

## **Space Science education and its application at the school level in Nepal**

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Key words: Space science, Satellites, Water rocket, Poster contest, teachers' training

### **Abstract**

In order to promote the space science in Nepal, Space science education and awareness for the school children is very essential. NESARC has conducted the space science activities at the school level. Poster contest gives the children an opportunity to develop in the depth of their imagination, exercise their creativity and showcase their ideas in art form. Water rocket event is a source of entertainment and education to enhance interest in and awareness of space science and technology among the school children of Nepal. Teachers training programs on space science will encourage teachers to conduct space science activities in their school. All these activities aim to enhance interest in and awareness of space science and technology in Nepal. This paper discusses the details of past events on space education and awareness program in Nepal followed by the present activities on space science education and awareness. Present activities are focused on the activities of school children at the class room on painting and drawing with the given theme of space science for poster contest, application of Rocketry science with water rocket event, Geographic Information System (GIS) tool kits for the school children and teachers training programs on space science. Finally, challenges and recommendations on space science education and its application at the school level in Nepal are discussed at the end of paper.

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## Space Science education and its application at the school level in Nepal

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**Introduction:** Our universe originated about 14 billion years ago in a “*Big Bang*” explosion, where an enormous amount of energy appeared and converted to particles of matter. Hundreds of years later, Universe continues to increase in size. It looks like big ball of fire; it got cooler and formed clumps of matter to make Galaxies and Stars. Our solar system is a tiny part of universe, as more than 100 billion galaxies exists in the universe. A star is a big ball of hot blowing hydrogen and helium gases. Sun is the nearest star from earth and more than 4.5 billion years old. Earth/solar system are in Milky Way Galaxy. Our Milky Way Galaxy is a spiral galaxy so big that even at the speed of light; it would take 100,000 years to travel across it. Our solar system is located at what is called the spiral’s Orion arm, about 25 000 light years from the center. It orbits galactic center about once every 225million earth years. Sun together with the planetary system including earth is solar system. A planetary system consists of planets, moons, asteroids, meteoroids and cosmic dust.<sup>[1]</sup>

Earlier Astronomy was the study of solar system and beyond. We study astronomy on Surveying /physics to fix the position of a point on earth through sun/star observation. Now a day, it is beyond Astronomy and it is Space science which includes: Astrophysics, Galactic science, planetary science, Stellar science, Astronautics, Exobiology, Space colonization and space defense , we are more concerned with Astronautics which deals with the science and engineering of space flight and its operation & maintenance of space craft. Space flight is used for space exploration, space tourism, satellite telecommunication, space observatories, reconnaissance, earth observation, positioning and navigation etc. Earth observation and global positioning System is frequently used on the land management. Land use planning needs updated thematic and topographic map of the country. Global Positioning system provides very efficient control network and maps are updated very effectively through remote sensing i.e., digital data from earth observation satellite. Now a day, large scale mapping and establishment of its data base is possible through high resolution remote sensing digital data. Some of the services provided from satellite system are.<sup>[6]</sup> Satellite remote sensing, Television and Satellite communication network, Navigation and positioning, Weather satellite, services from other type of satellites and Space station. Thus, space science education particularly astronautics is very important for the school children.

## **2. Space science education in Nepal**

Many governmental organizations, non-governmental organizations (NGO), International non-governmental organization (INGO), private consultants and universities are using space technologies in different fields in Nepal.

Kathmandu University with the collaboration with the government of Nepal, Ministry of Land reform and management, Land management training Centre has the Bachelor of Geomatics Engineering education program since last five years and Purbanchal University is also engaged on the development of human resources on Geomatic engineering. Similarly, universities in Nepal have astrophysics on their curriculum of graduate study in general science. Besides universities and educational institutions, space science information user agencies working on Nepal also conduct training programs on the use of space related information and product. However, sufficient attention is not given on the space science education for the schools in Nepal.

Nepal Scientific Activities and Research Center(NESARC), a non-government organization in Nepal has taken initiative for the Space education awareness program at the school level by organizing water rocket events, poster competition, school teacher's training program and training on Geographic information system (GIS) tool kits for school children. These programs have given a very good response to enhance the understanding of space science technology and its application for the benefit of the school teachers to teach the science subject at the class room by using the space material and appropriate teaching methods. It also stimulates the school student's curiosity and interest on space science in their class room.

## **3. NESARC activities on space science education and awareness in Nepal.**

Nepal is a small mountains land locked country in South Asia lying between India and China. It has an area of 147,181 square kilometers and a population of more than 26.5 million<sup>[7]</sup>. It has a rich human culture and natural biodiversity. Nepal, being one of the under developed country of the Asia Pacific region, has no governmental space agency and it needs more effort to establish a self sustain and capable space agency in the country with a space policy of the nation. The entire government sector needs to understand the importance of Space science as space technology could address to resolve the major issues such as population growth, environmental degradation, resources management, poverty reduction, urbanization etc. Also the space technology is applicable for different development activities, education and research as well as disaster management. The importance of space satellite in the development process of Nepal is realized on the development activities of the country as well as in the daily life of general people. People are using telephone, television network and need to know the prediction of weather condition, which is possible through satellite system. Many countries are using the services of the satellite system and have been a part of the system on the development activities of the country.

NESARC had organized various space education and awareness programs from the very beginning of its establishment.<sup>[2]</sup>

- **Water Rocket:** A water rocket is a chamber, usually a 2-liter soft drink bottle, partially filled with water. Air is forced inside with a pump. When the rocket is released, the pressurized air forces water out the nozzle (pour spout). For the first time, Water rocket toys were made and used in Germany and USA in 1960 AD. Scotland had made water rocket competition in 1980 for the educational purposes. Japan started water rocket contest in 1996, whereas England organized water rocket challenge competition in 2001 only. Asia Pacific regional space agency forum (APRSAF) was established during 1993 and Space education awareness working group of APRSAF started international water rocket competition on Asia and pacific region to promote space science in 2005 AD.<sup>[4]</sup> Nepal, one of the members of APRSAF, had initiated space science educational awareness program including arrangement of Water Rocket Event (WRE) in 2009 AD. For the first time, Nepalese student and teacher were invited to participate on international water rocket event, which was held at Bangkok on 2010 AD. Since then, Nepalese students and teachers had participated every year on APRSAF international water rocket event. To participate on international water rocket event, students and teachers need to participate on national water rocket event and qualify themselves for international competition. Since 2009 AD, NESARC had initiated space science educational awareness program including arrangement of WRE and had organized national water rocket event every year in different part of the country. As a result, high school students and teachers of Kaski, Tanahun and Kathmandu had already participated on international water rocket event which was organized outside Nepal.

National Water rocket Event 2015 [2]



It has been realized that, WRE has enhanced the understanding of space science particularly rocketry science technology and its application to teach the science subject in

the school class room. It has stimulated student's curiosity and interest on space science education. In addition to this, it provides a source of entertainment on space science education by allowing students to experiences rocket engineering by making water rocket and its launching. There is a great benefit to the school children and teachers to share the ideas on space science education as well as establish cultural exchange and friendship between the countries of Asia & pacific region and beyond.

- **Poster contest for school children**

Since 2010 AD, various schools in Kathmandu and Kaski district of Nepal has organized poster contest with a given theme on space science for the school children of age 8-11 years. Every year three posters of school children of 8-11 years were selected from Nepal and were send for the International Poster exhibition at the exhibition hall of APRSAF. Many countries of Asia and pacific region were participating on the poster competition. Every year poster contest was held during APRSAF meeting and prizes were given to the winner of the poster competition. There is a tradition to give the Certificate of participation on international poster contest and every year APRSAF had published an international calendar with the posters of all the participants to distribute around the world including the countries of Asia and pacific region.

**Children's Painting/Drawing for national poster contest 2013** <sup>[2]</sup>



It has been found that, Poster contest for school children had given the school children an opportunity to delve in the depth of their imagination, exercise their creativity and showcase their ideas in art form. The contest aims also to enhance interest in and awareness of space science and technology among the children of Asia and pacific region.

- **High school Teachers training on space science**

Every year since 2012, NESARC had initiated to give the training for the secondary and higher secondary school teachers on space science education at the class room. Geographical Information System (GIS tool kit) for school children, space science application (rocket science) and planetary exploration are the main subjects on space science education. National and international resource persons for the teachers training program were involved.

## Teachers training on space science [2]

*GTTT 2013 at Pokhara*



**Dr. Bonnie Therber, North Western University of United States of America gave a lecture on the moon over us project and a workshop was organized to give the knowledge on Astronomy software.**

**Zhang Yao of Shanghai Astronomical observatory, Chinese academy of science share the experiences on astronomy.**



**NESARC Chairman Er. Krishna Raj Adhikary gave the lecture on Rocketry science and water rocket with the practical exercise of construction of water rocket from local materials.**

This had helped the teachers to understand and use the space materials (e.g., Remote Sensing information product and Global Positioning System (GPS)) on their science education activities. As well as, lecture on Planetary exploration with the Satellite information in our daily life, rocketry science with the Try Zero-G “DVD – Video” by Astronaut had also helped the teachers to understand the planets and planetary exploration activities.

- **Interaction and evaluation:** Interaction program for school teachers was organized at different school of Nepal and NESARC activities on space education used to be discussed at the interaction programs and evaluate the effectiveness of its activities of drawing/painting for the poster contest on the theme of the space science, Water Rocket event, Geographical information system (GIS tool kits) for school children education and teachers training program on space science.

## Program at Loyalty HS School Mandikhatar Kathmandu 2014 [2]



- **Use of space science information:** Science teachers are encouraged to use the Space science information and products in the science class room with the different space education activities e.g, Water rocket event, poster contest, space camp, use of GIS and GPS. In order to start with some of the materials and equipments such as , Software for Geographical Information system (GIS) tool kits for the school children, Global Positioning System equipment, Water rocket launching equipment, Satellite image etc could be provided to the school teachers from NESARC and some of the item should be managed by the school.
- **Science exhibition at the school:** Students of the schools are encouraged to use space science related activities and take part on the science exhibition organized every year by the different government and non-government organizations. Mostly water rocket event is very popular at the exhibition.

## Science exhibition at Tanahun 2014 [2]



Astronomical telescope, Painting/drawing on the theme of space science related theme, and Space education materials and information are also popular on the exhibition.

#### **4. Challenges**

As a result of above activities Space Education Awareness is increased in our country and teachers' are motivated to teach space science education at the class room. This year there is a big demand of teachers training program, not only from the school of capital city, but also from the rural areas of Nepal. Similarly, many students of various school in Kathmandu and rural areas of Nepal are taking part on water rocket event and poster competition. Now a day's water rocket is popular at the school level in Nepal.

The biggest challenges on space science education and its development in Nepal are:

- Lack of sufficient government budget on space science education
- Establishment of self sustained space agency in Nepal which will encourage the universities and educational institution to conduct formal education on space science and help to produce qualified and capable human resource in the country on space science, which will help ultimately to establish of its own satellite system in the country at least for telecommunication and earth observation.

#### **5. Conclusion and recommendation**

Finally, Space science education and awareness is very important for every development process of the country. Satellite and its use for the overall development of the country has become the necessity of the nation. A lot of expenses need to be done by the nation to use the space products. The entire government sector including land management need to understand the importance of Space science. Nepal, being one of the under developed country of the Asia Pacific region, has no governmental space agency and it needs more effort to establish a self sustain and capable space agency in the country. We need to develop our own satellites at least with earth observation satellite and telecommunication satellite. This will give us the saving on the use of expensive space products in the long run and we will be proud to be a partner on space exploration with other countries and reserve a place for Nepalese on space colonization process.

To overcome the challenges mentioned above, Government of Nepal should take a coordinated approach to work together with the space science related national organization such as Nepal scientific activities and research center (NESARC), Nepal astronomical society (NASO) and science teacher association of Nepal and International organization such as Japan Aerospace Agency JAXA, NASA, ESA and other space agencies of friendly countries

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