



JAXA Space Education Center

Report on Its Activities in 2017-2018



REPORT OF JAXA SPACE EDUCATION CENTER

ON ITS ACTIVITIES IN 2017 AND 2018

(Information as of March 2018)

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From the Director



In her 1965 book *The Sense of Wonder*, Rachel Louise Carson wrote, “If a child is to keep alive his inborn sense of wonder, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement, and mystery of the world we live in.” Children acquire various sensations naturally. The adult’s role is to support what they learn. Fulfilling experiences during childhood can lead to future innovations. Outer space is a very effective subject that provides opportunities for the youth to continue learning. With “to ignite the passion in children’s hearts” as our motto, JAXA Space Education Center offers programs in Japan and collaborates with other countries to promote their activities.

JAXA astronaut Dr. Norishige Kanai conducted protein crystal growth and a variety of other experiments as part of the Expedition 44/45 mission with the theme of “searching space for the secrets to a long and healthy life.” His field of expertise is medical science, focusing on managing the physical health of divers and submarine crews. Ricky Arnold, an educator and NASA astronaut, has been on the ISS along with Dr. Kanai on a long-term stay since March 2018. The many space experiments they have been conducting will surely lead to a brighter future for today’s youth.

JAXA Space Education Center has conducted a variety of initiatives in the past year. In our formal education support activities, we have helped teachers improve their lessons through their own capabilities. Our Cosmic College, Space School for Families, and Aerospace School programs have fostered independence in children. Our Space Science Reporter for a Day, which lets participating students observe a rocket launch, has provided excellent opportunities to increase students’ scientific interest and curiosity. We strive to share our views and insights on children’s learning and the outcomes from our educational programs, domestically and internationally. By doing this, we believe we will contribute to the young generation’s future.

A handwritten signature in black ink, appearing to read 'Nozomu Sakuraba'. The signature is fluid and cursive.

NOZOMU SAKURABA, Ph.D.

Director, JAXA Space Education Center



5-6 MAY-JUNE

APRSAF Space Education Seminar for Educators in Thailand

A Space Education Seminar for Thai elementary and junior high school teachers and museum curators was held at the National Science Museum Thailand. Held by JAXA along with the NSM (National Science Museum) and GISTDA (Geo-Informatics and Space Technology Development Agency), the two-day seminar offered lectures on a wide range of topics along with a panel discussion and practical training for making alcohol rockets and gyro models. The approximately 50 participants learned hands-on how familiar materials could be used in space education activities.



4 APRIL

Cosmic College / Space School for Families

April — the start of the new school year. The Cosmic College and Space School for Families are year-round programs at the JAXA Space Education Center. These programs make a fresh start every April. Cosmic College is a hands-on science learning program hosted by local communities throughout Japan. In Space School for Families, students and parents learn together using familiar materials through schooling and at-home learning. Each year numerous students participate in these programs that open the doors to intellectual curiosity.



English Search Site for Space Education Materials Opens

You can now search for educational materials in English through the Space Education Center's educational materials database website. Space School for Families texts and a variety of other materials on space and science can be downloaded free. Searches can be conducted with keywords or through learning methods such as "Make," "Research," "Exercise," and "Observe."

URL: <http://edu.jaxa.jp/en/materialDB/>



- A** Cosmic College
- B** Space School for Families: "Let's Build a Hot Air Balloon"
- C** English Search Site for Space Education Materials

7 JULY

Space Education Collaboration Seminar

A Space Education Collaboration Seminar was held in Komaki City, Aichi Prefecture, one of the Space Education Center's strategic partners. For the first time, this seminar focused on network building among five strategic partners near Komaki City.



Partnership Agreement Signed with Fujieda City, Shizuoka Prefecture

JAXA has signed a partnership agreement with Fujieda City in Shizuoka Prefecture. "Achieving the highest educational standard in Japan" as its slogan, Fujieda city is pursuing an ideal environment for education that can inspire other cities throughout Japan. Adopting space education is a part of such efforts.



7-8 JULY-AUGUST

KIMISSION (Making Your Own Space Mission)

Eighteen high school students gathered at the Institute of Space and Astronautical Science (ISAS) to participate in a five-day intensive program. With the guidance of ISAS graduate students and faculty, the students formed three groups and investigated

original space missions, such as sample return from a long-period comet, power-supply system for Jupiter exploration, and bacteria cultivation on Mars. The students presented their missions in front of a panel of JAXA professionals, followed by active discussions.



8 AUGUST

Open Campus at JAXA Sagamihara

As part of the JAXA Sagamihara Open Campus, the Space Education Center held an event at the Sagamihara City Museum with three activities of “making, thinking, and taking home.” Students made spinning tops, thought about space experiments, and took home handprints. The event was a huge success, with approximately 1,140 students attending.



A Open Campus at JAXA Sagamihara

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8 AUGUST

Teacher Training at JAXA Sagamihara Campus

JAXA hosted its first Teacher Training program. This program was designed to let teachers learn the core concepts of space education and experience the educational materials just like students do. At the end of the program, the teachers held a discussion and considered ways to incorporate space education in future classes. Having teachers participate from all over Japan was very inspiring.

B Teacher Training at JAXA Sagamihara Campus

Aerospace School

In addition to Taiki Aerospace Research Field, Kakuda Space Center, Tsukuba Space Center, and Chofu Aerospace Center, our Aerospace School was held at Tanegashima Space Center, with 100 high school students from all over Japan taking part. Themes were set according to each center's special features: Space science experiments (Taiki), rocket engines (Kakuda), space environment utilization (Tsukuba), aeronautical technology research (Chofu), and launch site development (Tanegashima). These themes were addressed through tours of the facilities along with intense discussions.

C Aerospace School



International Space Education Board



9-10 SEPTEMBER-OCTOBER

ISEB Student Program and annual meeting at the International Astronautical Congress (IAC) in Adelaide, Australia

Ten university and graduate students were sent by JAXA to join 44 of their peers dispatched from various countries under the ISEB international cooperative framework. In addition to participating in the IAC, students actively engaged in the special ISEB program, which consisted of various activities such as a cross-cultural awareness workshop, Question and Answer session with the heads of space agencies, lunchtime sessions, and space education outreach to local elementary and junior high school students. Through these activities, they interacted with each other to further deepen mutual understanding and friendship which should give them more

confidence and insight to lead the next generation. The JAXA-sponsored students also visited Adelaide Japanese Community School and conducted special space education classes with hands-on activities and experiments for local children and students. At the ISEB annual meeting, a signing ceremony was held for the addendum to the charter by the Heads of Education of participating member agencies and organizations. They shared activity reports and discussed future collaborative activities.



11 NOVEMBER

APRSAF-24 in Bengaluru, India

Space Education Working Group Annual Session

More than 60 individuals from 13 countries took part in the APRSAF Space Education Working Group (SEWG) annual session, giving 29 presentations. The Working Group has been conducting a space education seminar as a teacher and educator support program for the development of human resources for the next generation. A panel discussion was held by the host countries of the past three years, to share the seminars' outcomes along with challenges. Each year the SEWG holds an international water rocket event for children ages 12 to 16 and a poster contest for ages 8 to 11.

A Space Education Working Group Annual Session

APRSAF Water Rocket Event

The APRSAF Water Rocket Event, which began in 2005, was held for the 13th year. This year 56 junior high and high school students from 12 Asia-Pacific countries along with 21 teachers and educators gathered for international exchange. The weather was just right for making and launching water rockets, and many amazing records were set. The teachers and instructors from each country shared their activities and space education efforts through the workshop.

B APRSAF Water Rocket Event

APRSAF Poster Contest

"United Through Space" was the theme of the 2017 Poster Contest. Thirty-six wonderful posters from 12 Asia-Pacific countries were received, each filled with the warm connections between people and their dreams of space. The posters were displayed at the main APRSAF-24 meeting venue, and winning works were selected through votes by conference participants. Yearly and monthly calendars of 2018 featuring all exhibited works can be downloaded for free from the following link.

URL: http://www.aprsaf.org/working_groups/se/

C APRSAF Poster Contest



12 DECEMBER

Classroom Partnership: Haibara Kita Nursery School, Uda City (Nara Prefecture)

JAXA and Uda City in Nara Prefecture conduct classroom partnerships every year. In 2017, classroom partnerships were carried out at a kindergarten, a nursery school, and an elementary school in the city. Since it is difficult to keep nursery school children involved in the same activity for an extended time, those classes were combined with talks about space and making film canister rockets. The lecture about space was given by JAXA staff members, and the rocket making was mainly instructed by nursery teachers. At the end of the class, the children went outside and were all able to launch their rockets. The children who were too young to make rockets enjoyed watching the launch from afar.

A Classroom Partnership: Haibara Kita Nursery School, Uda City



Space Science Reporter for a Day

The Space Science Reporter for a Day program gives students the opportunity to watch a rocket launch at the Tanegashima Space Center, taking in the emotion, pressure, and exhilaration of the people involved in the launch site work, and the chance to act as a journalist and report the events to peers. At the Space Science Reporter program held in December, participants reported on the H-IIA Launch Vehicle No. 37 with the Shikisai (GCOM-C) and Tsubame (SLATS) satellites onboard.

B Space Science Reporter for a Day



1 JANUARY

Sora no Tobira (Portal to Space) and SORATOBI Science Pocketbook released

In addition to Sora no Tobira (Portal to Space), the quarterly print magazine for children, an online version of the SORATOBI Science Pocketbook was released in 2018. It compiles all kinds of information that can be used for science education, including astronomy, space environment utilization, space science, and aerospace research and development.

URL: <http://edu.jaxa.jp/soratoibi/> (Japanese only)



2 FEBRUARY

SEEC: Space Exploration Educators Conference

Every year JAXA sends two teachers selected through a public search from all over Japan to the SEEC in Houston, the U.S. This year the teachers demonstrated the fascinating materials they use in their own classes to give presentations at SEEC, and also conducted lessons at local elementary schools. This program is also very useful for giving the teachers insight into the state of education abroad. Even after returning to Japan, the participating teachers have continued their activities to educate and nurture children.

A SEEC: Space Exploration Educators Conference

Space Education Symposium & Liaison Meeting of the Center's Strategic Partners

Key representatives of the Center's strategic partners gathered from all over Japan to attend the first Liaison Meeting. This meeting was held to cultivate a shared understanding of space education. It was followed by the 2018 Space Education Symposium, held under the theme of "Space Education Expands from Local Communities." Unique activities from local regions were introduced, and participants were divided into groups by region to discuss unique qualities of each region from a learning perspective.

B Space Education Symposium & Liaison Meeting of the Center's strategic partners



3 MARCH

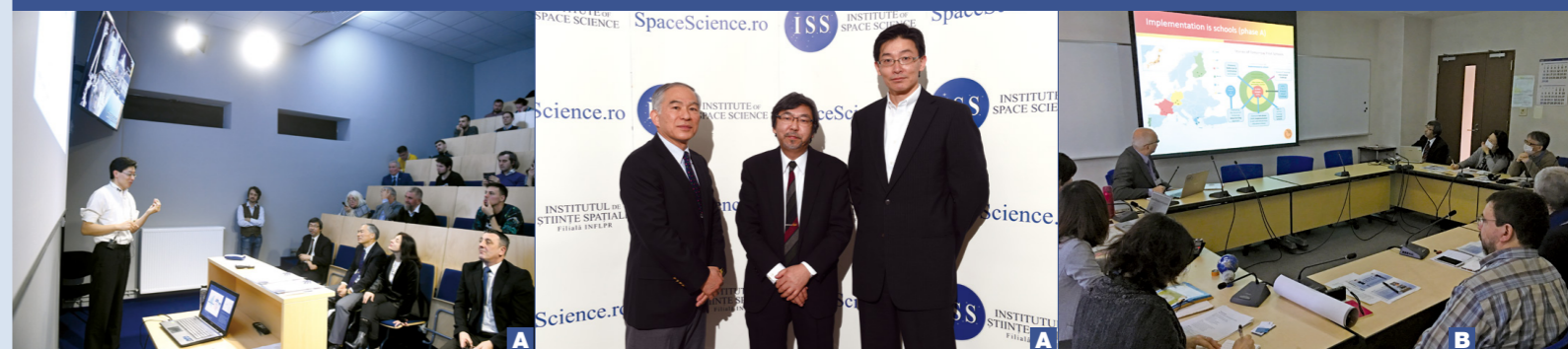
Information Exchange with Overseas Space Agencies and Educators (Romania, Portugal)

At the Conference about "Societal changes determined by the national program of JAXA Space Education Center" held at the Institute of Space Science in Bucharest, Romania, three presenters gave lectures on JAXA activities and space education.

A Conference in Romania

Educators from the non-profit organization NUCLIO from Portugal and Ellinogermaniki Agogi of Greece visited the JAXA Sagami Campus for an information exchange on space education. They exchanged views and discussed future cooperative possibilities.

B Information exchange with educators from Portugal and Greece

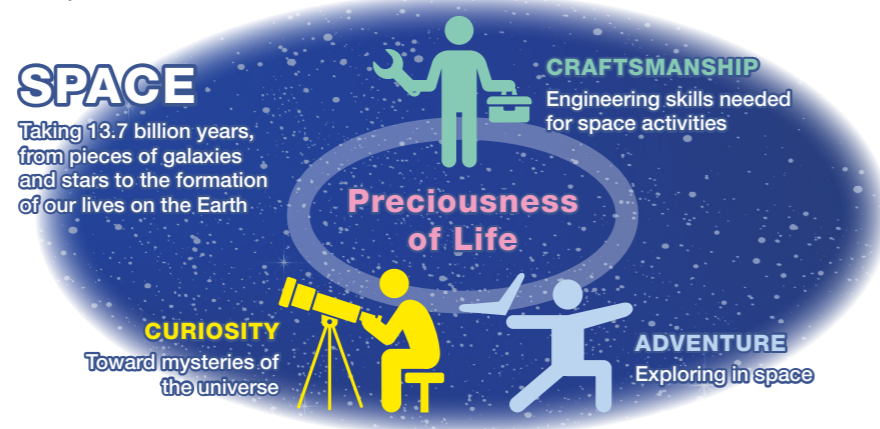


WHO WE ARE

Space is a unique source of interest and inspiration, and gives flight to the imagination. The Space Education Center of the Japan Aerospace Exploration Agency (JAXA) works with children and young people to nurture their inherent curiosity about the natural world, the universe, and all living things. Over the past 13 years, we have increased and expanded our program, bringing space-related topics and materials into schools and homes across the nation and around the globe. Our mission is to stimulate interest in not only science and technology, but also in human behavior.

THE HISTORY OF JAXA SPACE EDUCATION CENTER

Space education has long been a part of the Japanese space program's mission. The early years were marked by the Public Affairs Department's efforts to increase general awareness of space and gain the public's understanding of how society could benefit from space-related activities. One team involved in this outreach specialized in working with children and young people, using compelling, space-related educational materials to connect science to everyday life; the hope was that a greater interest in science would positively influence their intellectual growth. With the creation of JAXA in October 2003, it was increasingly recognized that education is fundamentally distinct from public relations. Combined with the foundation already laid by the student outreach team, this led to the establishment of the Space Education Center on May 1, 2005, by executive order of the then-president of JAXA. Since then, the Center has been a vibrant presence on JAXA's Sagamiyama Campus.



OUR GOALS & PRINCIPLES

Children love the natural world, and look at life with wonder. In particular, the mysteries of space tug on their **curiosity** and fire the imagination. Space exploration calls to their spirit of **adventure**. But alongside the spirit of curiosity and adventure is another spirit, just as important. Without hands-on perseverance to match the adventurousness, there can be no reaching what you seek. This is the spirit of creativity—**craftsmanship**. To ignite these three spirits within children is the core philosophy of the Center. Children will then grow their own knowledge and experience, driven by the joy of learning. With space as an effective educational material and the preciousness of life as underlying message, we aim to use the wealth of knowledge and technology gained from space development to nurture young minds. The spirit of curiosity, adventure, and craftsmanship. By learning “with space” rather than learning “about space,” children develop the capacity to learn continuously. That, we believe, is the key to raising people capable of creating knowledge and techniques on their own, and all their lives.

WHAT WE DO

The Space Education Center consists of teams that support educators, serve community learners, structure international actions, and share information with the public in a meaningful way.



FORMAL EDUCATION: PROFESSIONAL DEVELOPMENT & CLASSROOM PARTNERSHIP

Space is a great fit for classrooms, and not just in science, technology, engineering and mathematics (STEM) courses. The possibilities for application are many: social studies, language learning, art, ethics, even life skills. From lesson plans to educational materials, the Space Education Center is there to support teachers. Teaching is a demanding profession, and flexibility is the cornerstone of our **professional development programs**. We work with education boards and other groups to organize lectures and workshops targeting educators for all age levels throughout their career: preschool and kindergarten, primary, middle, and high schools, education majors and seasoned teachers. We also work with individual educators on an advisory basis.

Number of sessions and participants of professional development programs

| | FY2005 | | FY2014 | | FY2015 | | FY2016 | | FY2017 | |
|-----------------------------|----------|-------------------|-----------|-------------------|-----------|-------------------|-----------|-------------------|-----------|-------------------|
| | Sessions | Students/Teachers | Sessions | Students/Teachers | Sessions | Students/Teachers | Sessions | Students/Teachers | Sessions | Students/Teachers |
| For candidates for teachers | Nil | 3 | 1 | 200 | 4 | 350 | 2 | 265 | 1 | 204 |
| For teachers | 1 | 39 | 28 | 1,200 | 35 | 1,929 | 34 | 1,550 | 50 | 1,545 |
| TOTAL | 1 | 42 | 29 | 1,200 | 39 | 2,279 | 36 | 1,815 | 51 | 1,749 |

NOTE: The Japanese fiscal year runs from April 1 to March 31.

By bringing space into the classroom, we change perspectives and encourage observation. The classroom partnership program consists of thematic lesson activity, information about and rental of space-related educational materials, and lesson planning advice. In one example, students in a life skills class conducted a taste test of two instant curries, one for astronauts and one from the supermarket, discussing the noticed differences in ingredients and properties to build their analytical thinking skills.

Numbers of schools supported by the Center and students who have benefited from the program

| | FY2005 | | FY2014 | | FY2015 | | FY2016 | | FY2017 | |
|---------------------|-----------|-----------|------------|---------------|------------|---------------|------------|---------------|------------|---------------|
| | Schools | Students | Schools | Students | Schools | Students | Schools | Students | Schools | Students |
| Kindergartens | 0 | 2 | 5 | 264 | 3 | 207 | 4 | 284 | 3 | 188 |
| Elementary Schools | 1 | 14 | 69 | 7,180 | 74 | 6,669 | 69 | 5,400 | 75 | 6,194 |
| Junior High Schools | 5 | 14 | 25 | 4,663 | 24 | 5,714 | 31 | 6,549 | 31 | 3,278 |
| High Schools | 14 | 20 | 18 | 1,273 | 17 | 1,450 | 13 | 1,084 | 17 | 1,499 |
| TOTAL | 20 | 50 | 117 | 13,380 | 118 | 14,040 | 117 | 13,317 | 126 | 11,159 |

INFORMAL EDUCATION: EXTRACURRICULAR AND HOME ACTIVITIES

Weekends and holidays offer a wonderful opportunity for informal space education. The Space Education Center has a raft of cohort-specific programs that children of all ages, their parents and even grandparents can participate in. For the youngest learners, Space School for Families represents an opportunity to not only gain early exposure to science but also grow a stronger family unit and a more close-knit local community. Co-organized with the NPO Kodomo Uchu Mirai Association (KU-MA), the program consists of hands-on group sessions with “homework” in between and a final presentation by each family; to date, the Center has developed 106 homework texts in various subjects.

Number of Courses and Participants of Space Schools for Families

| | FY2013 | FY2014 | FY2015 | FY2016 | FY2017 |
|--------------|--------|--------|--------|--------|--------|
| Courses | 49 | 51 | 53 | 54 | 56 |
| Participants | 4,768 | 4,987 | 4,799 | 4,701 | 4,989 |

The **Cosmic College** is an experiential learning program for primary and middle schoolers, designed to be facilitated by leaders in the community. Lasting just half a day, these workshops use engaging hands-on activity to encourage young learners to think about familiar phenomena through the lens of science. One popular Cosmic College course guides children through the basics of aerodynamics, then has them construct, test, and make adjustments to paper hovercrafts.

As children grow, they need more—more independence, more interaction, and more immersion. In JAXA’s **Aerospace School** program, high schoolers live and work as a team for several days in space center facilities across Japan. The program brings students into direct contact with working members of the Japanese space program, state-of-the-art research facilities and spacecrafts, and authentic experiences that emerge from working with other teens that share their passion. After attending the Aerospace School, some of the participating students gave reports on their experiences at their own schools and shared what they learned with their classmates.

Number of events and participants of Cosmic Colleges and Aerospace Schools

| | FY2013 | | FY2014 | | FY2015 | | FY2016 | | FY2017 | |
|------------------|--------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|
| | Events | Parti- pants | Events | Parti- pants | Events | Parti- pants | Events | Parti- pants | Events | Parti- pants |
| Cosmic College | 260 | 19,163 | 280 | 18,598 | 328 | 18,184 | 405 | 26,948 | 481 | 27,776 |
| Aerospace School | - | - | 7 | 104 | 7 | 142 | 5 | 98 | 5 | 100 |
| TOTAL | 260 | 19,163 | 287 | 18,702 | 335 | 18,326 | 410 | 27,046 | 486 | 27,876 |

Making Your Own Space Mission (aka **Kimission**) goes further with the idea of youth autonomy. Adults take a backseat while high school students team up and plan space missions from the ground up under the supervision of graduate students of the Institute of Space and Astronautical Science. The young mission planners spend five full days in JAXA Sagami-hara campus, exploring their own ideas along with space. Their missions are presented to the audience of JAXA professionals on the last day, and the teams have the option to develop their mission further and give presentation at the annual meeting of the Astronomical Society of Japan.

INTERNATIONAL ENGAGEMENT: INVESTMENT IN A SHARED FUTURE

The Space Education Center supports and creates opportunities for students and educators to expand their horizons through intellectual and social interaction that cross borders.

JAXA is a founding member of the International Space Education Board and serves as a secretariat of the Space Education Working Group of the Asia-Pacific Regional Space Agency Forum.

The **International Space Education Board (ISEB)** was founded by CSA, ESA, JAXA and NASA in October 2005. It now brings together eight space agencies (AEM, CSA, CNES, ESA, JAXA, KARI, NASA and SANSA) and one space education entity (VSSEC). Every year, one of the four founding members of ISEB organizes the International Student Zone at the International Astronautical Congress, the world’s largest gathering of space professionals. The ISZ serves as a vital hub for university and graduate school students sponsored by each of the member agencies, who attend IAC sessions, present their research, network with space professionals and fellow students, and conduct outreach for local students.

Now the largest space conference in the Asia-Pacific, the **Asia-Pacific Regional Space Agency Forum (APRSAF)** draws attendees from public, private, academic, and non- governmental sectors from more than 40 countries and regions. The Space Education Center serves as co-chair of the APRSAF Space Education Working group and assists in organizing the water rocket event and the themed poster contest. The annual pair of events gives primary, middle, and high school students a rare opportunity to shine on the international stage. The APRSAF Space Education Seminar and the Educator Workshop provide valuable opportunities for teachers and educators to gather and trade experiences, insights and achievements from their own space education activities. The aim of these educator programs is to enhance the quality of teaching, nurturing the kind of next-generation talent capable of true innovation.

CONTENT PUBLISHING:

INFORMATION
AND EDUCATIONAL MATERIALS
IN PRINT
AND ONLINE

Curating information about space, science, and our own activities is also a major part of the Space Education Center's mission. We use a variety of media to deliver knowledge and learning to people of all ages.

A quarterly print magazine geared to children, **Sora no Tobira (Portal to Space)** is also available in PDF format. Young readers can find news about space development, interviews with astronauts and technologists, and information about space education activity in which they can participate, across Japan. Copies are available in school libraries, science museums, and online. (<http://edu.jaxa.jp/soratobi>)

Space is only a click away with **Space Education TV**, our online video channel packed with original content for young people, space education professionals, and the general public. Our programming requirements are simple: the content should be interesting, and it should be useful. Check out the eclectic collection, from satellite launches and expert speaker sessions to space-related experiments and coverage of educational events such as the "Space Science Reporter for a Day" program. (<http://fanfun.jaxa.jp/jaxatv/yac>)

The Space Education Center shares information about its events on **Twitter**. This is also a great way to stay in touch after one of our many international outreaches. Heart us, retweet us, and share your own pictures of events! (@jaxa_education)

Developing educational materials is an essential support for space education. Utilizing images and videos linked to JAXA's R&D achievements, we develop material and tools that work with a variety of space education programs in collaboration with outside experts. The results are released online for anyone engaged in space education to use in their own learning activity. (<http://edu.jaxa.jp/en/materialDB/>)

The Center's series of **educational materials designed for the classroom** are linked to subjects mandated by the official curriculum, for easy implementation in classes such as social studies, science, and even ethics.

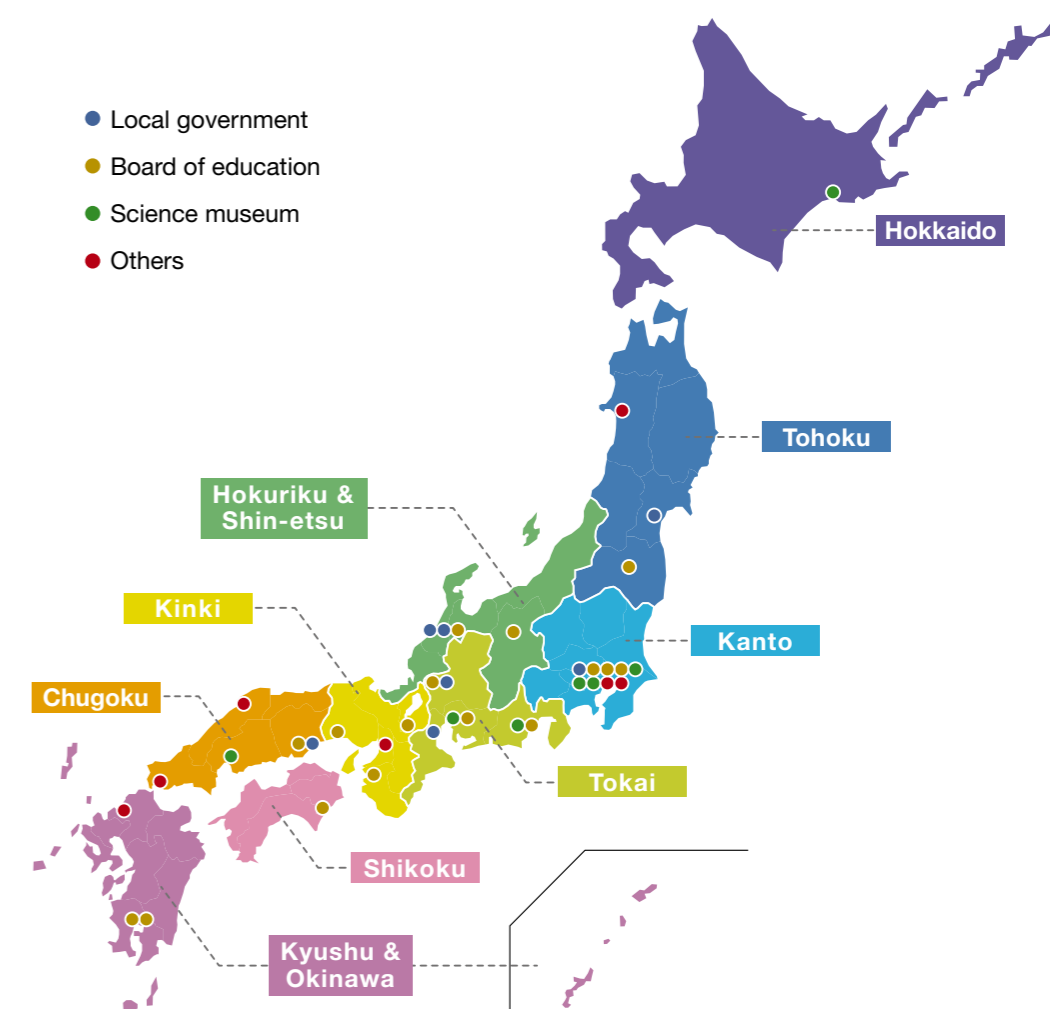
The **workbooks for Space School for Families** are designed to be provided in sets (of 30 over one year) for home learning. Around 106 workbooks have been created to date, and we have been seeing expanding use of individual workbooks, and beyond the setting of family homes at that. Of these workbooks, we have translated 43 of them into English to date.

On a related note, our educational materials extend to recordings of simple **experiments conducted in the Kibo module** by JAXA astronauts during their multi-month stay on the International Space Station. The contrast with earthbound iterations of the same experiment brings home the mystery and allure of space.

ESTABLISHING STRATEGIC PARTNERSHIP

As part of the executive directions set by the management of JAXA, the Space Education Center has been tasked since the fiscal year 2008 to establish strategic partnerships in all nine regional blocs of Japan, i.e. Hokkaido, Tohoku, Kanto, Hokuriku and Shinetsu, Tokai, Kinki, Chugoku, Shikoku, Kyushu and Okinawa. This is to ensure that the kind of classroom support provided by the Center continues to be expanded and further enhanced in an effective manner to benefit each of the primary and secondary schools without requiring direct and intense support by the Center itself. While it does not need to be a school, and it could well be a science museum or a board of education in a local community—a strategic partners should endorse the goals and principles of the Center and should actively pursue the development of space education materials and teaching methods to be introduced to schools within the bloc under its responsibility. The Center was also tasked to ensure the steady increase in the number of schools that newly introduce aerospace subjects into their classroom teaching by using the materials or teaching methods developed by the strategic partners in their bloc.

As of March 2018, the Center has concluded agreements with 37 entities to serve as its strategic partners in all nine blocs.



Report of JAXA Space Education Center

On Its Activities in 2017 – 2018

**Space Education Center
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