

# Need of Environment and Space Technologies Education in Indian School Curriculum

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## I. INTRODUCTION

It's more than two decades in India, the computer education/ICT (Information and Computer Technology) was introduced into the school curriculum and majority of Schools including those run by central or State Governments, have good infrastructure with basic software and internet. Space technologies i.e., the technologies involved in acquiring Earth's information such as Sensing/acquiring Earth's pictures through Aircrafts, Satellites, Drones etc., and collecting local ground/field information by using GPS receiver and computing into digital maps (GIS database) have become very popular in recent times across the Globe.

Few major advantages of the present day school children are that they have access to see the high resolution satellite pictures of their houses/gardens/farm lands, their villages/towns with surrounding resources in true colors through several geo-portals. This would generate curiosity among school children to identify their known/visited locations and tagging field photos to such locations/places. Secondly they have got exposure on GPS through latest mobile phones which create interest to track or navigate places during their travel to schools, colleges and other tourist locations. Unlike in Nineties with limited costly software, today there is plenty of open source software or low cost education licenses of GIS software available in the market. By utilizing such low cost software the students can take-up practicing the mapping concepts at school level itself. Further, the awareness and knowledge on geo-special technologies helps to understand and motivate towards the Environmental concerns which are very crucial in the present day's global scenario. The paper addresses few reasons and demands for a practical oriented education on Space sciences/technologies along with Environment management to the school and graduate level students in their curriculums with proper importance.

## II. EXPLORING THE EARTH

Many free geo-portals/sources of earth information such as Google Earth, Bing maps, Apple Earth, ArcGIS Earth, NASA, ISRO, Bhuvan etc., have come up to reveal the geography of earth with High Resolution Imagery (HRS) acquired from Satellites. Further advantage of these sources is that they are providing true(real) pictures, sometimes live pictures as street views which is very much useful to the children in knowing

about new places. Exploring of earth creates lot of curiosity to learn and magnify the knowledge on nature & understanding the advantages of clean & green environment. Interesting fact is that, out of all other regular subjects, the Space or Geo-spatial technologies like Satellite Sensing, GIS, GPS etc and environment related activities creates more interest to the students as everyone is familiar to their surrounding real world and the same could be virtually viewed by them by utilizing these technologies



(a)



(b)

Fig1: (a) Cartosat & LISS Merged Indian Satellite data; (b) Aerial photo of NTR Gardens, Secretariat & lumbini park area in Hyderabad



Fig2: HRS imagery of built-up & plantation areas

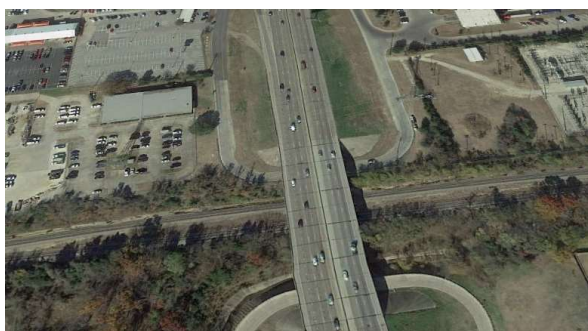


Fig3: Street view tagged to the HRS images in Google Earth(Irving-Dallas highway-USA)

### III. AWARENESS ON SPACE & ENVIRONMENT

The most liked subjects by the school level students are the Environment & Space Technology. Many schools offer Telescopic view of planets, stars and encourages to exhibit

space technology related machinery and activities through models. Several organizations like ISRO, Space application centres, Space India, IITs, IISc, NASA, Institute of Space Technology (IST), European School net, Universities etc., conducts educational programs to mark World Space Week, Science day, Earth day to create awareness on space technology among children. Such activity induces lot of interest towards their future academic carrier and profession.



Fig4: Space exhibitions & demonstrations to students

Space Awareness is an international project for children and teenagers, striving to increase their enthusiasm and knowledge of science and technology using the exciting possibilities of space, and inspiring them to pursue a career in relation to space subjects.

Indian Space Research Organisation (ISRO) has launched from this year (March 2019) a 'Young Scientist Programme Called 'Yuva Vigyani Karyakram', the Programme aims to impart basic knowledge on space technology, space science and space applications to youngsters to arouse their interest in this emerging area. Three students from each State/Union Territory will be selected to participate in a two week training programme every year. Those who have finished VIII standard and are in IX standard will be eligible. The selection will be based on the academic performance and extracurricular activities. Students belonging to the rural area will get a special weightage.

Environmental awareness is pretty self explanatory. It is about being aware of the environment. The Environment refers to all flora and fauna, including all marine and wild life areas. This is particularly important, given the increasing environmental challenges we are facing including: climate change, global warming, water scarcity, droughts, deforestation, floods, pollution, waste management, sanitation, plastic etc., Children, as early as possible, should be aware of the environmental issues we're facing. Schools must lead the conversation. Environmental awareness should be a part of the curriculum in all schools. This will encourage young people to engage in their environment to protect it and can help communities become more environmentally aware. Schools can adopt:

- Introduce the 3 R's: reduce, reuse, and recycle materials.
- Organise tree planting days at school and tell them why trees are important to the environment
- Encourage children to switch off all appliances and lights when not in use
- Ensure taps are closed properly after you have used them and use water sparingly

Environment is degrading at a much faster pace than our imagination. Most of this damaged is caused by human activities and is sometimes global, as in the case of the depletion of the ozone layer & of the increase in the greenhouse gas emissions. Often the damage is regional, as with pest degradation of native forests, or the erosion of river catchments. Often too, the damage is local, pollution from motor vehicles, contamination of soil by chemicals, sewage discharges and hundreds of other human activity stresses the environment. Appreciation and concern for the environment are values that need to be inculcated during early year of development and thus environmental education for children and youth becomes an integral and important part of the environmental strategy of any country. Education has been recognized as a necessary constituent for sustainable development all over the world. The function of education would also optimistically manipulate the administration of the stressed out natural resources through the integration of victorious procedures of environmental education. The environmental education offers students with the skills, experience and knowledge that are necessary to turn out to be victorious community leaders, and also making clever decisions pertaining to the administration of their natural resources.

#### IV. MAPPING CONCEPTS

Survey and mapping attract any individual, organization or nation to know their natural resource location and potential. The map concept among students will enable



Fig5: Capturing earth photos through balloon & map construction from image

them to interpret Earth surface features using a variety of methods such as satellite imagery, aerial photography, and topographic and geologic maps using appropriate technologies. The concept learning shall include building and using a balloon kite kit to capture aerial photographs of their surroundings, then use map knitter to construct a map from images. The students can also know how to draw and read contour lines, water flowing channels, surface water bodies, rivers, location of settlements, road connectivity from topography maps, Compare different seasonal photos and to learn disaster assessments from images.

#### V. GEO-TAGGING OF PLANTS & LOCAL ENVIRONMENTAL DAMAGE

Students across the world are involved in taking up the Green cover programs like afforestation, Green & clean Environment, Save Tree, Haritha haram etc., If they are trained in basic mapping concepts by utilizing smart phones, handheld GPS instrument, they can involve in the geo-tagging of the plants and takes care of their trees. Simple mobile based Apps could be made for free use by the students in coordination with teachers/faculty.



Fig6: children in plantation

Students can also involve in bringing out ground realities of several environmental damages such as tree cutting, waste dump, un-lifted garbage bins, water leakages, polluting units, sewerage blocking, exploitation of ground water, unhygienic places, encroachment of natural resources (water bodies, forests) etc., by utilising the geo-tagging apps.

#### *Training of teachers*

Also there is good number of Geo-spatial subjects' related professionals today across the country who could be involved in training the teaching community, particularly teachers who are involved in geography/science/ICT/Engineering education. They could be trained for short periods during their teacher training programs/courses or exclusive 1-2 week courses at district levels. This would fill the gap in the trained human resources. The students including from rural areas have exposure to Scientific centers like Planetariums, Space centers and few of them have represented even in ISRO & NASA sponsored programmes.

#### *Manpower resource creation*

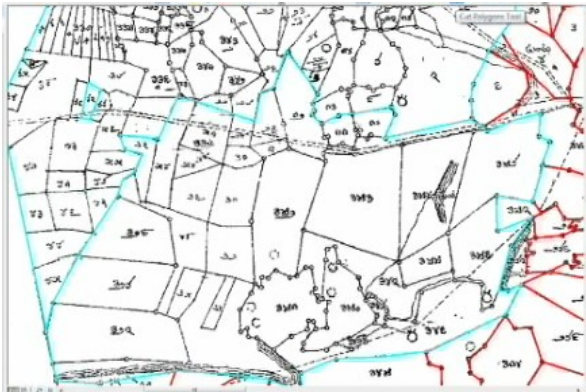


Fig7: Vectorisation of maps

Further with the availability of High Resolution information of Earth through Satellites, enormous opportunities will be created in developing worldwide reliable large scale spatial data. Thematic mapping of agriculture, horticulture, forestry, infrastructure (road/railway), water resources, waste lands, urban (built-up & utilities) mapping in large scale requires lots of manpower. Special practicing programs will be conducted for attaining skills on interpretation or vectorisation of imagery or maps. Selective students from senior schools or graduate schools who has attained working knowledge can be involved in such projects. This would strengthen their economic status also.

#### VI. CONCLUSION

It is the need of the hour in bringing up the new dimension in education system by introducing of these environmental and space related subjects with basic practical knowledge and skills in the **school curriculum** at least from higher school standard.

Also there is need for introduction of Geo-Spatial technology as a new special subject in combination with Geography/Geology/Environmental Sciences/civil/electronics/IT/CS at graduation & Post graduate level. Special subjects that can associate with GIS/Geomatics at PG and Research stages are Agriculture, Water Resources, Forestry, Transportation & Road Safety, Natural Calamities & Disaster Management, Urban & Rural development, Energy, Irrigation, Mining, Revenue and Planning.

Although in every educational institution there is a provision for formal environmental & space related education, but is not conducted with serious. Many institutions carry out these subjects with conventional methods and without regular & practical methods. Management & certification authorities shall evaluate the works/practices of the students through tests and award appropriate marks/grades to inculcate seriousness on environmental and space related subjects/technologies. Moreover, at most of the educational institutions, there are no specialized trained teacher /eligible faculties for conducting this general education. In the present scenario of advancements in Space activities and the high time for environment concerns, the education, and awareness and in depth knowledge is highly needed for a safe and healthy future life on earth. Hence in country like India which is accomplishing top position in space technology related activities, this is right time to introduce the environment and space technologies as regular subjects in the curriculum of higher secondary and graduate schools

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