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Teaching Techniques and Activities for the Education of the Gifted Young Scientist

Science Activity at Climatology: Melting Glacier

ABSTRACT: The biggest weakness of gifted students' education is the lack of creative activity. Such activities contribute to the development of gifted students' many skills. In this study, it has been provided to be faced with gifted students on a matter that requires holistic perspective. Students discussed together on global climate change with the help of inference and generalizations due to the activity of glaciers melt. Thanks to the science activity, students could explain the glaciers melting phenomenon from different perspective. Moreover, the development of students' ability to conduct idea (predicting) against the new situations that may occur has been provided. It is recommended that this activity should be used for educating gifted young scientists.

Key words: global warming, melting glaciers, the ability of generalization

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INTRODUCTION

Global warming or global climate change is an issue whose effects spread over a period of centuries, but felt noticeably in the last century. In daily life, The things that can be done about global warming whose effects appear such as excessive rainfall, drought, changes in the shape of rainfall (less snow), abnormal conditions in the properties and sequence of the seasons, can be grouped in 3. a. Research, investigation and experiments on whether there is global climate changes or not. b. Studies that lead to inferences and prediction about the future climate. c. Disasters likely to live as a result of climate change, their dimensions; and measures to be taken.

Educational activity to be made about global climate change, emerge as a multidisciplinary study. That analysing from different perspectives in detailed this multi-dimensional issue in the activities handling abstract as well as concrete signs will enable to reach original results about the issue. For example, the fact that sea level is at 0 meter today, is not a feature since the beginning of the world. Sea levels took their final shape in 4th Geological Time (Quaternary) (İzбірak, 1991).

Here are the questions that should be asked; Can the conditions of sea levels change in the future (as in the past) ?, If sea levels taken as a landmark for zero (0) metre, change, is new shoreline still considered as 0 meter?, In other words, for example, will -2 meter sea level be considered as 0 meter if the sea levels drop 2 meters?, Will new sea levels lead to the death of some species , decrease in number and new ecosystem?, Is the global warming a natural process of the earth, or has this level been reached with major negligence of human beings?

There's no doubt, questions may be increased. In the last quarter of the twentieth century, with the effect of publications and studies on global warming, questions about global warming have increased. In these researches, the balance, focusing on carrying capacity of ecosystems and often exceeded, has been the subject (Brown, 1979).

We can categorize global climate changes in 4 groups;

- Changes depending on the sun
- Changes depending on ground form, movements, the degree of curvature
- Changes depending on the atmosphere and the distribution of gas

- Changes depending on geomorphologic characteristics of the earth (Erol, 1993).

In educational activities, doubtlessly, these matters can be dealt with separately or in connection with one another.

In a study conducted among primary school students, that students perceived acid rains-a different problem from global warming- as the part of the global warming (Bozkurt and Koray, 2002) shows that there are a lot of misconceptions about global warming.

In another study, we focused on the university students' perception of global warming. It is concluded that university students have misconceptions about the greenhouse effect, climate change and global warming (Oluk, 2007).

The biggest misconception about global climate changes in students is expectation of extreme increase in the temperatures and desertification of the earth. However, beside there is global warming in the world, there is also a global cooling reality as it was in the past.

At the end of the study students are expected to gain following acquisition;

- They explain the global warming-cooling within the concept of climate changes,
- They query the reasons of the imbalance in the climates,
- They distinguish the effect of human factor and natural factors which lead to climatic imbalances,
- They see the new situation and the overall photo as a result of the climate changes,
- They develop approach to resolve the issues as a result of the climate changes,
- They develop thinking skills to reduce artificial climate changes to a tolerable point.

With all of these studies, it is expected that gifted students improve different skills areas such as especially creativity, interpretation of the subject with the deep and intense knowledge at an advanced level (Ataman, 2013). In addition, another expected result of studies is to be more sensitive and be more interested in major natural events.

Melting of glaciers activity is an example of series of activities to do about the global climate changes. A better understanding of the issue, surely, depends on increasing the types of activity. As a result of the different activities and

experiments on the subject, a more accurate analysis can be done and solutions can be produced.

Implementation of the Activity

The purpose of this activity is to enable gifted students to conclude on the subject of melting of glaciers and sea level rise by using scientific methods. In this activity, students will have the chance to observe the situation that occurs after melting of glaciers and its reflection on sea level. Materials to be used for this activity, 3 jars, water, ice, strainer, ruler, pencil, paper.

To arouse students' interest and curiosity some questions will be asked before the application. Students are asked to make predictions and foresight about the views on global climate change whether they are true or not and their possibility to come true. Students are asked to do an experiment in the laboratory. Experimental designs that can be made are discussed. Today, answers are sought to the question that is frequently discussed in scientific environments "what kind of an experiment can be done about the global climate change and its possible consequences?". After necessary materials are prepared, the activity is begun.

Table 1. The stages of activity application

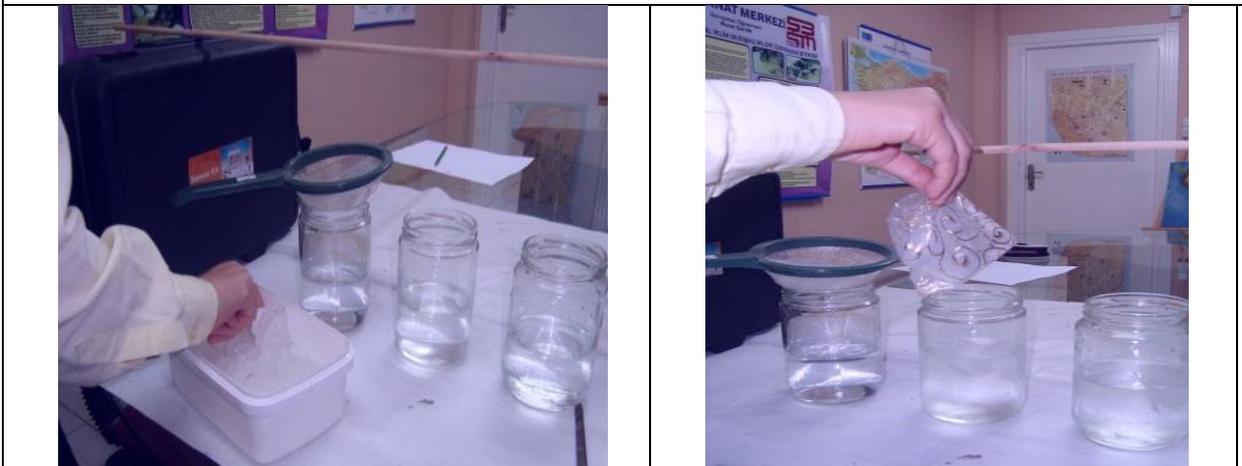
	
<p>Stage 1: The water can be obtained with the help of a bag hung on the stick.)</p>	
	
<p>Stage 2 : The level of first jar is measured and the ice is put on the strainer on the jar.</p>	



Stage 3: Pieces of ice are put in the jar and its level is measured and recorded immediately



Stage 4: A large piece of ice is thrown in the third jar and it is pushed to the bottom with the help of a pen or a stick. The level is measured when the ice is under the water.



Stage 5: The ice pre-formed in a container, can be used during the experiment. A little bag can also help you to do the experiment in a different way.

Table 2. Chart to be used for the activity measurements

Jar	First Level (mm)	Last Level (mm)
1		
2		
3		

Three jars stacked side by side. The water is filled till the half of the jars. After the water level

of first jar is measured and recorded, a strainer is put on the jar and pieces of ice are put into

strainer. This jar symbolizes the glaciers melting and joining in seas. The pieces of ice directly put into the second jar. Pieces of ice will float. 90% of the ice pieces is under the water, the rest is on the water. The level of second jar is measured and recorded immediately. This jar symbolizes the glaciers on seas. A large piece of ice is pushed under the water by a stick. As soon as the ice is under the water, the level of the jar is measured and recorded. Then the ice released.

Released ice melts. The last jar symbolizes the situation when the ice is under the water. In fact this is not a real situation, but it is important to compare the first volume before melting and the last volume after melting. After these procedures we have to wait 10-15 minutes to melt the ice. Then, the water levels of the jars are measured. The measured values are compared with the first measured values.

Students are asked questions at the end of the experiment: "How can you explain the water level remains the same in the second jar?", "How can you explain the level drop in the third jar?". So, the students have scientific inferences by answering the questions.

Some important points (tips) should be noted during the experiment. Informing and discussion can be done on the issues such as the distribution of the glaciers within the expected time to melt the ice and global warming. A more systematic study can be conducted if a chart is prepared before the experiment to record the data (See Table 2).

CONCLUSION

Inventor side of gifted students should be supported by funny activities that support these features. In gifted students' ability grouping such as general mental ability, specific academic aptitude, creative or productive thinking ability, leadership ability, visual and artistic ability, psycho-motor skill, was done in literature (Gallagher & Courtright, 1986). With this proposed activity, it is thought that the first three abilities will develop; moreover, with the help of multidisciplinary approach it will enable students to develop a holistic perspective to the topic.

Preparative knowledge given before the experiment is very important. The issue should be outlined and then motivative (driving) questions should be asked. Before the activity, producing answers to questions about the topic will allow to put forward ideas and focus on the subject.

During the experiment (when glaciers melt) continuing to search the topic from the sources as well as observing, will allow to interpret new and useful knowledge at the end of the experiment.)

After the activity, as a result of in-depth analyzes, concrete suggestions, determinations, and the results on the subject should be produced. Manmade effects on climate events as well as natural effects are interpreted by connecting a relationship with greenhouse effect the features of the gases (Atalay, 1992) causing this effect. With the help of this interpretation, the study of producing alternative solutions is started. Gifted students' thinking differently, effective, extraordinary solution development process with stunning analysis begins in this way. In fact, the experimental activity was designed to give rise to such a concrete output.

With the event, due to its relation with the issue of erosion and desertification, the impact of human activities on climate change and desertification, will be able to be interpreted better. (Aydoğdu and Gezer, 2007).

Melting of glaciers activity includes incentive and motivating elements sparking more than one topic. With the help of multidisciplinary experimental activity which is in accordance with creativity, invention, discovery and the will to conduct research of gifted students it will be reached the capacity to develop new experimental activities.

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