their environment, give important experience directly to children, develop basic concept of natural science, enhance the ability in observing, get the opportunity to use material which can be used in science learning so children started to be accustomed with that from earlier, get a help in solving the problem, get the opportunity to stimulate their curiosity and get the opportunity to explore, develop sensor, physical, intellectual, emotional, spiritual and social abilities and develop linguistic ability through vocabulary addition when children do activity of questioning and answering.

That explanation above explain about the many advantages obtained in science learning in children, so science has an important role to stimulate children's growth and development from earlier.

2.2. The Scope and Principle of Mathematics and Science Learning for Children

The scope of mathematics learning for grade 1 and 2 elementary school students includes a variety of understandings and abilities as stated in the standards of the National Council of Teacher Mathematics (NCTM, 2013) as follows:
### Table 1. The Scope of Mathematics Learning for Children

| No | Content Standards       | Pre-K through Grade 2 Expectations                                                                                                                                                                                                                                                                                                                                 |
|----|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Number & Operations    | a. At this stage, children have an understanding of numbers, how to represent numbers, number systems and understand relationships between numbers among others: children are able to calculate by understanding and recognizing "how many" in object sets, developing initial understanding of place values and number systems from number 1 to 10, develops an understanding of relative integer positions and quantities, ordinal and cardinal concepts and their relationships, develops a sense of integers and representations and uses them in a flexible way, connecting words and numbers to the numbers they represent and understand the division of numbers in general.  
   b. Children begin to understand the meaning of number operations and their relationships, including: understanding of the meaning of addition and subtraction of integers and the relationship between two operations; understand the effects of integer addition and subtraction, children can also understand situations that require multiplication and division, such as grouping the same objects and sharing them equally.  
   c. Children are able to do counting activities smoothly and are able to make reasonable estimates, including the ability to use strategies for integer calculations, focusing on addition and subtraction, develop fluency with basic numerical combinations for addition and subtraction, and use various methods and tools to calculate/compute.  
| 2  | Algebra                | a. Children are able to understand patterns, relationships, and functions, including the ability to sort, classify and order objects based on size, numbers, and other aspects, recognize, describe, and expand patterns such as sound sequences and simple numerical shapes or patterns and translate from one representation to other representations and able to analyze how repetition and growth patterns are produced.  
   b. Children are able to represent and analyze mathematical situations and structures using algebraic symbols, such as the ability to illustrate general principles and the nature of operations, such as commutation, using certain numbers and using concrete representations, pictorial, and oral to develop an understanding of created and conventional symbolic notations.  
   c. Children are able to use mathematical models to represent and understand quantitative relationships such as modeling situations involving adding and subtracting integers using objects, images, and symbols.  
   d. Children are able to analyze changes in various contexts such as describing qualitative changes (such as increasing height) and describing quantitative changes such as the number of height increases. |
No | Content Standards | Pre-K through Grade 2 Expectations
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3 | Geometry | a. Children have the ability to analyze the characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
b. Children are able to determine the location and describe spatial relationships using coordinate geometry and other representational systems.
c. Children are able to apply transformations and use symmetry to analyze mathematical situations such as the ability to recognize and apply slides, flips, and turns and recognize and create symmetrical shapes.
d. Children are able to use visualization, spatial reasoning, and geometric modeling to solve problems.

4 | Measurement | a. Children are able to understand measurable object attributes and units, systems, and measurement processes.
b. Children are able to apply the right techniques, tools, and formulas to determine size.

5 | Data Analysis & Probability. | a. Children are able to formulate questions that can be overcome with data and collect, organize, and display relevant data to answer.
b. Children are able to choose and use appropriate statistical methods to analyze data, describe parts of data and aggregate data as a whole to determine what data shows.
c. Children are capable of developing and evaluating, emanating conclusions and predictions based on data such as discussing events related to student experience as activities that are liked and disliked.

Whereas according to Kellough (394-401), the scope of science learning for children are as follow:

**Table 2. The Scope of Science Learning for Children**

| No. | Scope | Description |
|-----|-------|-------------|
| 1. | Thinking Process | This scope comprises children ability in observing, guessing and classifying. |
| 2. | Concept Development | This scope comprises children ability in distinguishing, grouping and labeling. |
| 3. | Product | This scope comprises a content of science study domain among others are:
  a. Biology: learn the concept of living things and non-living things, the kinds of living things on earth, categorize living things, understand the characters and feature of living things. As for the study of biology comprise plant, animal, human, life.
  b. Physical Science: comprise the study of astronomy, chemistry, meteorology, and physic. |
| 4. | Attitude | It is expected to acquire by children after science learning is given to them. |

2.3. **APEL Program as Alternative of Mathematics and Science Learning for Children**
The APEL program is a program to introduce children to the conservation of the natural environment. One of the supporting activities is gardening activities. Gardening is one of the activities carried out in After School Care. Gardening activities are basically one of the physical activities, but in ASC is intended be developed as a stimulation of various aspects of child development, such as science skills and also the introduction of the natural environment in children. This APEL program includes several activities including gardening activities, recycling waste and cleaning up the surrounding environment.
Gardening activities start from gardening preparation such as the introduction of tools and materials for farming, determining the types of plants to be planted and planting media. The next stage is for children to do gardening activities, the process of caring for plants and harvesting. The final stage is the evaluation of all gardening activities that have been carried out. As for waste recycling activities, activities begin with children carrying out environmental cleaning and separating organic and non-organic waste. Organic waste will be recycled into fertilizer, while non-organic waste will be recycled into decorations and toys, for example making dolls from plastic bottles, making decorations from plastic, etc. Examples of the implementation of the APEL program for grade 1 and 2 elementary school students can be seen in the pictures as follows:

![Picture 1. Planting activities and the introduction of the natural environment in grade 1 and 2 students of elementary school](image)

Some of the benefits of children's environmental care programs are as follow (Remaklus, 2014; Langellotto & Gupta, 2012; McLennan, 2010, Nimmo & Hallet, 2008):

- **Grow children’s love toward nature by familiarizing children to plants surrounding them and recycling waste.**
- **Gardening and recycling activities can stimulate children's mathematical abilities such as the concept of numbers, patterns, measurements, geometry, analysis and probability, for example when children recognize the form of garbage or plant forms, group garbage and plants, measure water requirements for plants, calculate the amount of waste, and many others.**
- **Gardening and recycling activities can also improve children's scientific abilities, for example in science process skills, using science to preserve the environment and so on.**
- **Enable children to move actively, because gardening and recycling waste process automatically involve all children’s senses, for example when helping to put the seeds, pour soil into the pot, water the plants, making a doll with a plastic bottle, etc.**
- **Children can learn by doing. The experience obtained through working is learning outcome which not easily forgotten, therefore in teaching learning process it is better to direct children to do an activity or “Learning by Doing.”**
- **Children learn to understand plant growth process. Through gardening activity, children are able to see the proof, that if the plants which ‘drink’ or ‘eat’ sufficiently then will grow healthy, and vice versa.**
- **Children can understand the process of recycling waste in a simple way so they can make something more useful in their daily lives.**
- **Children are able to know the process of planting, maintaining and cooking the plants to become delicious food. The gardening activity also capable to grow children interest toward certain vegetables which children not like before such as green onion.**
- **Add children insight about the name of objects used in gardening and recycling waste activity, the name of plants and also another term which children can obtain when doing gardening and recycling waste activity.**
- **Gardening and recycling waste activities for children is a fun activity which can invoke pleasant and enjoyable atmosphere, so it will encourage children to take a part in the learning process, therefore in each learning, the enjoyable atmosphere through fun activity is needed to be created.**
Based on the description above, APEL program is designed to become an alternative of science learning for early children because there are many advantages which can be obtained from gardening activity, recycling waste and cleaning up the surrounding environment for children. In addition, this program is also in accordance with the principles of learning that are right for children.

3. Conclusion
APEL program is designed to become an alternative to science learning for early children because there are many advantages which can be obtained from gardening activity, recycling waste and cleaning up the surrounding environment for children. Besides introducing mathematics and science learning, APEL program also gives a contribution to physical-motor, language, cognitive, social-emotional and also the moral-religious development of children, so it can be concluded that gardening activity is able to give positive result toward various aspects of children development integrally.

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