

Report of JAXA Space Education Center

on Its Activities in 2005 -2006



REPORT OF JAXA SPACE EDUCATION CENTER ON ITS ACTIVITIES IN 2005 AND 2006

(Issued in November 2006)

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I. INTRODUCTION

Japan Aerospace Exploration Agency (JAXA) achieved a milestone in space education in Japan. On 1 May 2005, JAXA established a Space Education Center by an executive decision by its President.

The establishment of the Space Education Center was a dream that had come true for those who were determined to spark a bright flame in children's hearts and minds by making full use of attractive space materials that JAXA had in order to respect Mother Nature and lives of all creatures on our planet Earth. The Center would serve as a solid base for working with school teachers around the country, united by their love for children and determination to create bright future for young people.

The Space Education Center was officially opened on 19 May 2005 and is located within Sagamihara Campus of JAXA.



<Opening of the Space Education Center>
Left : Prof. Y. Matogawa, Director, Space
Education Center
Right : Dr. K. Tachikawa, JAXA President



<Staff of the Space Education Center>

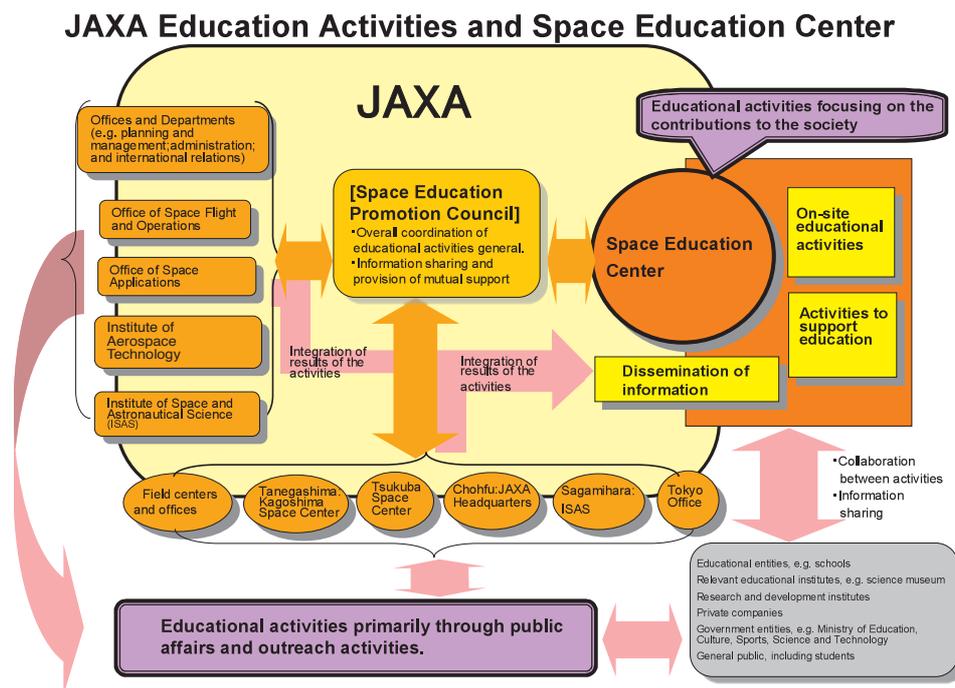
II. BACKGROUND OF THE CENTER

A. Educational Activities of JAXA and the Space Education Center

Educational activities of JAXA had long been carried out as part of the public relations and outreach activities. Those activities focused on increasing public awareness and understanding of the work of JAXA that brings societal benefits for the Japanese citizens. Those activities also contributed to promoting space activities as a whole.

The growing recognition of the fundamental difference between public outreach and education resulted in the establishment of a separate unit dedicated to space education activities. Those education activities focus on contributing to developing human resources to support the country in the bright future.

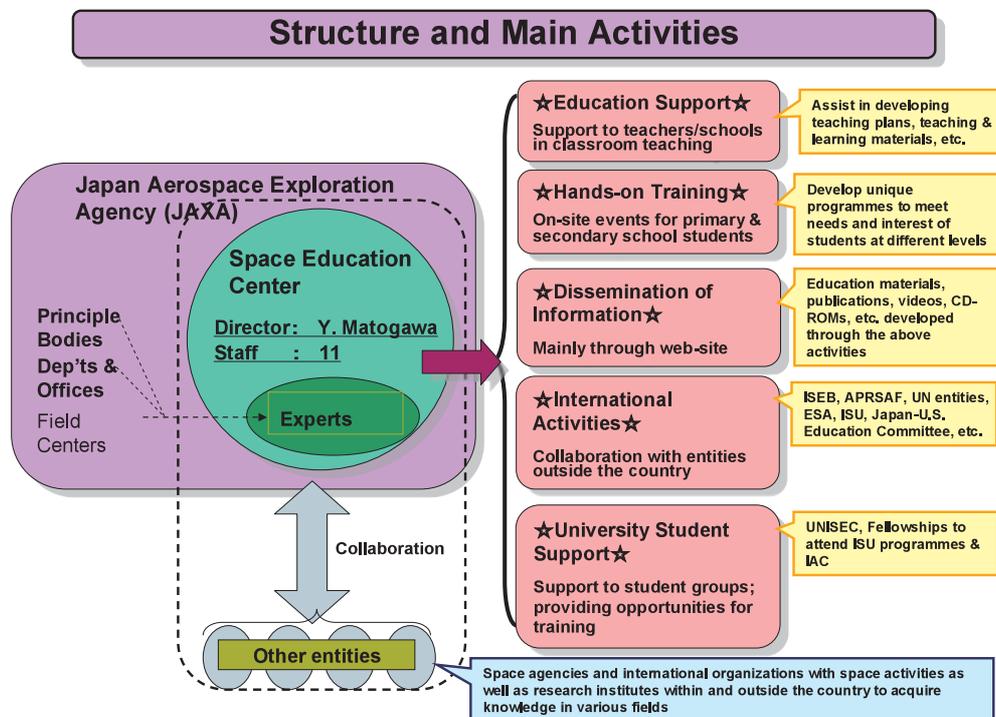
The Space Education Center does not work in isolation. It collaborates with the Public Affairs Department as well as other offices, departments and research institutes that have educational elements in their activities and that have space engineering and science expertise to enrich the content of educational programmes and materials. For example, the Center works in close cooperation with the Outreach Group of the Public Affairs Department, which continues to send JAXA staff to give talks on various space topics at schools around the country particularly during the one-month period celebrating Space Day in Japan, 12 September. The Space Education Center also works closely with the Space Environment Utilization Center, which carries out education-related activities in association with Space Shuttle flights and the International Space Station.



B. Organization and Structure

The Space Education Center itself is a virtual entity the operation of which could be considered similar to a time-bound project. The Space Education Office, which serves as the implementing body of the Space Education Center, was created by transforming the Education Group of the Public Affairs Department. The establishment of the Space Education Center, therefore, did not result in an increase in the number of organizational units within JAXA.

The Space Education Office currently consists of 6 regular staff members and 10 invited or contracted staff, of which 3 are full-time staff. A several researchers of the Institute of Space and Astronautical Science (ISAS) were appointed as technical advisers to the Center, to participate in the strategic planning of the activities of the Center on a regular basis. Other experts from ISAS or other research institutes, offices and departments work with the Center on an ad-hoc basis upon request from the Center.



III. GOALS AND PRINCIPLES

A. Mission Statement and Principles

The Space Education Center promotes space education as an effective means to develop human resources to build better future. By inspiring young generations to discover truths in the universe and to take up challenges in the exploration and the use of outer space, the Center endeavours to help young people acquire insights and develop their own visions as well as to increase their motivation to work together toward better future. The goal of the Center would be to use space activities as a common thread that links many different aspects of human activities and to inspire young people to realize the importance of life, the importance of the society and the importance of servicing the society for the benefit of all.

There are some principles followed by the Space Education Center in its activities.

The Center places importance on understanding the thinking process behind what is acquired as knowledge. The Center aims to take advantage of children's simple curiosity embedded in their minds toward nature, lives and space and to offer opportunities to experience the joy of solving mysteries by themselves.

Importance of life, or dignity of life, is the most important message that the Center endeavours to get across to young people.

The abundance of goods and services that meet various needs of people in Japan might indicate the richness of the society. However, that may not necessarily be true if the minds of people, especially those of young people, are taken into account. The alarming number of young people in Japan were observed to have no motivation to do anything, be pessimistic about their own future and even treat people's lives lightly and get involved in serious crimes. Those people involved in the establishment of the Center became deeply concerned about this, and they wanted to something about it.

Space was found to be an excellent tool to inspire and motivate young people to start believing that they can do more, achieve higher and have a bright future if they set their goals high and work toward those goals. When the young people who participated in the JAXA education activities realized that there had been a lengthy chain of relays of one life to another before a certain life was born and that the lives on the Earth today had come a long way from the pieces of galaxies and start, it was observed that many of them started to think deeply about the origin and evolution of lives, as well as the importance of life.

The Center is committed to increase the young people's appreciation of science and technology, in order to acquire insight in their daily lives and also to understand and master the logical thinking process.

The spirit of "Never Give Up" is considered important in the Center's activities, as this is something

essential for anybody who wants to achieve something significant in the present, challenging world. The history of the exploration and use of outer space is full of examples that show how important this spirit is.

Through its activities, the Center makes efforts to guide the young people to appreciate how important, and how exciting, it is to be part of the society to build a better future together. No individual can easily carry out space activities by themselves, but together, a large number of people with various backgrounds can build a global system that could benefit the global society. The Center focuses on enhancing young people's appreciation of the importance and the power of collective efforts made toward common goals and invites them to think about what they can do for their own society together.

Principles of Space Education Center

- ① **Understanding the thinking process behind the knowledge**
 - ★ Joy of exploring mysteries of life, the nature and the universe
 - ★ “Importance of life”
- ② **Increasing appreciation of “Science and Technology”**
 - ★ Important process of the development of a human being
 - ★ Mastering the logical thinking process
 - ★ Spirit of “Never Give Up”
- ③ **Understanding the importance of contributing to building better future**
 - ★ Responsibility as a member of the society

B. Main Activities

The Space Education Center carries out the following main activities: i) providing support to teachers and schools in their classroom teaching (education support); ii) organizing one-day events and short-term courses with hands-on training activities (hands-on activities); iii) disseminating educational programmes and materials (information dissemination); iv) supporting university students; and v) participating in educational activities organized by entities outside the country or organizing activities with partners outside the country through international cooperation.

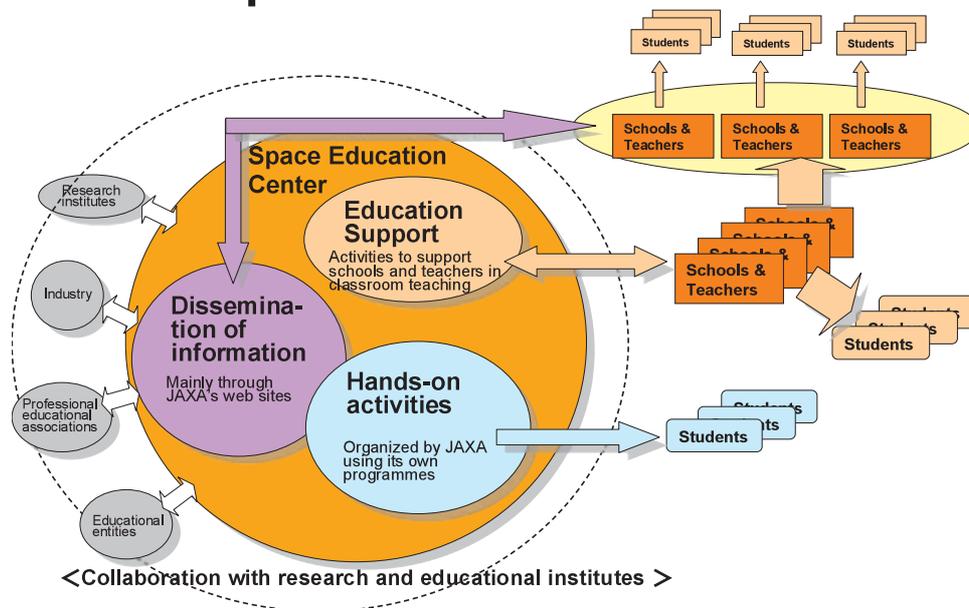
The Center concentrates its efforts on the first three activities listed above.

Through education support activities, the Center makes suggestions and responds to teachers' inquiries on how to introduce space science and technology into their classroom teaching or extra-curriculum activities. The Center assists the teachers in developing their own teaching materials and unique learning programmes for their classrooms.

Another priority activity is to organize on-site courses and events with hands-on activities. These events are mainly for primary and secondary school children, but there are some one-day seminars and short-term courses for educators and leaders of voluntary groups of young people interested in space activities. For these seminars and courses, the Center develops its own programmes, including instructor's manuals and textbooks for participants.

The teaching and learning materials as well as educational programmes that the Center develops through its education support activities or on-site hands-on activities are being made available on its web site for use by anybody interested in space education activities.

Priority Activities of the Space Education Center



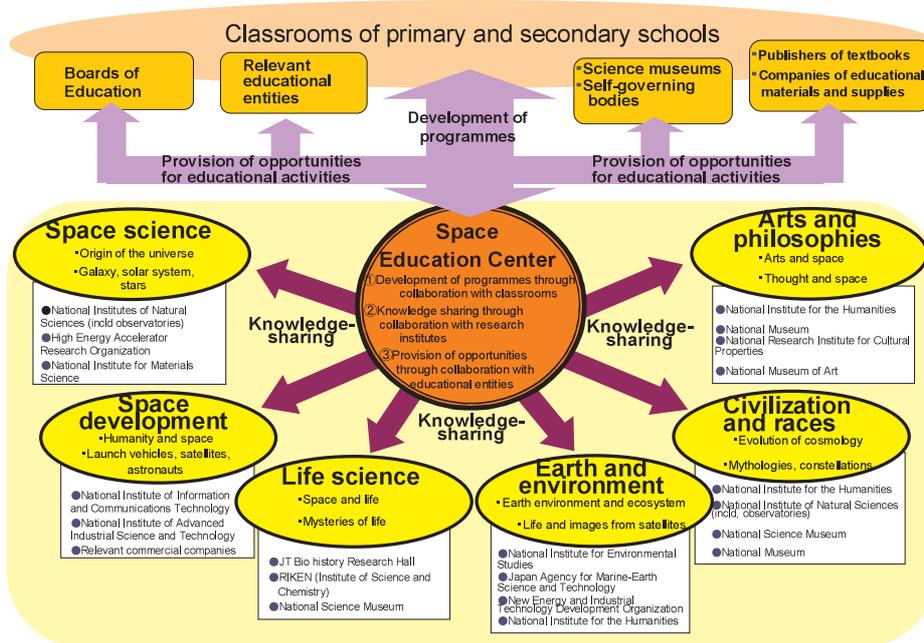
C. Collaborations with Relevant Entities

The collaborations and cooperation with various entities engaged in education are the key for success for the Space Education Center. Close collaborations with teachers are considered most essential. The staff of the Center stand ready to hold numerous consultations to exchange views and ideas with associations of teachers, boards of education as well as publishers of textbooks and companies of educational materials in order to enhance the activities of the Center to meet various needs of schools and classrooms.

The Center intends to work with many other entities that are involved in education and also expanding human knowledge. Not only with those entities involved in space science, space applications, life sci-

ence and Earth science, the Center endeavours to establish partnerships with those entities engaged in studies on humanities and civilizations as well as arts and philosophies, thus, taking a comprehensive approach in expanding space education activities.

System of collaborations



IV. EDUCATION SUPPORT

A. System to Support Teachers and Schools

The Center provides customized support to those teachers who have specific requests for the Center to assist them in introducing space science and technology in their classroom teaching or extra-curriculum activities according to the interests and needs of teachers and students.

Staff of the Center hold numerous consultations with those teachers to identify goals and to develop plans for their classroom activities. From among those experts of space science and technology as well as pedagogy and other fields who collaborate with the Center, it finds appropriate experts to provide knowledge and expertise to develop teaching and learning materials according to the plans developed with the teachers. Once the plans and teaching and learning materials have been developed, the Center sends its staff and appropriate experts to provide on-site support to the teachers during the planned classroom activities.

Providing customized support to teachers and schools consumes a large number of staff time and efforts. A plan for classroom activities normally consists of more than one lectures, and the period of those activities could last for one year, requiring a several visits by the staff to hold consultations. However, this will continue to be the priority of the Center, and the Center makes all its efforts to ensure that all the teachers that have received support from the Center achieve satisfactory results.

Not too many schools are able to adjust their existing curricula to accommodate extra activities that address space topics. The education support activities of the Center have focused on those schools that have been designated by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) as “Super Science High Schools” (SSH), which are expected to achieve concrete results in enhancing science and math education, or that have been selected by MEXT to implement “Science Partnership Programs” (SSP), which aim to provide more opportunities to stimulate intellectual curiosity of the students for science through collaborations with universities and research institutions. The Center has often provided support to those schools that have set aside time in the curriculum for “integrated learning”.

B. Reaching out to Schools around the Country: achievements in 2005-2006

From May 2005 to March 2006, the Center provided educational support to 20 schools in total, consisting of one elementary school, 5 junior high schools and 14 high schools. The number of class hours required for support from the Center varies a lot from school to another, ranging from one class of three hours to 46 classes of 50 minutes each. In total, the education support provided by the Center benefited 1,543 students and covered 205 hours of classroom teaching. The Center also supported the Board of Education of Kanagawa Prefecture in training a group of teachers responsible for SSP in developing plans for classroom teaching with the use of space topics.

1. Wakayama School for Handicapped Children

The experience with Wakayama School for Handicapped Children motivated the staff of the Center to reach out to schools around the country regardless of various challenges they face in providing customized support to meet their unique needs.

The passion of the teachers of this school encouraged the staff of the Center to respond positively to their request although the staff had not had experience with working for handicapped children. Together with this school, the Center organized a one-day space class, and the handicapped children were given the task of creating their own “petit” rockets out of plastic containers for camera films and using bubble-creating bath tablets and warm water as propellants. It was not an easy task for them, but none of them gave up creating their own rockets. Their excitement, as well as that of the teachers, reached the highest when they finally succeeded in launching their own petit rockets after so many hours of trial and error.

The beaming faces of those children who gained confidence in their own ability encouraged the staff of the Center to reach out to all children regardless of the limitations in their physical abilities or hurdles in social and economic circumstances.



<Flying “balloon” rockets>



<Students of Wakayama School for Handicapped Children>



<Making “petit” rockets>



<Launching “petit” rockets>

2. Tanegashima Chuh-hei Elementary School

The Center has provided support to a school in Tanegashima, where one of JAXA's space centers with launch complexes is located. Tanegashima Chuh-hei Elementary School uses the time allocated to “integrated learning” in its curriculum to study the environment. The Center has assisted self-studies by the students on the difference between the Earth and other planets in the Solar System and on environmental changes with the use of images provided by Earth observation satellites.



<Scene from Chuh-hei Elementary School>



<Lecture on the planet Earth>

3. Shimosuwa Yashiro Junior High School

Shimosuwa Yashiro Junior High School has been carrying out “Yashiro Space Project” for four years as part of its “integrated learning” activities. The Project is open for participation by any interested students regardless of their classes. The highlight of the Project was drawing a map of the Solar System on the playground of the school at a reduced scale. By doing calculations to make models of planets at a reduced scale and plotting the orbits of those planets on the map, the students had opportunities to feel the vastness of the universe and increased their appreciation of their own existence.



<Map of the Solar System>



<Scene from Shimosuwa Yashiro Junior High School>



<Lecture by Prof. Y. Matogawa, Director,
Space Education Center>



<Lecture by Mr. K. Watanabe, Director,
Space Education Office>

4. Ya'ei-nishi High School

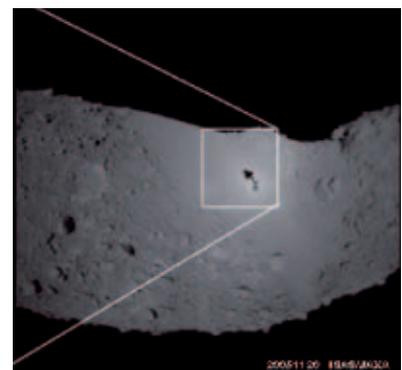
Assistance is provided to local schools around the Space Education Center. Students of Ya'ei-nishi High School, which is only fifteen-minute walk from the Center, had opportunities to directly talk to the researchers and experts involved in “Hayabusa” mission. They learned about how Asteroid Sample-Return Spacecraft “Hayabusa” overcame technical challenges of landing on and sampling Asteroid “Itokawa” 300 millions kilometers away from the Earth. Considered as one of the finest achievements in the history of space exploration by Japan, “Hayabusa” mission was full of stories of never-ending pursuit of curiosity and adventures, rising to challenges with courage, achieving the maximum through teamwork, based on the spirit of “Never Give Up”. The stories of “Hayabusa” touched the students so much that when they made a school trip to Okinawa, they brought back a local charm to “Hayabusa” team, to protect “Hayabusa” on its way back home to the Earth. Their charm, known as “Sheh-sah” in Okinawa, is still sitting in the control room for “Hayabusa” mission.



<Image of “Hayabusa”>



<Hayabusa on Asteroid “Itokawa”>





<Visiting Institute of Space and Astronautical Science and listening to explanations by an expert in front of “Hayabusa” model>

5. Sagamidai Technical High School

The students from Sagamidai Technical High School decided to take up the task of making self-propelled rovers. Through the arrangements made by the Space Education Center, the students received assistance and advice from the researchers who are actually involved in rover research, and they studied how to communicate with the rovers at remote, unexplored areas. The students received hands-on training on software development, test runs of rovers in a mock space environment, and tele-operation of rovers, among other things. By experiencing the first step toward the advanced space robotics engineering, the participating students appreciated the difficulties of space exploration as well as the importance of continuous challenges to overcome difficulties.



<Training on software development>



<Test run of a rover>

6. Receiving school visits

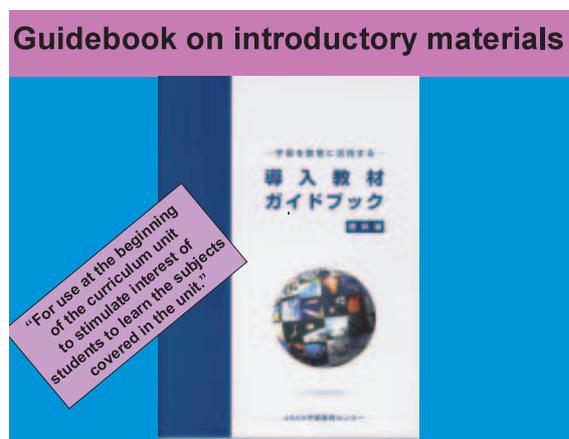
The Space Education Center receives numerous requests from schools to receive their visits. During the school visit, the Center normally offers a lecture on space subjects for about an hour. In the period from April 2005 to March 2006, the Center received 150 schools, totaling 1,733 students.

C. Developing introductory materials

To support many school teachers who are too occupied with the existing curricula and teaching requirements and unable to set aside time for any additional activities to address space subjects, the Center has begun developing materials that could be used by those teachers to integrate space topics into the existing curricula. Introductory materials are designed for use by teachers at the beginning of a study unit to stimulate students' interest in the subjects to be learned covered in the unit.

The Working Group on Introductory Education Materials, consisting of space scientists and engineers, teachers of elementary and junior high schools as well as professors of pedagogy, examined all textbooks of science for elementary and junior high schools. They identified sections of the textbooks where space activities could be introduced or space-derived images and information could be presented in association with the subjects to be taught in those sections. "Guidebook of Introductory Materials: Science", which the Working Group has first produced, consists of ten space-related materials. Each material is provided with: i) background information of the relevant space activities; ii) explanatory notes on what is expected to be taught and learned in the textbook at elementary and junior high school levels in association with those space-related materials; iii) examples of how those space-related materials could be used in classrooms and sample questions that could be addressed to students; and iv) a list of relevant chapters and sections of particular textbooks.

The Working Group is currently working on producing similar guidebooks for the homemaking course and Japanese language and intends to produce guidebooks also for social science, music, and other courses.



<<"Guidebook on Introductory Education Materials: Science Course">



<Developing educational materials for the homemaking course in the Working Group on Introductory Education Materials>

V. HANDS-ON ACTIVITIES

Hands-on, on-site activities are organized by various research institutes and offices of JAXA mainly for primary and secondary school students. Those institutes and offices develop their own programmes for the activities.

There are mainly three categories. One is known as “Cosmic College”, which currently offers four different courses depending on the school grades of the participating school students and the levels of their background knowledge of space activities. Cosmic College also offers courses for school teachers and educators. Activities of Cosmic College are planned, organized and managed by the Space Education Center.

During the one-month period around 12 September each year, which is designated as “Space Day” in Japan, JAXA sends its staff, mainly through its Public Affairs Department in cooperation with the Space Education Center, around the country to offer “Space Classes” at schools upon request. In those “Space Classes”, JAXA staff provide lectures on various topics relating to space and aeronautics. In 2005, JAXA offered “Space Classes” at 51 venues in the one-month period.

For primary and secondary school children, the annual Mars Rover Contest is held. In 2005, there were 64 entries, and the Contest was attended by 805 people.

For students of high schools and technical colleges, JAXA space centers in Tsukuba and Kakuda as well as JAXA headquarters in Chofu organize Science Camps each summer. During the three-day programme of the camp participating students learn about space research and development at the Campus in Tsukuba, aeronautics in Chofu and rocket engines in Kakuda.



<Mars Rover Contest>

A. Cosmic College

The Cosmic College aims to achieve the following objectives: i) to increase interest of young people in science and technology; ii) to help establish voluntary groups of young people that are fond of science and technology; iii) to motivate young people to pose questions, think and find solutions by themselves; iv) to encourage collaborations with others; v) to lead young people to appreciate the importance of life.



<Studying sands>



<Conducting a scientific experiment>



<Visiting JAXA research facilities>



<Demonstration of a scientific experiment>

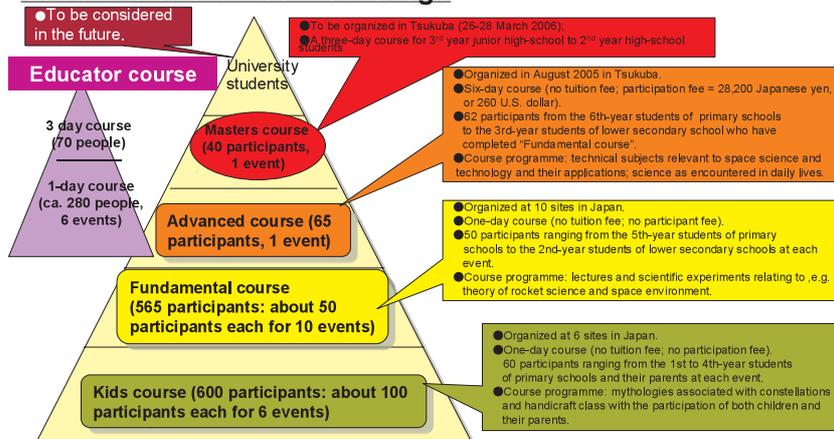


<Presentation of traditional handicraft work>

With those objectives, the Cosmic College held, in the period from May 2005 to March 2006, six Kids Courses for 300 pairs of a child and a parent in total, ten Fundamental Courses for 565 students in total, and one advanced course for 65 students and one masters course for 43 high school students.

Cosmic College : Achievements in FY 2005 (April 2005 - March 2006)

Structure of the Cosmic College



1. Kids Course

“Kids Course” is for the first- to the fourth year students of primary schools, from 6 to 10 years old. The one-day programme of the Kids Course is designed for the participation of school children together with their parents. The programme focuses on providing opportunities for the school children to enjoy doing something together with their parents. Examples of activities include learning about constellations and related mythologies as well as creating basic models of rockets.



<Making paper spacecraft >



<Making mobiles together>

2. Fundamental Course

“Fundamental Course” is for the upper-level primary school students up to the second-year students of secondary schools, from 11 to 14 years old. Through the one-day programme, the students learn about basics of space science and technology, such as basics of rocket science and engineering, space environment and Earth sciences. The programme also includes some basic, scientific experiments to be conducted by the participating students.



<Conducting a basic scientific experiment>



<Learning about how the rockets fly in space>

3. Advanced Course

“Advanced Course” offers a six-day, comprehensive programme for those who have completed “Fundamental Course”. The participating students learn about various specific subjects relating to space activities, such as the mechanism of flying and rocket development, the history of the universe and its future, unique features of the Sun, status of the Earth, planets and the search for life in the universe, space environment and the International Space Station. They also have opportunities to participate in a wide range of hands-on activities, such as developing and flying hot-air balloons, observations of constellations and satellites as well as building rovers and computer programming to run the rovers.



<Visiting JAXA research and development facilities>



<Flying hot air balloons>

4. Masters Course

Starting from 2006, the Cosmic College offers “Masters Course” for those high school and technical college students who have completed “Advanced Course”. Through the three-day programme, the participating students are provided with opportunities to receive on-the-job training at JAXA research centers. It aims to encourage the students to pursue space-related career. This Course serves to conclude the comprehensive training offered by the Cosmic College.



<Visiting JAXA research and development facilities>



<Simulation of rocket launch>

5. Educators Course

The Cosmic College also offers courses for school teachers. The primary objective of the “Educators Course” is to provide training opportunities for school teachers as well as the leaders of voluntary groups of young people who carry out educational activities with the use of space topics and materials. There are three-day courses and one-day courses. With these participating teachers and leaders, the Space Education Center shares the methods and materials that the Center has developed for Cosmic College courses. The programme of the Educators Course includes not only lectures on space education as part of scientific education as well as on space and education, but also hands-on training for the teachers, for example, through rocket experiments.



<Flying a hot air balloon>



<Demonstrating an experiment of solar power battery>



<Discussing how to introduce the experiment in the classroom>



<Making educational materials relating to space activities>

B. Leaders Seminar

The Space Education Center offers seminars to train leaders who organize space education activities on a voluntary basis for young people. With the primary objective of expanding space education activities for young people, to appreciate the importance of life and to acquire the ability to think and take necessary actions, Leaders Seminars were held at nine venues during the period from May 2005 to March 2006, providing training opportunities for more than 200 teachers and leaders of voluntary groups of young people.



<Experiencing the water rocket launch>

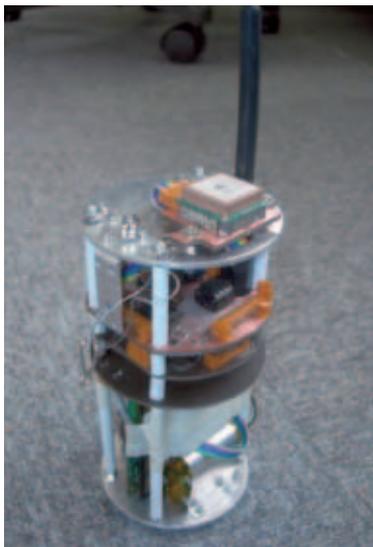
VI. SUPPORT TO UNIVERSITY STUDENTS

A. Supporting University Space Engineering Consortium

While the Space Education Center envisages the organization of activities for university students in the future possibly through its Cosmic College, the current focus of the Center's support for university students is on providing financial and in-kind support to the University Space Engineering Consortium (UNISEC). UNISEC is a non-profit organization to support practical hands-on space training activities carried out by universities and colleges. The membership includes 35 university laboratories with more than 300 students. 165 other individuals provide support to UNISEC activities.

The highlights of the activities of UNISEC include the development of: i) CanSat, made of a soda can of 350 ml with all basic functions of a satellite, such as power, communications, a GPS receiver for position sensing and control device for maneuvering parafoil; ii) CubeSat, 10 cm., 1 kg, small satellite, using commercially available components, that can be turned into high-performance space systems, for example, for Earth observation and astronomy; iii) Ground Station Network, to link stations at multiple universities that have launched their CubeSats, to maximize data collection and command transmission opportunities; iv) Hybrid Rocket, utilizing rubber-like organic material as fuel, combined with liquid oxidizer.

With the assistance provided by the Space Education Center, UNISEC recently developed a complete kit to develop CanSats accompanied with an instructor's manual. With this "CanSat Kit", anybody from high-school and above should be able to develop their own CanSats.



<Fitting sub-systems into a soda can to make a CanSat>



<CanSat>



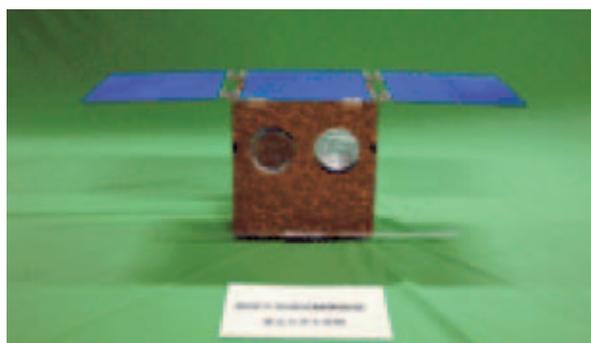
<Launching an amateur rocket: participation in ARLISS, A Rocket Launch for International Student Satellites, Nevada, United States>

B. Supporting Joint Events for University Students

Together with other organizations, the Space Education Center convened a Satellite Design Contest for students of universities and technical colleges, with the purpose of providing opportunities for the students to participate in the basic and applied research and of expanding the base of human resources to support space research and development in the future. The students competed for the most creative ideas for the mission and design concept.



<Award ceremony of the Satellite Design Contest>



<Entry of the team of graduate students of Tohoku University winning the Best Design Award>

C. Providing Opportunities for Training and Knowledge-Sharing Abroad

1. Programmes of the International Space University

As part of its contributions to the implementation of the Memorandum of Understanding between JAXA and the International Space University (ISU) for cooperation, which was signed in December 2003, the Space Education Center established JAXA fellowships to support Japanese students to participate in the Space Studies Programs and Master's Programs of ISU. These programs are being carried out based on ISU's concept of 3 I's, i.e. international, interdisciplinary and inter-cultural programme elements.



<Visiting a research facility>



<Hands-on experiment>

<Photographs : courtesy of ISU>



<Model inter-governmental meeting>

(Photograph : Courtesy of ISU)

2. International Astronautical Congress Student Participation Programme

Together with the Canadian Space Agency (CSA), European Space Agency (ESA) and National Aeronautics and Space Administration (NASA) of the United States of America, JAXA through its Space Education Center jointly organizes the Student Participation Programme during the annual International Astronautical Congress (IAC). For the IAC held in Fukuoka, Japan in October 2005, JAXA, through the funding support from the Space Education Center, sponsored close to 100 Japanese students to participate in IAC and various activities of the Student Participation Programme.

The activities of the Student Participation Programme during IAC in Fukuoka included: i) the organization of “International Student Zone”, which served as the place for interactions between students and experts participating in IAC; ii) “Tree Workshop”, where the students discussed and developed their visions for space activities in the next 20 to 30 years, under the topics of world heritage and natural preservation, natural disaster monitoring, manned spaceflight and exploration, and space education and awareness; iii) CANSAT activities, through which a several teams of students competed to design small can-sized satellites, to launch and return them to a designated spot. The results of all these activities were presented at the Student Plenary Session of IAC.



<Orientation session>



<Lunch time lecture on life science >



<Having intense discussions during Tree workshop>



<Displaying Students' posters>



<Hands-on training on CanSats>



<CanSat comeback competition>

As for IAC held in Valencia, Spain, in October 2006, JAXA funded the participation of 18 Japanese students, by defraying the cost of their air travel, accommodation and registration fee for IAC, among other things. The students enjoyed the opportunities to attend various IAC sessions and events as well as interactive sessions with senior managers and leading experts from CSA, ESA, NASA and JAXA, specially organized for the participants of the IAC Student Participation Programme.



<Orientation session, Valencia, Spain>



<Interactive session with Heads of Education from CSA, ESA, JAXA and NASA>



<The group of Japanese students participating in IAC 2006 Valencia Student Participation Programme>

In addition, the group of Japanese students took the initiative to organize a water rocket session for local primary and secondary school children. Through the water rocket workshops, the Japanese students taught how to make water rockets and provided opportunities to local school children to experience the launch of water rockets that they made.



<Teaching how to make water rockets>



<Counting down, in Spanish, for the water rocket launch in Valencia>

The winners of the national CanSat competition also joined the group of Japanese students to participate in various activities held during IAC, including those of the Student Participation Programme. In addition, they were invited to participate in the CanSat Demonstration organized by ESA.



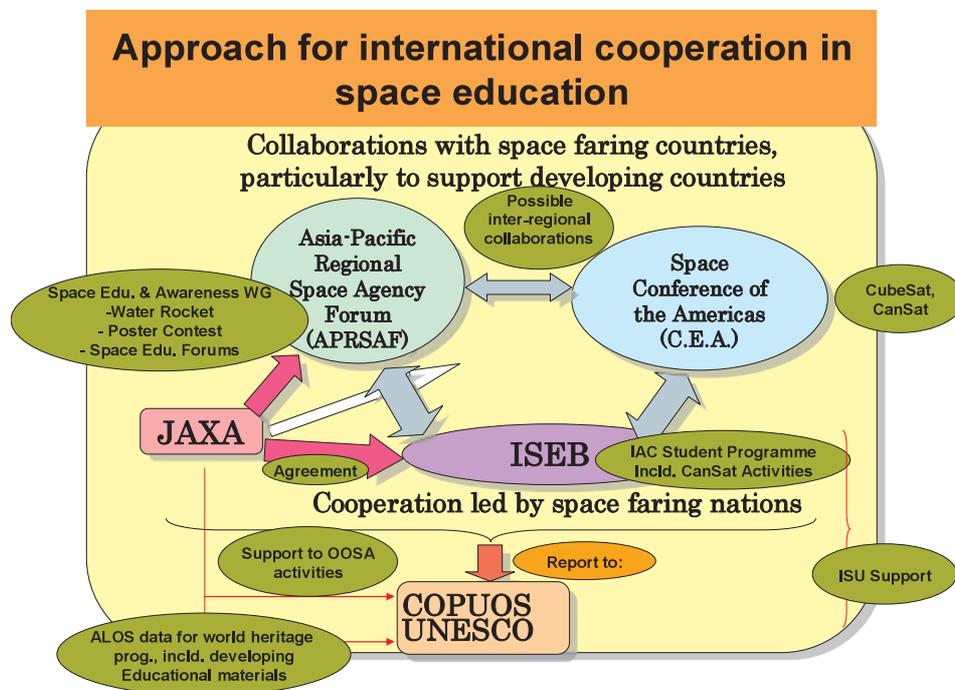
<Participating in CanSat Demonstration>



<Group photo with the participants of CanSat Demonstration>

VII. INTERNATIONAL ACTIVITIES

Based on its goals and principles, the Space Education Center is expanding partnerships to entities of other countries and international organizations. The Center values the opportunities offered through International Space Education Board, ISEB, to work with leading space agencies with established education programmes. At the same time, the Center considers it important to exchange ideas and experience with those countries with increasing interest, and potential, in expanding their space capabilities and carrying out space education activities. To establish partnerships with those countries, it was found beneficial to use the existing regional mechanisms, such as Asia-Pacific Regional Space Agency Forum (APRSAF) and the Space Conference of the Americas. The Center considers it also important that the activities carried out by the Center through those regional mechanisms lead to creating synergies with efforts made by the entities responsible for global cooperation, such as the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and the United Nations Educational, Scientific and Cultural Organization (UNESCO), at the regional and global levels.



A. Within Global Framework for Cooperation

1. Among Advanced Spacefaring Countries: International Space Education Board

JAXA, through its Space Education Center, collaborates with the members of the International Space Education Board (ISEB), which was established by CSA, ESA, JAXA and NASA in October 2005 to achieve the following objectives:

- a) To increase science, technology, engineering and mathematics literacy achievement in connection with space;
- b) To support the future workforce needs of space programs

ISEB meets once a year, during the annual IAC. The work of ISEB is carried out by its Representative Working Group, consisting of one officer each from the ISEB member agencies. The membership is open to any public organisation carrying out space activities and pursuing education programmes. While this is a framework led by well-established space agencies, ISEB has potential of providing a global framework for cooperation in space education.

With regard to specific activities carried out within the framework of ISEB, the members, at its last session held in Valencia, Spain, in October 2006, agreed to pursue the following projects through joint efforts. i) student participation in the annual IAC and the Assembly of the Committee on Space Research (COSPAR); ii) international participation in NASA Academy; iii) ground station network project; iv) international CanSat competition; v) global education activities during long duration flights onboard the International Space Station; vi) similar projects to Delta Research School Project for the benefit of other countries.

Having completed the successful initial year under the chairmanship of ESA, which resulted in more frequent interactions among its member agencies to provide more space education and training opportunities for young people, ISEB agreed to welcome the application of the French Space Agency (CNES) to become its new member. ISEB members also agreed that NASA should assume the chairmanship for the next one year, until the next IAC session in 2007.



<Signing of the agreement to establish ISEB:
Fukuoka, Japan, in October 2005>



<Founding members of ISEB >

2. With Developing Countries: Entities of the United Nations system

The Space Education Center considers it important to work with such entities of the United Nations system as the Office for Outer Space Affairs and UNESCO Space Education Programme. Those entities provide global mechanisms for cooperation that benefit a larger number of countries and people than what the Center itself could possibly do.

a. United Nations Office for Outer Space Affairs and the Committee on the Peaceful Uses of Outer Space

The Space Education Center attended the meetings of the United Nations Committee on the Peaceful Uses of Outer Space when it took up the agenda item of “Space and Society” at its sessions in 2005 and 2006. Under that agenda item, the Committee focused its consideration on “Space and Education”, and the Space Education Center reported on its achievements and presented its perspectives for international cooperation in expanding space education activities through partnerships with various entities.

The Center also supported some of the training and educational activities organized by the United Nations Office for Outer Space Affairs.

In October 2005, the Center supported the organization of the United Nations / International Astronautical Federation Workshop on “Space Education and Capacity Building for Sustainable Development” by contributing to the development of the programme and participating in substantive discussions. The Workshop addressed: i) space education for primary and secondary school children; ii) education and training for space scientists and engineers; iii) enhancing public awareness; iv) strengthening international framework to support global and regional initiatives. Some of the recommendations of the Workshop stressed the importance of: i) hands-on training for teachers; ii) making education and teaching materials of space agencies available for use and dissemination by UNESCO; iii) dissemination of education and training programmes through media that are best suited for the local situations (e.g. radio); and supporting UN-affiliated Regional Centres for Space Science and Technology Education.

b. United Nations Educational, Scientific and Cultural Organization

The Space Education Center was invited by UNESCO to participate in its space education workshops held in Medellin and Bogota in Colombia in November-December 2005 and in Hue and Ho Chi Minh in Vietnam in March 2006. The space education workshop in Hanoi, Vietnam was jointly organized by the Center with UNESCO within the framework of APRSAF. At those workshops, the Center introduced water rocket activities as educational activities.



<Marking water rockets in Bogota, Colombia>



<Launching water rockets in Medellin, Colombia>



<Receiving a certificate for water-rocket launch event>



<Together with students of Hue Science College>

The water rocket activities introduced by the Center were enthusiastically welcomed by the school students and teachers participating in the workshops. Bogota Planetarium, which hosted the UNESCO Space Education Workshop, was successful not only to get about 400 children in total participate in the water rocket activities that it organized after the workshop, but also to organize a session for teachers, who then went back to their schools to teach their students with water rockets. Bogota Planetarium and the Association of Andean Universities (Uniandinos) are planning many more activities with water rockets.



<Showing their water rockets : Bogota>

In response to the increasing number of requests for information on water rocket activities, the Space Education Center is currently developing an instructive DVD and educator's manual for distribution in December 2006, on the occasion of the thirteenth session of APRSAF.



<Launching water rockets from the terrace of Bogota Planetarium >



<Making water rockets in Bogota>

B. Within Regional Framework for Cooperation

1. Focusing on Asia and the Pacific: Asia-Pacific Regional Space Agency Forum

In the region of Asia and the Pacific, the Space Education Center supports space education activities through the Asia-Pacific Regional Space Agency Forum (APRSAF). The Space Education Office serves as the secretariat of APRSAF Space Education and Awareness Working Group.

Through APRSAF, the Space Education Center introduced water rocket competition, which is becoming an annual regional event for secondary school students.

The first regional water rocket competition was held in Kitakyushu, Japan, in October 2005, immediately following the twelfth session of APRSAF. The event was a resounding success, with the participation of 70 junior high school students representing 10 countries from the region (Australia, China, India, Indonesia, Japan, Malaysia, Republic of Korea, Sri Lanka, Thailand, Vietnam). Following the success of the first regional event, the second Water Rocket Event is planned in conjunction with the next APRSAF session in December 2006 in Jakarta, Indonesia. During the second Event, the Space Education Center plans to organize a seminar for teachers and instructors of water rocket activities to exchange ideas for further enhancing water rocket activities as educational activities and for developing supportive teaching and learning materials.



<Making water rockets in Kitakyūshū, Japan>



<Getting ready for the water rocket launch>



<APRSAF-12 Water Rocket Competition>

Also within the framework of APRSAF, the Center organized a space education forum in Hanoi, Vietnam in March 2006 in cooperation with UNESCO. APRSAF/UNESCO Space Education Forum provided opportunities for the school students and teachers in Hanoi to learn about various subjects of space science and technology and to participate in hands-on activities in astronomy and water rocket.

Prior to the Space Education Forum, the Center organized an APRSAF Space Science Education Workshop, with the objective of bringing space scientists and educators together to enhance space education activities in the region. The participants of the Workshop recommended that there should be closer links between the members of the APRSAF Space Education and Awareness Working Group and researchers in space science and engineering within each country represented in the Working Group, to exchange ideas and views on how the efforts made by those researchers to enhance educational activities could be better supported within the framework of the Working Group. They also recommended that at its next meeting, the Working Group could give consideration to establishing an informal group of researchers in space science and engineering and educators that could serve as resource persons to assist in the work of the Working Group in carrying out joint space education activities within the framework of APRSAF.



<Participants of APRSAF/UNESCO Space Education Forum : Hanoi, Vietnam>



<Opening session at APRSAF/UNESCO Space Education Forum>



<Discussing space education strategies in the APRSAF Space Science Education Workshop>

For younger primary school students, a regional poster contest is planned during the next APRSAF session in December 2006 in Jakarta in Indonesia.

Through APRSAF, the Center endeavours to organize activities that would allow young people across the region to share the excitement and joy of accomplishing something together, beyond whatever the differences they may have.

2. Establishing Contacts with Entities in Other Regions

The Space Education Center maximizes opportunities offered through the global frameworks to find best partners for cooperation. It is considered important to identify and work with those entities that serve as the focal points for cooperation in the region.

For example, in Europe, cooperation with ESA is very important to the Center, as this would allow the Center to establish contacts and interact with various European entities and also to learn what would work to enhance regional cooperation. In November 2005, the staff of the Center benefited from attending “Science on Stage”, organized by EIROforum, consisting of 7 European research institutes. “Science on Stage” provides opportunities for and promotes the exchange of teaching methods among science teachers from around European countries. Possibilities are being explored to have Japanese teachers attend the next “Science on Stage” to engage in the exchange of ideas, experiences and methods to teach science with the use of space materials.

In Latin America, UNESCO provided the Space Education Center with an important opportunity to work with various entities of Colombia, which served as pro tempore secretariat of the Space Conference of the Americas, a mechanism to promote regional cooperation in space activities. The contributions of the Space Education Center in promoting space education activities by introducing water rocket activities were recognized at the Preparatory Conference of the Fifth Space Conference of the Americas, held in Santiago de Chile in March 2006, as well as the Fifth Space Conference of the Americas, held in Quito, Ecuador in July 2006.

As for Africa, the Space Education Center received in September 2006 a group of 10 science teachers from eight African countries (Kenya, Gambia, Ghana, Malawi, Namibia, South Africa, Tanzania and Uganda), who were participating in a training programme organized by Hiroshima University in cooperation with Japan International Cooperation Center. The staff of the Center shared the goals and prin-

principles of the Center with those teachers from African countries and introduced various courses offered at Cosmic College. A useful exchange of information and ideas took place with those African teachers particularly on hands-on activities to stimulate interest of school students in science.



<Presenting to the African teachers the goals and principles of the Space Education Center>



<Trying one of the scientific experiments used in the Cosmic College>



<With teachers from African countries>

VIII. DISSEMINATION OF INFORMATION

The education programmes and teaching and learning materials that the Space Education Center has developed through its education support activities and for hands-on, on-site activities are being made available through its web site, <http://edu.jaxa.jp>. This web site is meant to serve as a single-entry reference source of space education materials for use by any interested school teachers and others interested in space education.

The work to fully restructure the web site of the Space Education Center and renew its content was completed in November 2006. The renewed web site aims to achieve the following three main objectives: i) to serve as the focal point to disseminate information on space education activities and to provide a forum for exchanging ideas and information among educators; ii) to provide education materials, images and pictures that can be easily downloaded for use by educators in classroom teaching; iii) to make available immediately the teaching and learning materials developed through education support activities of the Center as well as reports on support provided to schools.

In addition, the Center distributes news letters to about 15,000 elementary and junior high schools in the country. For those interested, the Center disseminates “Mail Magazines” through the Internet services, to announce upcoming activities of the Center and to provide background and other relevant information on selected space-related topics.



<Restructured web site of the Space Education Center>

IX. CONCLUDING REMARKS

Using space as the common theme to address, we can help our young people to find something that gives them joy of working together and that gives them means to communicate with others beyond the barriers created by language, cultural and any other differences.

Space, it's a keyword to spark interest, imagination and inspiration of children in the world.

As the Space Education Center expands its space education activities with its partners, we in the Center will continue to focus on establishing the linkage between space and various aspects of our daily lives, our history and our future as well as strengthening the linkage between peoples, societies and countries. It is our dream that someday, what we do through space education would eventually play an important role in bringing civilizations together to work toward global peace and prosperity.