

## Space Education in Schools and Colleges - Exciting times.... Much to be done



Dr. Jaydeep Mukherjee is the Director of the NASA Florida Space Grant Consortium (FSGC), an association of eighteen public and private Florida Universities and colleges led by the University of Central Florida and administered by the Florida Space Institute. Dr. Jaydeep Mukherjee received his Bachelor's degree in Physics from St. Xaviers College, Mumbai and Master's degrees in Physics from Mumbai University (University of Mumbai), India, and his M.S and Ph.D degrees in Astronomy from the University of Florida. Jaydeep has been passionately working over the past many years in promoting STEM education and is an avid speaker and writer on Space Sciences.

His illustrious career has been filled with many awards and recognitions for promoting Space Education. In this insightful interview with D. V Venkatagiri, CEO, Explore The Space, Jaydeep talks about Space Education in Schools, future of Space Exploration, role of teachers in spreading awareness on Space Sciences and related matters.

### Dr. Jaydeep Mukherjee, Director, NASA FSGC, USA

**1. You have been lecturing in Indian schools and colleges during your yearly visits....what is the change and what is the striking aspect that you observe in the Indian Education System, with respect to awareness on Space Sciences?**

When I was a student in Mumbai in the 1970's and 1980's, there was no awareness of Space Sciences. Astronomy was not taught in the schools and colleges. The Astronomy we learnt was about the planets in our solar system (namely just the names and not characteristics of the planets.) Remember, that there was no internet, and I had to get my information from Astronomy books (scarcely available in India) or encyclopedias. Things are vastly different now, with access to astronomy and space sciences fundamentals, readily available, either in the form of books or the internet. It is not fair to compare the two eras. These days, there is a lot of awareness for Space Sciences among school students



and the general public. The success of ISRO missions have played a large part in generating excitement about space sciences etc.. Social media also helped in spreading the awareness of space sciences. However, a note of caution about social media. Social media is also responsible for the spread of false information and "junk" science!

**2. I remember you emphasized on "collaborative hands-on projects". can you please elaborate a little.**

From my experience with school and college students in Florida, engaging in hands-on collaborative project is essential for the overall development of a student. Hands-on collaborative projects are those where the students build something, using their knowledge of science, mathematics, engineering and technology.

**"Dedicated and Trained teachers can bring a world of difference in increasing awareness on Space Sciences."**



The students should be from a mixture of various backgrounds. Some of the students should be focused on sciences and some on engineering. In the real world, especially for projects in outer space, science leads the mission but most of the work is done by engineers. Sitting in a class room and getting 90% or 95% does not mean anything if the students cannot apply their knowledge to the real world. An example of a hands-on collaborative project for college students would be a project where the group is divided into two parts. The project could be say, building a payload to measure the characteristics of the earth's atmosphere. The launch vehicle could be a weather balloon or a small rocket. The engineering students design the rocket etc, while the science students come up with the payload idea.

**3. You have had your school and early college education in India and then you went for your higher education in the US. What do you see as the major difference between the two systems.**

During my tenure as a student, the emphasis was on memorization and not applications. The exams were such that if you memorized your subject matter then you could do very well in the exams. In the US, emphasis is on how you apply your knowledge of your fundamentals to real word problems. The other major difference was the learning environment. The environment in US schools and colleges were more conducive to learning. I want to see the Indian school system rewarding creativity more. There are a number of students, who may not be able to do great in their exams. Some of these students would thrive

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**4. How receptive is the industry in the US ( or Florida) to fund Educational projects? What drives the PPP (Public Private Participation) in Education Projects.?**

There are a number of not-for profit organizations who fund educational projects. When it comes to space, NASA is one of the biggest supporter and funder. Other federal organizations also support school projects through universities and colleges. Industry also is a very big supporter of education and provides support to a number of education projects, either individually or through one of their educational programs

**5. Teachers play the greatest role in shaping the children's thought process / future. Can we have your opinion / ideas on what kind of Teacher training programmes should be organized to increase Space Science awareness among the students.**

The easiest way to reach a large group of students, is to have a small number of trained, dedicated teachers. One should not focus on memorization. It would be great to train teachers on inquiry based learning. For Space Sciences, NASA has a large number of lesson plans that are available, free of charge.

6. As a firm, (Explore The Space) we believe that "Space Sciences holds the answers for many of the human problems that we are facing today" ....your word of advise for us please.

You are right, space sciences play an important role in solving some of our problems on Earth. We should understand our eco-system, how our climate changes because of human activity, etc. However, we are not interested in every person being a space scientist! What is more important that everyone understands how nature works. Everyone should understand, at a very general level, why we are experiencing such a different climate pattern. Everyone should understand the wonders of our Sun and how we can harness the energy from the Sun. We should have an informed, scientific literate society.

### 7. What are the areas in which NASA and ISRO are working together.

To the best of my limited knowledge, NASA and ISRO are working together on Mars Exploration and an Earth-Observing Mission. A few years ago, the past NASA Administrator Charles Bolden and K. Radhakrishnan, past chairman of the Indian Space Research Organization (ISRO), signed two documents to launch a NASA-ISRO satellite mission to observe Earth and establish a pathway for future joint missions to explore Mars. They also signed an international agreement that defines how the two agencies will work together on the NASA-ISRO Synthetic Aperture Radar (NISAR) mission, targeted to launch in 2020. The NASA-ISRO Synthetic Aperture Radar (NISAR) mission is a joint project between NASA and ISRO to co-develop and launch a dual frequency synthetic aperture radar satellite. The satellite will be the first radar imaging satellite to use dual frequency and it is planned to be used for remote sensing to observe

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and understand natural processes on Earth. It will provide an unprecedented detailed view of Earth by using advanced radar imaging. It is designed to observe and take measurements of some of the planet's most complex processes, including ecosystem disturbances, ice-sheet collapse, and natural hazards such as earthquakes, tsunamis, volcanoes and landslides. NASA and ISRO have been cooperating under the terms of a framework agreement signed in 2008. This cooperation includes a variety of activities in space sciences such as two NASA payloads — the Mini-Synthetic Aperture Radar (Mini-SAR) and the Moon Mineralogy Mapper — on ISRO's Chandrayaan-1 mission to the moon in 2008.

### 8. Your suggestions to School Education System.

It is a very highly complicated issue and you would want dedicated teachers, principals and administrators who are far-thinking and really interested in creating a society which will thrive in the future.

### 9. Your life is blended with stars / space / astronomy. If not for this, what would you have become or your other career choice?

I don't think I would have ever gone after some other field of study. I was interested in Astronomy as a very young child and my parents, brother and sister, and closest relatives supported me immensely. Most of my friends and others said that there is no future in Astronomy and I would not get a job and starve. Remember, in the 70's and 80's, emphasis was on either becoming a doctor or an engineer.

## Explore The Space

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