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An Approach to Thinking about Global Warming for Students in Elementary Schools

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In 2004, Non Profit Organization Weather broadCaster Network Japan (WCN) started nationwide activities highlighting the need for a reduction in damage caused by global warming and climatic change, and to promote public interest and raise the profile of broadcast meteorologists. Prior to them, in 2001, Sharp Corporation (SHARP) started environmental classes in schools local to their facilities, covering the various recycling systems appertaining to its products. Three years later in 2004, they took a step further and introduced similar classes covering natural energy.

From autumn 2006, WCN and SHARP began collaborative classes for thinking about global warming, relying on each other's strength. At these classes, broadcast meteorologists take the first session, where they inform participants of the actual conditions and the future prospects of global warming, with some quizzes and experiments.

Employees of SHARP take the second session covering recycling systems and natural energy (solar power), with experiments and presentations.

These two-part classes are designed so that firstly, children gain an interest in the environment through a familiar meteorologist class, and secondly, they can learn about the latest technologies and gain expertise in reducing environmental impacts through a SHARP class. We hope that these children, who will lead the next generation, (1) will understand the actual situation and the future of our planet, (2) will have a deeper appreciation of recycling systems and natural energy, (3) will have an improved awareness of the environment in general, and (4) will get to know more about how to live in a more "earth-friendly" way.

1. Introduction

Global warming is important, urgent and widely recognized, but as an issue is sometimes misunderstood and education is vital. The world's governments look for the best possible solutions and draw up action plans on how to mitigate risks caused by

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global warming. In factories lots of challenges have been overcome and CO₂ emission increases from those factories are slowing down. However, CO₂ emissions from private households is still increasing. We think that to reduce CO₂ emissions from households and to raise the awareness of the resultant risk of global warming, awareness and education initiatives with students who study at elementary schools would bring excellent benefits, not only for the students themselves, but also for their parents. Through learning about the earth's situation and how to reduce CO₂ emissions in everyday life, students will start to think about a more "earth-friendly" way of living and, through daily conversation at home with their families, will have opportunities to think about global warming.

When WCN started its previously mentioned nationwide activities in 2004, more than 100 members who worked or were working on TV or radio as broadcast meteorologists, joined with WCN, and pursued social action programs to enhance awareness on meteorological and environmental issues, mainly at schools, at local communities or at company sites through classes or lectures. On the other hand SHARP started environmental classes relating to the recycling systems of its products in 2001 and natural energy in 2004 in schools in the more local vicinity of its own facilities.

Meteorologists are very familiar to audiences of all types (including students), and are particularly good at talking about

scientific and meteorological issues with words that are easy to understand. In 5th. grade of Junior Schools and in 2nd. Grade of Junior High Schools, students learn about weather as a compulsory subject, and recently lots of schools have invited visiting lecturers who work in a company or in an organization as the first, introductory guide on such a subject. Additionally, SHARP staff members have expert knowledge about CO₂ reduction and in their usual field of responsibility, they are in charge of actual mitigation plans to reduce environmental impacts. ⁽¹⁾

2. Outlook of class

As we mentioned above, our classes consist of 2(two) sessions. Each session is almost 45 minutes long and there is a 10 minutes rest break between each session.

The teacher in the first session, a broadcast meteorologist, starts his or her class by presenting on the latest meteorological topics to capture the students' collective interest and by explaining how it relates to global warming. The topics are maximum temperature records or the "Top10" lists in Japan or even of the local town, and there is an explanation that most of the high temperature records were recorded in the year 2000 onwards. Or statistical data is shown that reveals the intensity and frequency of heavy rain (stronger than 100mm/hr) is increasing. When we show such topics, sometimes we provide the data in the form of a quiz and ask students to choose the answer from 3

examples. Such quiz (Fig. 1) gives students an opportunity to join in the class and to express their thoughts, and usually they enthusiastically participate in the class.



Fig. 1 A quiz relates to the global warming

After introduction topics, we show some slides or video regarding episodes actually happening in the world, for example shots of sea ice coverage around the north pole taken by satellites, Himalayan glacier setback, the actual situation at Tuvalu and so on. Additionally we explain that CO₂ efficiently absorbs long wave emissions from the earth and if there's no CO₂, the equilibrium temperature would be -15 degrees in Celsius. CO₂ plays an indispensable role for earth temperature balance but too much CO₂ brought about the global warming that we recognize today.

As is well known, the average temperature of the world in the last 100 years rose by almost 1 degree. However, students may think that 1 degree in Celsius may matter little or does not have great impact. To avoid misunderstanding, we use a body temperature analogy, and how a 1 degree rise in the human body temperature affects us. If

our body temperature rises to 37.5 degrees, it can make us lazy, and if it rises to 39.5 degrees, our symptoms would be very severe and prevent students from coming to school! The analogy may not be absolutely accurate in all cases, but reminds students of the fragility of the earth's health condition.

In the second half of the first session, we think about aspects relating to CO₂ emissions, that is, which parts of our daily life emit CO₂ or which processes emit CO₂ with statistical data slides referring to government reports. Then, in the last part of the first session, we show the illustration (Fig. 2) in a typical house and we discuss how we can reduce our energy usage and CO₂ emission from each of our homes. It provides ideas on how we can start activities to reduce our environmental impact at home and gives students hints or ideas which they can talk over with their families after going home. Sometimes, such discussions tend to give only a negative impression to students, so we discuss about new energies or recycling processes of electrical appliances. Such discussions also provide an introduction to the second session...



Fig. 2 Let's look for waste of energy

The second session focuses on experiments. There are a few experiments and we choose them based on specific requirements or advice from teachers following prior discussion. Experiments cover (1) CO₂ absorption, (2) solar panel and solar energy generation, and (3) a model of a typical recycling facility.

Referring to the CO₂ absorption experiment ⁽²⁾, a broadcaster meteorologist prepares two sets of a foam polystyrene box, an infrared ray lamp and a thermometer. Two boxes are separately filled with air and CO₂ gas and set at same temperature. At the beginning of the experiment, we irradiate the infrared ray lamp for several minutes and measure the temperature in the two boxes. After switching off the lamp we also measure the temperature descent for a while. We plot the data on a sheet and it shows that CO₂ absorbs heat and keeps the temperature higher than with the air.

On the solar panel experiment, firstly, the SHARP staff member explains how to make a solar battery, and talks about its materials, silica stone and silicon. Using a solar battery experimental kit, the staff member generates electricity and this turns a fan, plays a music box, or lights an LED.

On the recycling process experiment, the SHARP staff member explains that we trash a lot of stuff and why the 3R processes (reduce, reuse, recycle) are important for the environment. The staff member shows a video of a recycling facility, where they break freezers into pieces, into smaller pieces and then recycle the materials. Then, using an experiment kit they experiment with metals and plastics and show how they will be separated with magnets.

Through the two sessions / classes, students learn about global warming itself and what kind of meteorological episodes happen, and how we can reduce CO₂ at home.

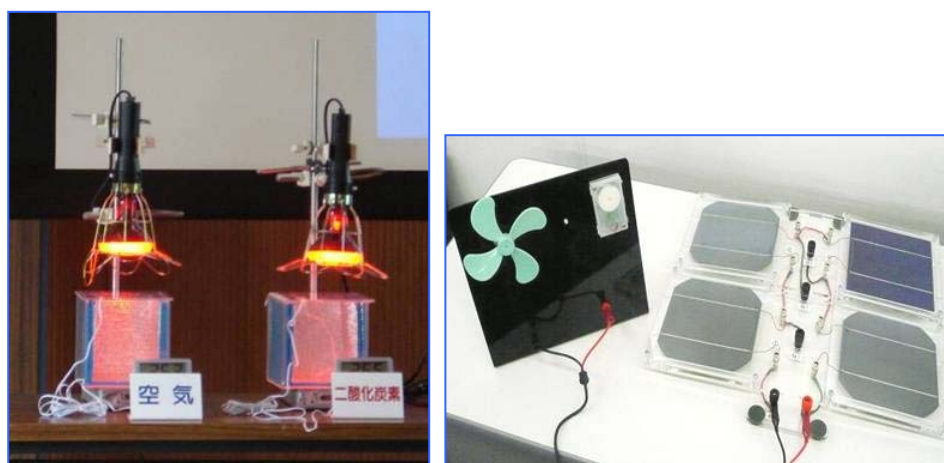


Fig. 3 Experiments

(Left: A greenhouse effect measurement set, Right: A solar battery kit)

Additionally students experience the greenhouse effect of CO₂, solar power energy and recycling processes. As a follow-up for the class, SHARP also manages a web site to support education relating to environmental issues (<http://www.sharp-eco-fan.jp/>). On this site, we handle and respond to questions from students after classes, exchange information on ways to improve our class and support ongoing student action on environmental issues.

3. Conclusion and future plan

So far, we have held over 500 classes each year, the total number of schools we have visited reached 1,500 by January 2010, and the number of students we met has exceeded 100,000. We expect that lots of children and their families have learned about global warming and are now practicing an "earth-friendly" way of living. We have been continuously improving and updating our lectures with the latest information, and we are going to continue our classes for the foreseeable future.

This WCN and SHARP cooperative activity has merits for schools, WCN and SHARP, individually and together. For schools, it is more acceptable to have a class with a broadcaster meteorologist compared to having a class with only a private company staff. For broadcaster meteorologists, they are able to enhance their activities and raise their profile. Finally, for SHARP, they can promote their environmental activities

effectively.

Our activities have won several awards for environmental initiatives, and more than 3,000 letters from students were sent to us in one year alone. In these letters, children wrote and informed us that their activities in their own home and within their own communities, for example: switching off lights, reducing unnecessary showers, stopping unnecessary outgoings and heat loss etc., have had a beneficial impact on their everyday lives and on the environment.

Through these activities, broadcaster meteorologists are able to brush up their skills and SHARP staff members generate a relationship with local communities and help improve their knowledge regarding the environment. From 2008, we started classes in foreign countries (U.S.A. and China). Click onto (<http://sharpsolaracademy.com/>), and from 2009 we started a class outdoors to study the workings of ecosystems in forests and their links to environmental issues.

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