Space Education Activity through IAC Participation

By Norimasa KATAYAMA1), Aria IWASAWA2), Yasuyoshi HISAMOTO1), Yayoi MIYAGAWA3), Emiko ANDO3) and Eijiro HIROHAMA3)

1) The Graduate University for Advanced Studies Sokenlai, Hayama, Japan
2) Graduate School of System Design and Management, Keio University, Yokohama, Japan
3) JAXA Space Education Center, Sagamihara, Japan

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Space education has been the leading role to inspire the young to hold interest in science and technology and learn to set goals. Japanese university students who want to actively participate in these kinds of activities are increasing. However, when students tempt to carry out space education on their own, they confront difficulty to get financial support, place and time. In this paper, we show the example of the lecture carried out during IAC 2010, which could be one of the solutions for the problems for Japanese university students.

Key Words: Education, Outreach, University Student, IAC2010

1. Introduction

Space education has been the leading role to inspire young people to hold interest in science and technology, and learn to set goals for their futures. Since interest of social action program and demand of ability of scientists and engineers to communicate science and technology have been raised lately, university students who wish to play an active role in space education activities have been increased. 1)

However, when students attempt to carry out space education on their own, they confront difficulty to get financial support, place and time. In order to expand the space education activities, those problems above must be solved, and create more space education opportunities facilitated by university students.

One of the solutions is to cooperate with JAXA Space Education Center that is providing opportunities to have a student lead outreach activity at the international conferences. There are so many outreach activities such as “kimi-ssion” 2), “Ginga-Gakko” 3), ISU outreach activities, and outreach activities by space agencies during the international conferences such as DLR booth at IAC. However, student lead outreach activity at the international conference is unique in IAC JAXA student program.

The importance of this opportunity is that students can experience the outreach activity in the world and be able to interact with students from other countries through space education. It is not just an outreach activity but also a wide range of educational opportunity.

As the practice of this solution, we’ve had an outreach activity through IAC2010 JAXA Student Program. JAXA Space Education Center selects the students for the JAXA Student Program and supports voluntary student outreach program every year at the IAC conference held throughout the world. In 2010, the activity was held at a Japanese School in Prague. We would like to introduce the details of the outreach activity at Prague Japanese School as an example of holding space education activities during international conferences participation. (IAC2010 JAXA Student Program is within a framework of the International Space Education Board (ISEB), which was established by CSA, ESA, JAXA and NASA to promote space education.)

The purpose of this paper is to report one of the outreach activity methods that how beneficial for students to hold an outreach activity while participating IAC2010 JAXA student program.

2. Report of Activities in IAC2010

2.1. Summary of activities

IAC2010 was held in Prague, Czech Republic in September 2010. The outreach activity was conducted at Japanese School in Prague. The university students who participated in this activity were 15 students from IAC 2010 JAXA Student Program.

This program was conducted by university students and was

<table>
<thead>
<tr>
<th>Group</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>1st - 2nd</td>
<td>3rd - 5th</td>
<td>6th - 9th</td>
</tr>
<tr>
<td>Number of Pupils</td>
<td>40</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>Contents</td>
<td>Folding Miura-Ori and Making plastic umbrella bag rocket</td>
<td>The game of folding and deploying a solar sail</td>
<td>Lecture of “IKAROS” and making paper craft of solar sail.</td>
</tr>
<tr>
<td>University students</td>
<td>5 students</td>
<td>5 students</td>
<td>5 students</td>
</tr>
</tbody>
</table>

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planned by the following criteria;

1) The program should trigger interest in space science.
2) The subject should be Japanese own space science and technology.
3) The program should involve something which children can actively participate in by using their bodies.
4) The program should consider educational levels in each grade.

Since the world’s first solar sail was launched in 2009 in Japan, we decided to carry out our activities based on the subject. We divided children into three groups. The contents of the plan for each groups is shown in Table.1. Details of the activities are described along the time series in the following chapter.

2.2. Advance preparations
Preparation for the lecture was done in two steps, one in Japan, and the other in Prague.
In Japan, we planned the program and selected materials for it. JAXA Space Education Center staff coordinated with local school, provided materials, and sends them to the school in Prague. Supports from JAXA Space Education Center are summarized in Table 2. During preparation period, we held two plenary meetings. For details, we communicated via e-mail.
In Prague, university students used free time at night after the conference in the hotel to prepare the teaching materials.

Table 2. Supports from JAXA Space Education Center.

| 1. | Coordination with Japanese School in Prague |
| 2. | Provision of educational materials |
| 3. | Delivery of educational materials |
| 4. | Local coordination |
| 5. | Educational advice of program |

2.3. Main activities for Group 1
Group 1 pupils learn about the relationship between their life and spacecraft. In addition, they made Miura-ori as hands-on activity. The Group 1 activities consisted of a 10-minutes lesson and 15-minute hands-on activity. They were divided into approximately ten small groups.

2.4. Main activities for Group 2
The subject of Group 2 was IKAROS Project. We conducted a game using a solar sail which we made from a garbage bag to understand unique techniques while having fun. (See Fig. 3) The students of Group 2 were divided into four groups. Students competed how beautifully and fast they can fold the membrane.

2.5. Main activities for Group 3
We introduced the overview of the” IKAROS” project to Group 3 students and taught how to fold the membranes of the solar sail. We also provided opportunities to make their own paper-craft and conduct a deployment test.
2.6. Main activities for all students

The activity for all groups is to conduct a water rocket launch. Water Rocket are easy to build and test. It is known as the best material to learn space science and technology. However, because the activity time was limited to 45 minutes, we used water rockets which were built beforehand. We donated water rocket production kits and the water rocket launching pads to the school for them to keep inspiring the students. University students explained to the teachers how the water rockets could be used in educational programs.

Fig. 6. Launching water rockets in the schoolyard.

3. Effects of this Outreach Activity

3.1. Results from university students

We surveyed university students and teachers of the Japanese school in Prague after coming back to Japan. The reflection of taking the survey is that we only took the survey after the event, but we should have taken a survey before the event. The survey among university students was to assess the effects of changes in interest and the amount of work in the space education activities. In addition, the survey among teachers is to know the changes of interest in science among children and the burden of the teachers to accept the program.

The questionnaire was answered from ten university students and eight teachers. The questionnaire consists of five multiple choice or free description questions. We summarized the results of questionnaires from the ten students who participated below.

Q.1) Have you had interest in outreach activities such as science education and space education?

Answers:
1) The subject “space” is very broad and vague, but using games and hands-on activities helped students to understand the subject. Even lower grade students were able to feel closer to “space.”
2) I realized that I have higher motivation for space Education. I would like to participate in similar activities if there are opportunities.
3) The IAC2010 JAXA Student Program was not only about learning space from the conference but also experiencing to teach about space to children. This activity definitely enlightened my future.
Q6. How can we improve this activity for the next time?

Answers:
1) I strongly felt that we should make the activities targeting lower grade should be simpler and easier. It is too early to teach Miura-ori to the first graders. I thought we should have let them draw pictures on a long plastic umbrella bag and make a rocket out of it. We should put more students to take care of lower grades since they like to gain attentions from the adults.

2) I think collaboration with other university students is the most difficult part of this activity. Using Skype and e-mails were the only tools for our communications. Those means of communications do not help us physical preparations. Since it is difficult to meet up with the members in scattered locations, I think it is important to find out how we can effectively work on the project.

3.2. Results from teachers

We summarized the results of questionnaires from eight teachers who participated.

Q.1) When you received the request for this program, how did you feel?

Q2. What were your difficulties in the program?

Answers:
1) It was difficult to prepare in our side because we didn’t have the detail information of the classes.

2) It unexpectedly took so much time to receive materials from Japan. We received the packages a day before the actual event. If JAXA staff told us about sending packages to us, we could have asked for help from the Japanese embassy so that it may go through customs smoothly.

Q3. Were you satisfied with the classes?

Q4. How was the length of class hours?

Q5. Was the course content appropriate for the students?

Answer:
Miura-ori was difficult for the students. I wanted my students to make an umbrella bag rocket.

Q6. Did university students teach appropriately?
Q7. Was the class taught by the university students effective?

Answers:
1) Sometimes, students (children) destruct the attentions from some random words from the instructors.
2) It was good that children made circles around the university students and the university students spoke to them through their eyes. I saw the children attracted to the space and passion of the university students. I saw the children's eyes glowing.
3) Teaching from big brothers and sisters (university students), who are closer to the children, was very effective.

Q8. Are there any effects in their interests in science after the class?

Answers:
1) Some students checked internet with the extension of what they have learned from the class.
2) Some students had strong impression of the class, and wrote about it as a memory of this year in the end of the school year.

4. Discussion

There are some good outcomes of the activity we found from the survey. Most of the university students were moderately interested in space education from the beginning. As seen in Fig. 7, “Interest” in the middle of the graph is the highest rate. After the activity, their interest raised that the highest rate is shifted to “Extremely Interesting”. Most of them said that they would like to involve in space education. In addition, they were satisfied with the support from JAXA Space Education Center as shown in Fig. 10, and most of them were able to make balance with the outreach activity and the conference. (See Fig. 9) The issue for the future is to improve communications between students before the event and choosing appropriate theme for each grade.

The expectation rate was high among the teachers among Japanese School in Prague (See Fig. 11). Fig. 12 shows that satisfaction rate is almost the same as expectation rate. Moreover, there is some positive feedback on the interest on science among children as shown in Fig. 16. Classes given by the university students received high reviews from the teachers according to the comments from Q7 (see answer 2 and 3 from Q7, and Fig. 15). On the other hand, there are some areas of improvements in this activity such as, methods to deliver the materials, difficulty levels of the themes, teaching methods, usage of teaching materials and so on. (See answers from Q2, Q4, and Q7.)

5. Conclusion and Future Prospects

According to the survey, we found that university students, teachers, and children raised their scientific interests from this activity. In order to improve our outreach activities, we would like to resolve certain issues including logistics and setting appropriate difficulty levels of the themes which were found from our present study.

“Student lead outreach activity” will be a good tool for university students to gain a well-rounded education by applying their theoretical knowledge. Thus, both children and university students are educated from these activities. We believe that cooperation between university students and JAXA Space Education Center using international conferences opportunity is beneficial for both students and society. In addition, it will fulfill the meanings of student lead outreach activities stated above, and will contribute to vitalize space education in wide areas. In the future, we expect more university students to involve in the outreach activities participating JAXA Student Program in IAC and other international conferences opportunities. This opportunity also touches children’s curiosity to enter the scientific realm. As those children get older, they may involve themselves in the space education to teach the next generation also. We are confident that this will create an educational cycle to benefit the society. We encourage students to take this opportunity for their benefits.

Acknowledgments

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