

United Nations/South Africa Symposium on Basic Space Technology

"Small Satellite Missions for Scientific and Technological Advancement"

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Young Africa Space Engineers in the Global Space:
Opportunities and Challenges

THEME: SPACE EDUCATION

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**International Masters Course on Space
Mission Design and Management**



SAPIENZA
UNIVERSITÀ DI ROMA

CONTENT



Introduction



Opportunities for Young Africans in Space Technology



**Capacity Building in Africa: Overcoming Challenges
& Institutionalizing Space Education**



Space Education and Partnerships – 1KUNS Program

What Space Education means for Africa



Space Education and its Progress

Space Education encompasses the study of all scientific disciplines that involve space exploration and study phenomena occurring in the upper atmosphere, in space or on celestial bodies other than earth.

Capacity Building encompasses country's development of human, scientific, technological, organizational, and institutional resources and capabilities (UNCED, 1992)

Considering one of the objectives of BSTI that is to respond to the growing interest of countries and establish indigenous capacities in basic space technology

Progress of Space Education



Benefits to African Nations

Space technology offers a wide range of innovative and cost-effective solutions to the challenges of development, arising from the need for geospatial data acquisition and critical communication infrastructures.

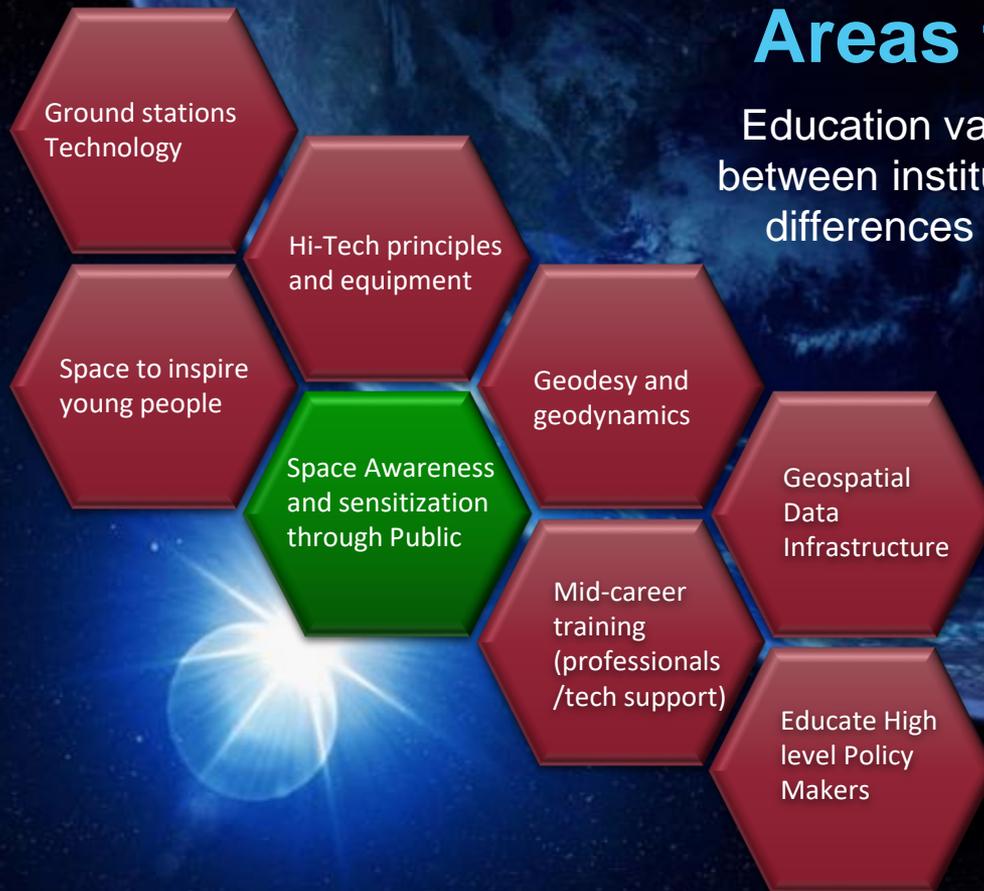
Some of the few benefits that arise from educating people on matters space include:

- ❖ Develop human capital with transferrable skills and infrastructures.
- ❖ Development of facilities, programs or other related resources and ability to perform specific tasks.
- ❖ Improved capabilities in space applications and services
- ❖ Developing the knowledge to address local economic situations
- ❖ Capacity to evaluate and address crucial questions related to policy choices and modes of implementation.

Progress of Space Education

Areas that Need Advancement

Education varies significantly between nations and even between institutions within the same country, which led to differences in space science and technology education curricula.



Disciplines that are essential range from:

- ❖ Astrodynamics/Astrophysics
- ❖ Space Craft Ground Operations
- ❖ Rocket Propulsion
- ❖ Atmospheric Profiling
- ❖ Applications of Remote sensing
- ❖ Space Systems

Opportunities for Youth in Africa

- ❖ Capacity building programs of the space agencies integrated into the satellite development programs; e.g. the KHTT to Nigeria and Algeria by SSTL

University/
Institutions

Capacity
Building/Joint
Programs

Regional
Training
Centers

Online
Distance
Learning

Scholarships
&
Fellowships

- ❖ United Nations (UN) Regional Centres for Space Science and Technology Education in Morocco and Nigeria and their mandates
- ❖ Regional Centre For Training In Aerospace Surveys (RECTAS), Nigeria and the Regional Centre for Mapping of Resources for Development(RCMRD)

- ❖ Pulling together the existing infrastructure and skilled workforce in institutions and industries, as well as developing links with emerging initiative such as the proposed ARM satellites

Progress of Space Education

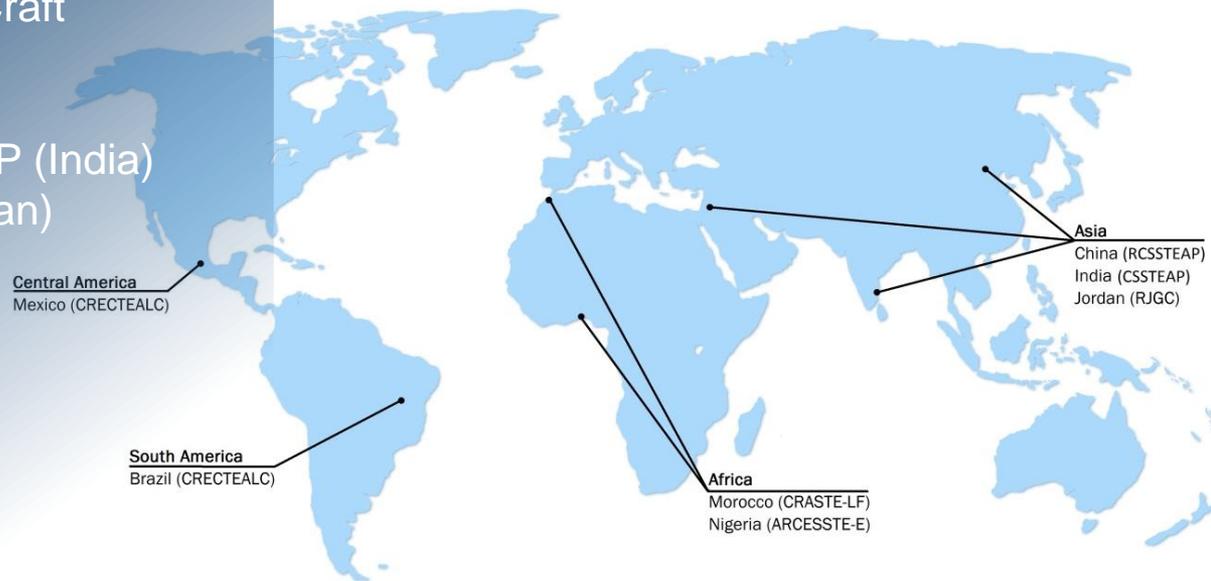
UNOOSA Affiliated Regional Trainings

The principal goal of each centre is the development of the skills and knowledge of university educators and research and applications scientists, through rigorous theory, research, applications, field exercises, and pilot projects in those aspects of space science and technology that can contribute to sustainable development in each country.

❖ African region: CRASTE-LF (Morocco), ARCECSSTE-E (Nigeria Space Craft Ground Operations)

❖ Asia and Pacific region: CSSTEAP (India) Atmospheric Profiling RJGC(Jordan) RCSSTEAP(China)

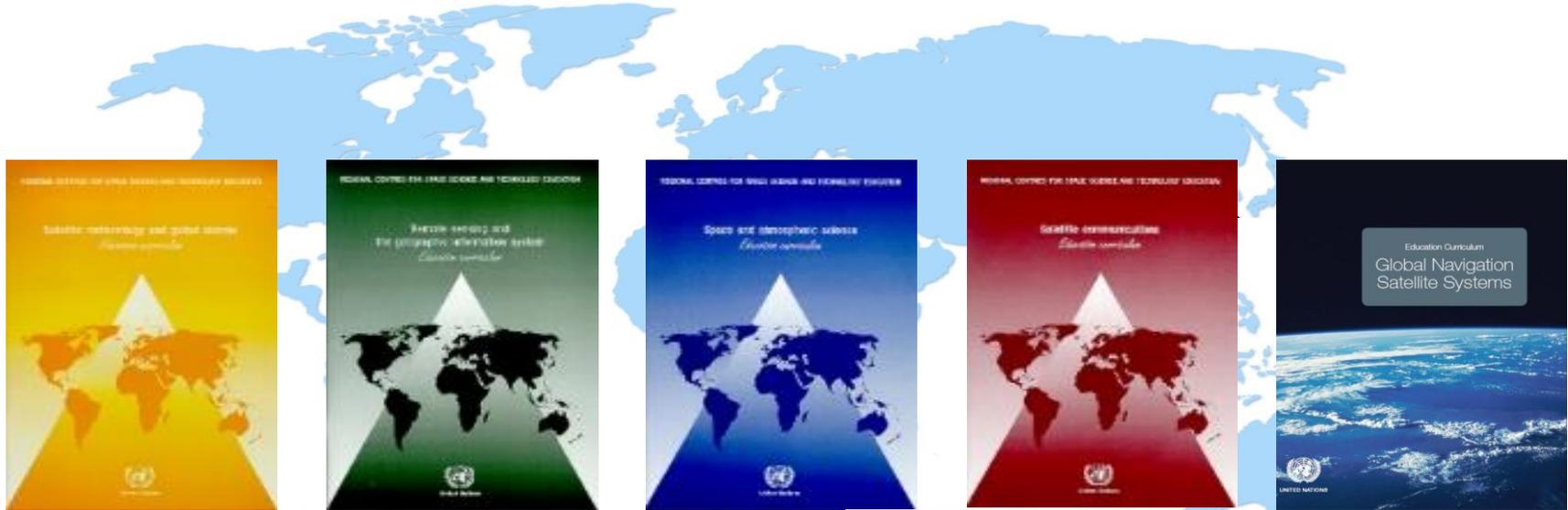
❖ Latin America and the Caribbean: CRECTEALC (Brazil and Mexico)



Progress of Space Education

UNOOSA Affiliated Regional Trainings

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meteorological
satellite applications

remote sensing and
geographic information
systems

space and
atmospheric sciences

satellite communications
and geopositioning
system

global navigation
satellite systems

Opportunities for Youth in Africa



Scholarships and Fellowships and Online Learning

- ❖ The MTN Solution Space Scholarship for Africans designed for mid-career professionals
- ❖ United Nations/Japan Long-term Fellowship Programme 2017 - Post-graduate study on Nano-Satellite Technologies (PNST) (Kitakyushu, Japan)
- ❖ Fellowship Programme for "Drop Tower Experiment Series" (DropTES) Germany
- ❖ United Nations/Italy Long-term Fellowship Programme on GNSS and Related Applications Torino, Italy
- ❖ Universiteit Leiden, in the Netherlands, offers the J.H. Oort Scholarship in Astronomy
- ❖ Applied Remote Sensing Training (ARSET), Future Learn, MOOCS

Opportunities for Youth in Africa



Spotlight on Universities in Africa

South Africa's rich heritage in astronomy, with associated capacity building institutions of excellence in astronomy spanned more than 180 years— University of Cape Town, Cape Peninsula University and Stellenbosch University.

Universities in Nigeria such as Kwara State University (KWASU) are making strides in this field.

Kenyan Universities

Increase in the number of universities offering space related disciplines

- ❖ University of Nairobi – Remote Sensing, Astronomy & Astrophysics
- ❖ Jomo Kenyatta University – GIS, RS and GNSS technologies
- ❖ Technical University of Kenya – Astronomy & Astrophysics
- ❖ Pwani University – Satellite Navigation
- ❖ Maseno university – GIS and GNSS

Masinde Muliro University of Science and Technology, Kenya Multimedia University

Capacity Building | Road Map and Overcoming the Challenges

Challenges experienced in Space Education

- ❖ Insufficient Capital and financial resources for training
- ❖ Rigid curricula with uniform academic standard –practicality eg 1KUNS
- ❖ Inadequate enablement in technology that would assist learning
- ❖ Capacity is usually at individual level it is hardly maintained and kept at an Institution level.
- ❖ Lack of Awareness
- ❖ Lack of well equipped training facilities
- ❖ Poor leadership, retrogressive policies and lack of political support

Capacity Building | Road Map and Overcoming the Challenges

How can Africa Institutionalize Space Education

- ❖ Increased efforts to raise awareness and outreach programs.
- ❖ Efficient national budgeting complimented by other thoughtful progressive financing mechanisms
- ❖ Pursuit of space technology should be explicitly laid out and understood by all stakeholders to guarantee all levels of political and policy backing
- ❖ Engaging multiple collaborating partners and being smartly innovative with the skills already acquired
- ❖ Create practical based trainings where institutions are involved.
- ❖ Self will and drive. Taking up online courses such as Massive Open Courses (MOOC's) e.g. ARSET, Space Labs and Tailor made course online distance learning
- ❖ Joint partnerships through training and research e.g. 1KUNS

Space Mission Design and Management

Objectives and Mission

Build capacity in space mission design and management with areas including;

- ❖ Space mission design, planning and management
- ❖ Managerial roles in space activities involving international cooperation
- ❖ Devoted to space research and space exploitation for commercial use and application



Educational Plan

The framework of is an ASI – Sapienza Agreement for the Broglio Space Centre (BSC) signed an Agreement dated 20 December 2013

The focus of the course is on space applications. Mission design and management

Idea is to design, build and deploy a “real” space mission in **One Year i.e 1KUNS**

Included real world experience through internship at BSC



Space Mission Design and Management

Joint Program

Part of the Space Agenda for Kenya includes capacity building and this is one of the steps that it has taken. Taking a major challenge into account, where capacity is hardly maintained at institutional level, this program was created with 3 objectives in mind:

- ❖ To Make the process institutional
- ❖ To make it practical and active
- ❖ Not to transfer know-how but build know-how

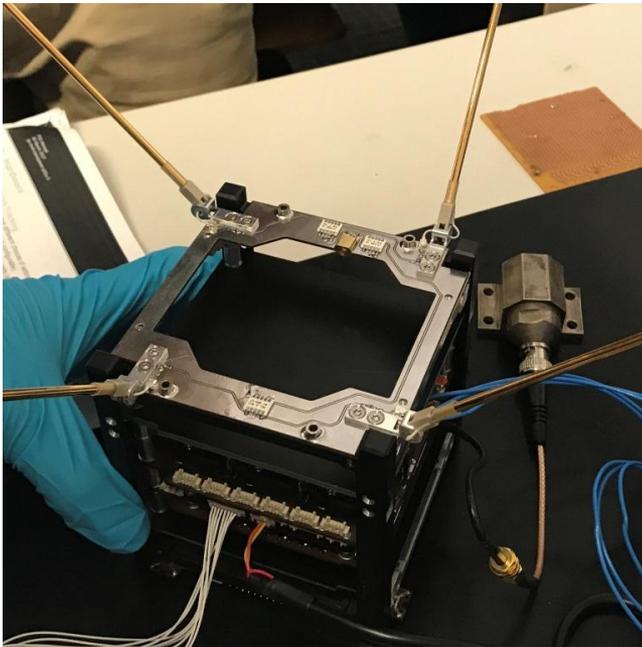
The joint program has an aim of using the research activity in which the Kenya institutions are active into education and prepare professional skilled in these fields e.g. IKUNS (Italy-Kenya University Satellite), SBAM (Satellite-Based Agricultural Monitoring) among others.

Everyone is directly involved, higher learning institutes, experts from both agencies and companies.

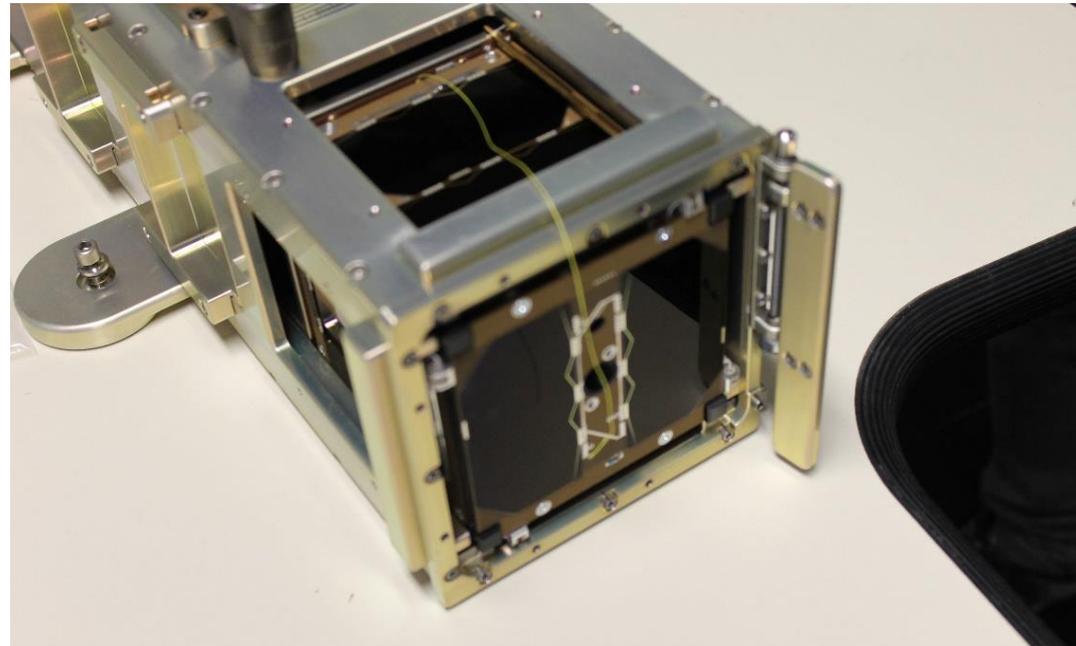


Space Mission Design and Management

1KUNS-PF



FIT Check Test



Inside the J-SSOD orbital deployer

Space Mission Design and Management

Joint Program

- The 1KUNS-PF team responded to the announcement of a launch opportunity through the **United Nations/Japan Cooperation Programme on Cubesat Deployment from the International Space Station (ISS) Japanese Experiment Module (Kibo) “KiboCUBE”** deployed on ISS by **Japan Aerospace Exploration Agency (JAXA)**
- The 1KUNS-PF team application was successful and by using “**KiboCUBE**”, the 1KUNS-PF will achieve successful deployment and the mission goals.



Space Mission Design and Management

Joint Program's Benefits

Part of the Space Agenda for Kenya includes capacity building and this is one of the small steps that it has taken.



Many Thanks



Italian Space Agency



University of Nairobi



University of Rome La Sapienza



Kenya Space Agency



UNITED NATIONS
Office for Outer Space Affairs



Japan Aerospace Exploration Agency

Mapping the way forward

Conclusion



Collaboration is Key - Joint partnerships



Many opportunities out there - regional trainings, universities with curricular in space education



Make learning fast and effective (Dr. John Kimani)



Don't only limit your challenges but challenge your limits



Thank you

Our World

Is Evolving

We are limited only by our own
imagination-

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University of Nairobi



Kenya Space Agency



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<http://www.unoosa.org/oosa/en/ourwork/psa/regional-centres/index.html>

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