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IAA-PDC-23 : Jagannatha Venkataramaiah :

**DIGITAL MODELLING FOR PLANETARY DEFENCE IN NON FORMAL
EDUCATION**

by

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ABSTRACT

This is a third presentation on community response to disasters since 6th PDC. It aims to pool creative artistic and participatory response of students to digital modelling so as to enhance civic societies participation in planetary defence. The desire to find out more about space is as old as human civilization itself. This is clear in all great civilized societies today. Unprecedented threats from both within and outside the human race have been evinced. As a result, planetary defence is becoming more significant for galloping scientific capabilities. It is also clear that resilience is an omnipotent attribute of human society as a whole. Natural and technological disasters have both been overcome with creative human responses. Planetary risks comprise NEOs from outside and pandemics, Infodemic, climate change, and an ever increasing unequal social order within. It is sustainable to enable students and citizens to network by employing cost effective non formal methods. The focus of this presentation is to comprehend the science and technological advances of planetary defence. Later lead it to voluntary creative emergency preparedness response for risk reduction by students and space concerned citizen..

The planetary defence aspects are utilized in this non formal education model in four target groups. NEOs: Near Earth Objects, surveillance, monitoring risks that exist, and community emergency preparedness and national disaster risk reduction are the focused topics. The activity lasts for ten weeks and involves participants creative responses that could include a poster, poem, slogan, or a socio cultural artistic reflection. This is focused on space and various threats evinced to life and on Earth. These multilingual and artistic expressions of cultural signatures for planetary defence are from space quest young and old. The Non Formal Space Eco literacy Model is Free and in line with the 1977 UNESCO/UNEP/IEEP Environmental Education Objectives. The paper outlines the particulars of the ten week, one hour per week program, schedules and background materials.

Keywords: Science and Culture, Planetary Defence, Modelling and Simulations, Non Formal Education

1.0 Background

A sustained effort can facilitate community enabled for its well-being with specific actions [1]. A conjunct, dynamic in nature, and able in its various forms, non formal education is defined as an amalgam of unstructured, ungraded, non-sequential learning experiences and socio-educational activities. This could lead to cultural versatility to change. Without investing additional resources, it might have concentrated on what it can achieve. Additionally, it has been claimed that non formal education may be befitting of the designation of "hinge" between science and culture[2].

In order to enable their population to enhance Awareness, Attitude, Knowledge, Skill, and Participation in all types of education, UNESCO/UNEP/IEEP, 1977 statutory guidelines were set up for Nation member states under the UN more than 40 years ago. It is reported that Pandemic instance has put societies' capacity for adapting to widespread disruptions to the test, and as a result, more robust societal action plans have been developed[3].

Additionally, it is a fact that the pandemic put the entire world's school system to a grinding halt during the lockdown. It is projected that at least ten years have been lost to lockdown in the formal education. In quantitative terms, reportedly, out of a 25 trillion US dollar global economy, the financial implications incurred was estimated to be about 5 trillion US dollars[4]. It has been possible to find agility and resilience in non formal education by communities embarking on Space Education Out Reach activities much before the onset of Pandemic[5],[6].

For young pupils, surviving the pandemic and Infodemic with family was a challenge. WHO with its wide reach among the varying public architecture revoking Infodemic management with active participation of voluntary and even faith based organizations was feasible. PSF KRVP Mysuru planned, designed and executed two Virtual Space Education Out Reach Models of ten weeks during the lockdown in 2020 and 2021. These two virtual activities had over a total of 84 students with a handhold in parents and teachers[7],[8]. These two unique no cost creative outcomes formed the basis of the present Space Education Literacy Planetary Defence Campaign SEL PDC 23 model.

Notwithstanding, the economic and life losses during lockdown, the quest for space among the parents and students was astonishing. This was also an vindication of prevalent people science capability prowess in India. During 1987 in India, a people science march was Organised by National Council for Science Communication at the Dept of Science and Technology, Govt of India. It had over 29 state level people science organizations networked, which bridged science in local dialect and various means of communication. Topics of rich cultural heritage in space endeavour in India were also focused. Over 25,000 Kms people science march BJVJ Bharat Jana Vigyana Jatha from five corners of the country converged at Bhopal,India. It also churned up innovative efforts and revealed wealth of science links to cultural heritage. The author was formally permitted by Dept of Space Indian Space Research Organization ISRO in the people science activities at KRVP without affecting the

formal assignments as a scientist/engineer. This formal handhold was since 1986 till superannuation in 2017.

One of the non formal education model EESS Ecological and Environmental Studies by Students planned and designed by a team of ISRO working scientists in 1987. This model developed during BJVJ as a non formal activity by students got cited as one of the 20 best eco education guides by the Earth day Network in 2000[9].

2.0 Materials and Methods

Based on previous two virtual Space education Outreach models SEL SW20 in 2020 and SEL NFSSA 2021, one more model for ten week of one hour a week in non formal mode could be designed. In this model it was necessary to include pre university students, degree students and all concerned youth and senior citizens. The fourth category without formal constraints of qualification in formal education criterion. The non formal program was test run for category I in four schools during National Teachers Day Sep 5th 2022 till Jan 2023. Students were given a general topic on space, environment and my space voyage and suggested to contribute a poem in local language or a painting. Over 100 students responded with a poem in English and Kannada the local dialect or a painting or a note.

Thus, four target groups were identified. They are, 1) 5-9th standard students in formal school education and 2) 11 and 12th standard students with Physics and Mathematics electives, 3) Any graduation studies students and 4) Any age, language, socio economic and cultural niches but with serious space quest. Retired and working space scientists, and people science resource persons script a two pages background note. The topics are on planetary defence preparedness for each week. The wealth of resources available in the open access and past Planetary defence conferences are used for basic primer knowledge sources.

Today, in India National Education Policy NEP 2020 spells out focus on skill and enabling. Earnest efforts are on to take science and technology education in local dialect in formal education systems. Medical, engineering and science curriculum are also drafted to enable younger generation to get involved with science in own dialect for enabling in professional niches.

Earlier in Lock Down virtual space eco literacy models, subjects covering climate change, pandemic, solid waste, environmental laws, lakes, space watching, spiritual paths, Indian Space Program, NASA,ESA, Amateur Astronomy were focused. This was made possible by using a one-hour per week, cost-free non- formal education model, with support from parents and instructors[8],[9]. During 2022, a new level was achieved at a webinar Space Science and Technology for School Students SST for SS program during national teachers day in Sep 22.

One webinar in five Indian languages were implemented in four states during 2022. In the local dialect, the event in Kannada was implemented by PSF KRVP along with popular science resource persons, working scientists/engineers at Indian Space Research Organization. 11 presentations by current and retired space scientist The were made. The presentations included, among others, the saga of Indian space

programme, job opportunities in space, planetary defence, space exploration, and space for human development in India. Two of the youngest among 14 students from 5-9 standards were co authors at 44 COSPAR in Athens, Greece in July 22 based on their work in SEL SW 20 [10].

In total students created in the SST for SS students contributed over 138 paintings and poetry about space explorations, outer space, and threats on only home, the Earth. This presentation provides information on the past non formal education outreach program and proposed SEL PDC23.

The existing socio cultural values embeded in the living environment turn out to be an invaluable natural material for space education outreach. what is known as a life style is the ecological niche as a sustainable method. Table.3.1. Furnishes, a typical common schedule for ten weeks. It also provides the topic focused, content, literature sources and specific objectives aimed at the end of each week.

Background note provide the required guidelines to the students. Typical notes provided for week # 01 are given below. After completion of the first week assignment, the next week is taken up by each participants.

Typical Background note for Week # 01 of 10 SEL PDC 23 is kept below.

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PSF

People Science Forum, KRVP, Mysuru India

www.oeliusob.com

TEN Weeks FREE PDC Orientation Program

SEL PDC23 Space Eco literacy and Planetary Defence Campaign23

TARGET, METHODOLOGY, OBJECTIVES, & FOCUS

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Week # 01 Time : 60 Minutes 22th April to 28, 2023 Duration : Seven Days

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TARGET

01 : Fifth to Ninth Standard Students **with a Handhold**

02 : 11th and 12th Standard Students with Physics and Mathematics **with a Handhold**

03: Any Branch of study degree level **on Self study**

04 : Any age, socio economic and cultural status **yet space quest with a Handhold**

METHODOLOGY

TEN WEEKS One Hour a Week with a Background material for a poem, painting or a slogan

OBJECTIVES

UNESCO/UNEP/IEEP,1977 environmental education objectives at Individual lifestyle

Science and Culture Hinge each other, UNESCO, 1989 as a Vision

FOCUS

Week # Date	Topic	FOCUS	Week Background notes
# 01: Apr 17-22	PDC 23	DART 2022: SEL SW 2020 I	IAA: NASA: ESA: NEO

At the end of one hour engagement in a duration of six days reading notes given below, all the four target group participants will be able to recognise the acronyms and note their source links and make a creative response in a painting/poem/ slogan/note or a sentence of own opinion.

Space Eco Literacy Vision for Planetary Defence at Community Level



NASA's DART Mission :
26-Sept-2022 — After 10 months flying in space, NASA's Double Asteroid Redirection Test (DART) – the world's first planetary defense technology ...
<https://www.nasa.gov/>



A 8th Standard Student Stanzin Otsal , Mahabodhi Carla School Mysuru, India in a SEL SW : Space Eco literacy campai during 2020 Lockdown depict the space quest of mankind using technology.

SEL PDC 23 WEEK # 01 of 10 BACKGROUND NOTES FOR ASSIGNMENT

IAA: International Academy of Astronautics:

IAA is an NGO, 1960, recognized by UN in 1996, IAA encourages international scientific cooperation through conferences, symposium and meetings in the area of: space sciences, space life sciences, space technology & system development, space systems operations & utilization, space policy, law & economy, space & society, culture & education; conducts 30+ conferences per year; Publishes cosmic studies dealing with a wide variety of topics including space exploration, space debris, small satellites, space traffic management, natural disaster, climate change, etc.; Publishes the journal of the International Academy of Astronautics, Acta Astronautic, Publishes dictionaries in 24 languages, ; and Publishes book on small satellite, conference proceedings, remote sensing(More at www.iaaweb.org). Assignment from 95 words above. A10 keywords listing or a poem/poster/slogan/a statement

NASA : The National Aeronautics and Space Administration

NASA,1958 is an independent agency of the U.S. federal government responsible for the civil space program, aeronautics research, and space research. NASA's science is focused on better understanding Earth through the Earth Observing System; advancing heliophysics through the efforts of the Science; exploring bodies throughout the Solar System with advanced robotic spacecraft such as New Horizons and planetary rovers such as Perseverance; and researching astrophysics topics, such as the Big Bang, through the James Webb Space Telescope, and the Great Observatories and associated programs (more at <https://www.nasa.gov/>). Assignment : From 84 words above, 10 keywords listing or a poem/poster/slogan/a statement.

ESA : The European Space Agency :

ESA,1975 is an intergovernmental organization,22 member states dedicated to the exploration of space. ESA's space flight programme includes human spaceflight (mainly in the International Space Station program); the launch and operation of unmanned exploration missions to other planets and the Moon; Earth observation, science and telecommunication; designing launch vehicles; and maintaining a major spaceport, at Kourou (French Guiana).The main European launch vehicle Ariane 5 is operated through Arianespace with ESA sharing in the costs of launching .Working with NASA

to manufacture the Orion spacecraft service module that will fly on the Space Launch System (More at <https://www.esa.int/>). Assignment : From 84 words above, 10 keywords listing or a poem/poster/slogan/a statement.

NEO : Near Earth Objects :

A near-Earth object (NEO) larger than 140 meters across, is considered a potentially hazardous object. There are over 30,503 known Near-Earth Asteroids (NEAs) and over a hundred known short-period Near-Earth Comets (NECs). Asteroids penetrate the atmosphere to the surface of the Earth, producing craters if they impact a continent or tsunamis if they impact the sea. As of January 2019, five near-Earth comets and five near-Earth asteroids have been visited by spacecraft. A small sample of one NEO was returned to Earth in 2010, and similar missions are completed. 8PDC at UNOOSA ESA and IAA gives the latest status (More at <https://www.nasa.gov/planetarydefense/neo>). Assignment : From 99 words above, 10 keywords listing or a poem/poster/slogan/a statement.

Planning, Design and Implementation

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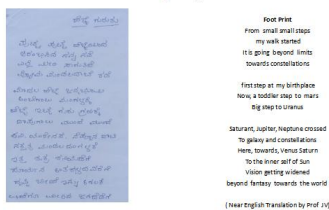
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3. Results and Analysis of SST for SS

Typical outcomes of a Space Science and Technology for School Students: SST for SS 22 are listed below. These paintings, poems and notes on my space voyage, space explorations are in local dialect Kannada and in English. There are over 100 students from local schools representing both Govt and Private schools are registered for the Space Eco Literacy Planetary Defence Campaign 2023 starting from April 22, 2023.

Selected Students Five Creative responses are cited below.

My space voyage, Space Science and Technology for School Students 2022
 Poem by Mr. Mahesh MP, 10th Std Student, Govt High School, Kukkarahally,
 Mysuru, India

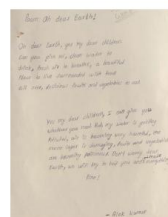


Foot print
 From small small steps
 my walk started
 it's going beyond limits
 towards constellations

first step at my birthplace
 Now a toddler step to mars
 Big step to Uranus

 Saturn, Jupiter, Neptune crossed
 to galaxy and constellations
 Here, towards, Venus, Saturn
 to the inner orbit of sun
 Vision getting widened
 beyond fantasy towards the world,
 (Near English Translation by Prof. JV)


Oh dear Earth,
 Poem by Alok Kumar, 10th Std Student, Mahabodhi Carla School,
 Mysuru, India



Oh dear Earth,
 Yes my dear children
 Can you give us, clean water to drink
 Fresh air to breathe
 Place to live surrounded with trees
 all over, delicious fruits and vegetables to eat

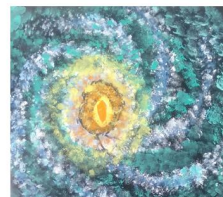
 Yes my dear children, I can give you
 Whatever you need, But my water is getting polluted,
 air is becoming very harmful, the ozone layer is
 damaging , fruits and vegetables are becoming
 poisonous . Dont worry daer Earth, we will try to
 help you and make everything.
 * Alok Kumar

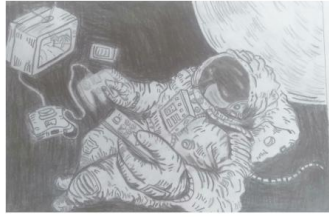
My space voyage, Space Science and Technology for School Students 2022
 Poem by Ms. Sanjana hana J, 11th B, Navodaya, School, Mysuru, India



Frogs croak for water
 Dark sky wish for rain
 My wish to watch sky is colorful
 From soil to sky wish to make wings
 Counting stars endless time
 My colorful aircraft float in a sky full of
 relations cradle and rock cloud dissolve
 My rocket lands on soil, yet quest of light
 spread do not quench.
 * Sanjana VR,
 (Near English Translation by Prof. JV)

My space voyage, Space Science and Technology for School Students 2022
 Poster Ms. Archana , 10th A Navodaya, School, Mysuru, India





4. Inferences

Interlinking the younger generation in schools and colleges to the living environment and threats locally and at planetary is vital. As a part of the formal education non formal popular science activities on space have been going on. It is believed and practiced that, bringing ecological sense to lifestyles is almost defining much of the riddles of our space and time crises. It is also understood that, issues of planetary defence are social issues such as untouchability, illiteracy, child and women exploitation and bonded labour. The real solution to these are beyond political and professional spheres: they demand technological efforts and social responsibility of all concerned. Space Eco Literacy models are operational in non formal formats as a supplement to formal education as science related activities and space. It is understood that Planetary Defence at Individual, Community leading to Civic Societies active participation is indispensable.

5. References

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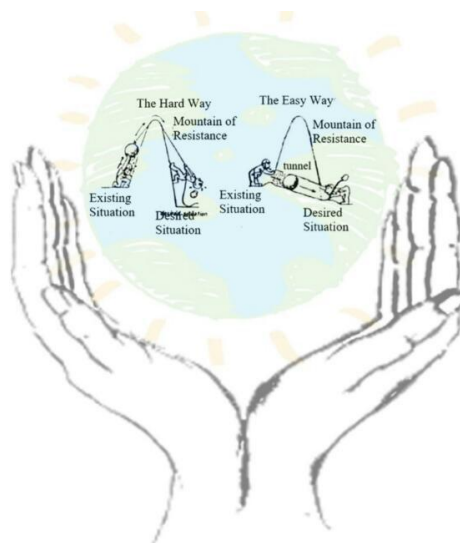
Sincere thanks to Dr. A S Kiran Kumar, Former Chairman, ISRO, Prof. Balasubramanian A, Former Pro Vice Chancellor, Pondicherry University, India , Prof.

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The proposed model SEL PDC23 with specific focus on planetary defence is based on the accruing experience gained at PSF KRVP since 2000 on a voluntary basis. There is neither a dedicated source of income nor or a budget but voluntary service as Space Education shall be a public good for all and everywhere..



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