

# Practical Research Regarding the Development of Oceanographic Study Teaching Materials: Implementation of lessons to foster perspectives regarding the use of renewable energy

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## 1 Purpose

The increased uptake of power generation using sustainable energies such as solar power, wind power and geothermal energy is necessary in order to construct a sustainable society. However, there are many pupils that feel that it is difficult to grasp the various energies used in daily life. Therefore, taking up the topic of the sea, which is a familiar topic in the island prefecture of Okinawa, lessons were implemented to arouse interest in various kinds of renewable energy.

## 2 Lesson implementation

This lesson was conducted during a general study period among pupils (two students (3rd year elementary and 1st year junior high) at Funauki Elementary and Junior High School, Taketomi Town, in Funauki in the southwest of Iriomote.

### (1) Monitoring coral spawning

In order to develop an interest in diversity in the sea, the sea environment and coral spawning in Funauki was monitored. Coral spawning could not be observed due to timing issues, but the pupils did learn about the diverse sea environment and the plenitude of the sea. Also, they summarized their connection to the coral in a newspaper article.

### (2) Learning about renewable energy from the sea

1) Solar power, wind power and wave power generation

One of the major causes of coral bleaching is the rise in seawater temperatures due to global warming. The children were told that thermal power stations emit a huge amount of carbon dioxide. Along the coast of Funauki, which is enclosed by the sea, they experienced solar power, wind power and wave power generation, which are renewable energies that do not emit carbon dioxide (Fig. 1).



Fig. 1 Wave power generation experiment

### 2) Energy map creation

Electricity generated on Ishigaki island is transported to Iriomote via underwater cables. Therefore, we wondered whether power could be generated and used locally in Funauki. The fact that blackouts occur when the amount of energy consumed cannot be supplied was understood using the power balance game on the website of the Agency for Natural Resources and Energy.

By consider the sea environment in advance, the children independently started to learn about the use of renewable energy in order to prevent global warming and to protect the sea. With an awareness of stable power supply and the size and cost of generation facilities, the children thought about renewable energy that would be suitable in the isolated island of Funauki, which was summarized as an energy map (Fig. 2).

The quantity of generation facilities needed to fulfil electricity consumption on Funauki was



Fig. 2 Energy map creation

calculated and the scale of the construction area was taken into consideration.

### (3) Lesson survey

Regarding their impressions, the pupils wrote that “the sea can make energy, so it’s important to use the various resources of the sea,” and “I think it’s important to use the power of nature.” Protecting the ocean environment is consequent upon an increasing interest in the use of renewable energy from the sea.

## 3 External transmission

Finally, renewable energy from the sea was summarised in a sea commercial. The commercial was submitted in the Okinawa Energy Video Message Contest (organized by the Okinawa

Energy and Environmental Education Study), where it was given the award of excellence. The results of the oceanographic study were presented at the Marine Education Summit (organized by Tokyo University and the Nippon Foundation).

#### **4 Conclusion**

Teaching materials were developed for oceanographic studies. In the implementation of this lesson, in addition to deepening oceanographic studies from the perspective of the use of renewable energy, interest was aroused in the natural resources and energy from the sea. By transmitting this externally, the ideas were made more tangible. This study was partially supported by the Okinawa Energy and Environmental Education Study. We would like to express our gratitude.