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Activities of the African Regional Centre for Space Science & Technology Education to Promote the Participation of Girls in Space Science in Nigeria

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# Introduction

- ARCSSTE-E, which presently operates under the administration of the Nigerian National Space Research and Development Agency (NASRDA) was established in 1998 by the **United Nations Office of Outer Space** Affairs (UN-OOSA) to develop human capacity and educate Anglophone Africans about the benefits of space science and technology.
- Mandate of ARCSSTE-E is achieved through:
   The Graduate Programs (Masters & PGD)
   The Space Education Outreach Program (SEOP)

## **Spatial Coverage**

#### Nigeria: Distribution of States by Political Zones



#### **Period:**

➤ 2010 to 2016

#### **Participants**

About 2000 school children and teachers drawn from over 300 public and private schools randomly distributed within the six geopolitical zones of Nigeria



#### UNITED NATIONS Office for Outer Space Affairs Human Space Technology Initiative (HSTI)

Zero-Gravity Instrument Project (ZGIP) promotes space education and research in microgravity.

http://www.unoosa.org/oosa/en/sapidx.html

The United Nations Office for Outer Space Affairs launched ZGIP on 1 February 2013, and will distribute the microgravity simulation instruments worldwide to qualified schools, universities, research centres and institutes.



CLINOSTAT: A one-axis clinostat was selected for distribution because of the ease of use and potential scientific benefits.









#### Learning goals:

- How to collect scientific data in a laboratory environment
- Analyze the data with specialized software
- Obtain results
- Interpret and present the result of their study in a standard format to the scientific community.

## **Zonal Workshops on Robotics**



North West Zone Venue: Kano, Kano State April 18, 2013



North Central Zone Venue: Minna, Niger State March 27, 2013



South East Zone Venue: Awka, Anambra State May 8, 2013



Students learnt about Robots as space exploration tools, and during the practical session, they built the driving base of a Robot and program the Robot to perform simple tasks.



South West Zone Venue: Ile-Ife, Osun State May 14-15, 2013





**South-South Zone** Venue: Calabar, Cross River State June 12, 2013



# Zonal Workshops

- Dual phased comprising of theoretical and practical sessions
- **Theoretical Session:** PowerPoint presentations, discussion, quiz
  - •Where is outer space?
  - •What is in outer space?
  - How can we view outer space from the Earth?
  - How does the environment of outer space differ from the one on Earth?

#### • How do we get to outer space?

Why do we venture into space exploration?
What are the benefits of space exploration?
Why is it important for school children in Nigeria to learn about outer space?





## **Applications of the GPS Technology**



TUESDAY, JUNE 24, 2014

### Why I buried ex-customs daughter alive — suspect

"Azeez was eventually amented through a tracking device installed on the sistim's Toyota Camey Asses, an herbalist, had hypnotized the woman for a long time. He had taken over N200m from her both in cash and property. We discovered he cleverly constructed a well in his boune, firred the woman with her daughter into the room, and buried them alive.

netro ... City, Crime, Courts

"We were able to recover the decomposed bodies of the victims from the woll. We also picked their property which was buried along with them. We have finished our investigations, and he will be charged to court for murder. We will have the rest to be decided by the court."



The

TIESDAY JUNE 24, 2014 VOL 38 NO. 20, 690 www.punchng.com

THE MOST WI

#### **Practical Session:** How to use the GPS



#### **Practical Session:** Introduction to TRMM Satellite Precipitation Data



#### **Practical Session:** Local fabrication of Water Rockets







#### **World Space Week Celebration**

# Science Exhibition



Model of an Interplanetary Manned Space Flight on a mission from the Earth to Mars: Project presented by the winner of the Science Fair during the 2011 World Space Week Celebration in Nigeria



Model of the Universe depicting the Mysteries of the Cosmos: Project presented by the winner of the Science Fair during the 2010 World Space Week Celebration in Nigeria



#### Debate: "How Relevant is a Space Program in an Emerging Economy like Nigeria?



## **National Physics Quiz Competition**



➢National Physics Quiz competition organized for secondary school students in collaboration with the Nigerian Institute of Physics (NIP) and the Centre for Energy and Research Development (CERD).

Seven States and the Federal Capital Territory (FCT) participated in the program.
 During the final version of the competition, which was staged at the opening ceremony of the World Space Week celebration in 2011, the president of the Nigerian Institute of Physics (NIP), Professor Okwuoeze, who was accompanied to the occasion by members of the NIP council, encouraged the students to take the study of Physics seriously as it will go a long way in influencing any future career in the space industry.

#### **Promoting Space Science: Role Models**

#### What is a rocket?

A rocket is a missile or a vehicle that carries spacecraft to their orbit in space. Rocket engines eject exhaust in one direction, obtains thrust to move the vehicle in the other. In the space industry it is also referred to as launch vehicle.

#### What is rocket launch?

A rocket launch is the takeoff phase of the flight of a rocket.

#### What is a space station?

A space station is a spacecraft which is designed to support a crew (group of people) who will remain in outer space for an extended period of time. It is also a space vehicle to which other spacecrafts can dock

#### What is solar panel?

A solar panel is a packaged, connected assembly of solar cells, i.e. semiconductor crystals e.g. silicon wafer, used to generate electricity directly from the sun. It is mostly used to supply the power a satellite needs to work.

#### How does the solar panel receive energy?

When photons from the sun fall on the solar cells, they liberate some electrons in the atoms of the semiconductor crystals. These energized electrons move across tiny junctions of silicon and phosphorus within the cell, decreasing the resistance in the cell. If the circuit is closed electricity is created.

#### What is remote sensing?

Remote sensing is a method of getting information about an object without making physical contact with the object.

#### What is LEO?

LEO is an acronym for Low Earth Orbit. It is a range of distance between 160-2000 km (100 - 1.240 miles) above the surface of the Earth. A satelite (such as NigeriaSat-X) isunched on a Low Earth Orbit can produce high resolution data.

How do Nigerians benefit from satellites?

Nigerians use data collected from satellites to make land use maps, for hydrology and water resources management, for environmental monitoring and disaster mitigation and for military and security purposes.

Please can you give us a specific example of how the Nigerian satellite data is beneficial to the country? The Nigerian satellite data can be used to prevent an impending famine. Famine can occur when bad insects (such as locust) destroy food crops.

Famine can occur when bad insects (such as locust) destroy food crops. Pictures taken by the Nigerian satelike from outer space can be used to spot the location of these bad insects so that we can send helicopters to spray their hideout, and destroy them before they get to the fams and kill our crops.

# Nigeria SatX

#### Students posing questions to the Engineers

Engineers

#### A cross section of participants during the workshop



- Quiz competitions are administered to assess the impact of the workshop on the knowledge level of the participants in space science.
- Winners of the competitions receive attractive prizes (including robotics kits and books).
- The programs culminate in the launching of space clubs in all participating schools and a teacher from each school will receive resource materials on DVD to encourage the development of the space club in their respective schools.



### **Distribution of Instructional Materials**



- Written by astrophysicist Jeffrey Bennett.
  - Winner of 2013 Science Communication Award by the American Institute of Physics
- An exciting and informative book for children to learn about outer space.





African Regional Centre for Space Science & Technology Education - English (AFFILIATED WITH THE UNITED NATIONS) Obsfemi Avodowo University Campus, Ile-Ife, Nigeria



THIS BOOK WAS DONATED

ΒY

THE UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, VIENNA

AND PRESENTED THROUGH

THE SPACE EDUCATION OUTREACH PROGRAM OF THE AFRICAN REGIONAL CENTRE FOR SPACE SCIENCE AND TECHNOLOGY EDUCATION IN ENGLISH (ARCSSTE-E)

То

THE SCHOOL LIBRARY OF COMMUNITY SECONDARY SCHOOL AKA OFFOT, UYO, AKWA IBOM STATE, NIGERIA

ON JUNE 11, 2014







The creation of space clubs in schools is to serve as mentorship programme to consolidate what the participants have learnt during the workshops organized by the Centre







#### 'Why we inaugurate space technology in schools'

#### Emeka Obi

THE African Regional Centre for Space Science and Technology Education says its plan to inaugurate space technology in primary schools is to create its awareness among pupils in the country.

The head of Space Science Education at the centre, Dr. Omowumi Alabi, made this known while inaugurating Space Science Club at the MD Nursery and Primary School, Oko-Oba, Lagos.

The awareness, she said, was part of the centre's catch-themyoung initiative, targeted at grooming and exposing youngsters to space science and technology.

She said, the pupils would also benefit in other science-oriented areas, such as satellite communication, weather monitoring and remote sensing.

On the sustainability of the programme, Alabi explained that the centre would continue to offer regular training to both teachers and their pupils.

She further hinted that a fresh curriculum to incorporate space science in schools was in the making in the country.

The event was held at, Olaniyi Street, New OkoOba, Lagos. The school is to serve as a coordinating centre through which ARCSSTE can reach out to other interested primary schools in Lagos.

The proprietress of the MD Nursery and Primary School, Mrs. Omolara Adedugbe, in her remarks, hailed the centre for introducing the concept in schools.

Meanwhile, 23 schools participated in the inauguration of the club in Lagos, where the Managing Director/Chief Executive of the UAC Foods, Dr. Tawanda Mushuku, was bestowed the Grand Patron of School Space Science Club in Lagos.

# Go LowerGo Broader



## **Training Workshop for Space Club Teachers**







#### **International Training Workshop for Teachers**



➤The SEOP of ARCSSTE-E facilitated the participation of two secondary school teachers (from Niger State and FCT), in a one week training programme titled 'Meeting of Modern Science and School Physics: College for School Teachers of Physics'. >This programme was held (April 27 and May 3, 2011) at the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy.  $\succ$  During the program, the teachers received international exposure to innovative techniques and methods of teaching science, especially physics.

# **RESULTS** SEOP: 2010 - 2016

#### **Invitation to Schools**

5 representatives comprising of:

- 4 students (2 Boys & 2 Girls)
- 1 Science Teacher.

African Regional Centre for Space Science & Technology Education - English (AFFILIATED WITH THE UNITED NATIONS) P. M. B. 019, Obstemi Avvolovo University Campus, lie-Ite, Nigeris Space Education Outreach Programme Database for Schools										
SCH	OOLDATA									
Name	of School:									
Acade	Academic Level of School (tick all that apply)           Type of School           Nursery         Hmany         Junior         Senior           Secondary         Secondary         Hmate         Hubic									
Addre	ss of School (include	e PMB if app	olicable):	_						
City: .		Stat	e:			LGA:				
Schoo	I Phone No.:			e	-mail:					
TEAC	HER'S DATA									
Name	of Teacher:						Title of	Teacher	r	
					UK.	engr.	Mr.	Mrs.	Mies.	Others
Subject taught by teacher: Gender: Male Female Phone No E-mail:										
STUDENTS' DATA Total No. of Students No. of Female Students										
S/N	NameofStude	nt	Class	Age	Ge	nder	sle Scie		Divisi	on mmercial
1										
2							_	_		
3								+		
4							—	+	_	

#### **Distribution of Participants by Age**



#### **Participants and predominantly**

Teenagers



African Regional Centre for Space Science & Technology Education - English (AFFILLATED WITH THE UNITED NATIONS) Obafemi Awolowo University Campus, Ile-Ife, Nigeria





Theme: Applications of Space Science & Technology

Venue: Scintillate International Model School Army Barracks Road, Otokiti Village, Lokoja, Kogi State

Date: 20-21 May 2014

#### **RESULT OF QUIZ COMPETITION**

Name of School

#### **Government Secondary School, Minna**

S/N	Name of Student	Score
1	Ishaya Tumaka	95%
2	Philemon Agebe	90%
3	Clement Mattew	85%
4	Shedrack Ibikitan	75%

Average Score of Participants: 86%



African Regional Centre for Space Science & Technology Education - English (AFFILIATED WITH THE UNITED NATION S)

Obafemi Awolowo University Campus, Ile-Ife, Nigeria



## North Central Zonal Workshop

Theme: Applications of Space Science & Technology

Venue: Scintillate International Model School Army Barracks Road, <u>Otokiti</u> Village, <u>Lokoja</u>, <u>Kogi</u> State

Date: 20-21 May 2014

#### **RESULT OF QUIZ COMPETITION**

Name of School Salem Oxford International School				
S/N	Name of Student	Score		
1	Uxouko Samuel	100%		
2	Mene-Ejegi Bawo	85%		
3	Sule Fatimah	75%		
4	Aivenibe Yemi	70%		
Average Score of Participants: 83%				

## **Result of Quiz Competition**



## Where are the Girls?



## **Background: My Family**



## Secondary School St Georges English School,

Rome, Italy (1976-1981)



## **Developing Human Capacity**

**Teaching**: Physics, Mathematic & Further Mathematics Government Secondary School, Minna, Niger State, Nigeria (1989-1997)



.....You taught me Physics, Mathematics and instilled a need to understand the English language in me. You stood for excellence, encouraging even the weak. Thank you!! (Text message from a student, on Teachers Day: 6 October, 2013)



# **Research Question**

# Why do Girls run away from the Physical Sciences?

#### **Talbott Initiative for Girls in Science (TIGS)**



Dr Linda Hood Talbott is an Electrical Engineer, Educator, Cooperate Board Leader, Civic/Community Leader and Philanthropist, residing in Kansas City, USA. ...nurturing a future generation of females in the Physical Sciences who will champion the technological advancement of Nigeria...



UMKC Alumni Association - Alumna honors UMKC mentor by helping African girls

### **Organizers of TIGS**



## **Partners of TIGS**

African Regional Centre for Space Science & Technology Education (ARCSSTEE)
 Osun State Ministry of Education
 Obafemi Awolowo University Staff School

#### **Permission from the State Government**



#### **Meeting with Principals of Schools**

Introduction/Update on TIGS
 Request for potential candidates based on specific selection criteria



## **Selection Criteria of Participants**

- Each school *recommended students* for the program based on the guidelines below:
- i. Student should be female and presently enrolled in the second year of the Senior Secondary School (S.S.S 2)
- ii. Student is within the age range of 13 to 17
- iii. Student should be able to communicate in English language (i.e. read, write and speak).
- iv. Student should be academically inclined towards the sciences.
- v. Student should be disciplined, hardworking, committed and punctual.
- vi. Parents or guardian of student must give high priority to the education of their ward.

## **Qualifying Examination**

The organizers of TIGS visited the schools to conduct a Qualifying Examination in mathematics for the students nominated by the schools.



## **Oral Interview**

The organizers of TIGS conducted a series of interviews for the selected students and their parents in their schools



SELECTION OF PARTICIPANTS FOR TIGS COACHING PROGRAM ORAL INTERVIEW						
Name of	Potential Participant: Refere	nce #: TIGS/10/05	355			
Age,						
Professional Aspiration:						
	Grading Critaria	Marks Obtainable	Marks Obtained			
	Appearance • Female • Cleanliness • Tidiness	10				
	Fluency in English language	10				
	Mental Agility	10				
	Value for education	10				
	Academic inclination towards the Physical Sciences	10				
	Willingness to learn	10				
Student	Diligence	10				
	Determination	10				
	Leadership trait	10				
	Willingness & ability to share knowledge	10				
	Punctuality	10				
	Time management	10				
	How disciplined is the student?	10				
	Sincerity/Honesty	10				
	Value for education	10				
Parent	Social Rank	Class Class 0 5	Class 10			
Total Score Obtained						
Comments:						
_						

### **Highest Level of Education of Parents**

linkost	No formal Education	9%
ducation	Primary	15%
	Secondary	52%
evei	Technical	3%
	Tertiary	21%

**76%** of the parents of the selected students were **Semi-Literates** 



# **Financial Implication**

- The classes are conducted at no cost to the participants:
- Arrangements are made to transport the students to and from the coaching venue
- Instructional materials are made available to all participants
- Participants are fed during the coaching sessions.

*Period*: Selected Saturdays from 10.00 a.m. to 4.00 p.m. for a period of two years.

# The Coaching Session

# **Venue for Coaching**

- Science Laboratory of *Obafemi Awolowo University Staff School*, Ile-Ife, Nigeria.
- Located within the Obafemi Awolowo University Campus
- > A secluded (Primary School) to minimize distraction from peers







## **At the Coaching Venue**



## **Instructional Materials**





#### **Cross-section of the Coaching Class**









## **Cross-section of the Coaching Class**



33 33 3







# **Feeding**Lunch





## **Celebrating the Girls**









# **MOTIVATING THE GIRLS**



# RESULT

**70%** of the students who completed the program indicated a re-orientation of career plan towards the physical sciences.



Miss ODUTOLU Abosede Folashade No 2, Kosere Sarun Street Ifewara Road, Ile-Ife Osun State, Nigeria



Dear Miss Odutolu,

#### LETTER OF AWARD FOR TIGS SCHOLARSHIP

We are pleased to inform you that you have been selected as one of the recipients of the TIGS scholarship, to provide partial support your university education. This Award is in recognition of your brilliant academic performance during the coaching program in Physics and Mathematics, conducted for selected secondary school students in II=17e, from 2013 to 2015.

The Talbott Initiative for Girls in Science (TIGS) is a mentorship program designed to promote the participation of girls in the physical sciences. This program is named after Dr Linda Hood Talbott who is an Educator, Cooperate Board Leader, Civic/Community Leader and Philanthropist, residing in Kansas City, USA.

The TIGS scholarship is tenable in any university located within Nigeria. This Award, of a total amount of one hundred thousand naira (H100,000) only, covers educational expenses and monthly stipend during the fellowship year which commences for you in 2017. The money will be paid into the recipient's bank account in instalments from the beginning of the academic year as indicated on page two of this letter.

For the Award to be tenable, the recipient would need to provide evidence of enrolment in a tertiary institution in Nigeria. Furthermore, a Grade Point Average (GPA) of at least 4.0 out of a maximum of 5.0 for the academic year is required to renew this Award for another academic year. Hence for continuous assessment, the beneficiary of the Award would be required to present her statement of results at the beginning of each semester to the Coordinator of the TIGS program.

#### Please note that:

- 1. You are not permitted to accept scholarships from other sources in addition to this award.
- You would need to return a signed copy of this letter (to the Coordinator of TIGS), to signify your agreement to the terms and conditions stated above.
- You are also required to make available to the Coordinator of TIGS, the details of your Bank Account (i.e. Name of Bank, Name of Account and Account Number).

We extend our warmest congratulations to you on being awarded this one-time scholarship and wish you the best in all your academic endeavours.

Best regards,

Dr Omowumi O. Alabi Founder/Coordinator of TIGS

> I accept this award and agree with the terms and conditions stated above. I do not accept this award.

Recipient's Signature

Page 1 of 2

Date

...nurturing a future generation of females in the Physical Sciences who will champion the technological advancement of Nigeria...

#### **Scholarship Recipients**

- Mathematics: Federal University of Technology Akure, Nigeria
- Electronics & Electrical Engineering: Obafemi Awolowo University, Ile-Ife, Nigeria

#### "Girls in ICT" Day

Theme: Igniting Girls for ICT Careers





Coordinated by Women in Engineering, a society under the Institute of Electrical and Electronic Engineers, Obafemi Awolowo University campus in collaboration with the Space Education Outreach Program of ARCSSTE-E.

Keynote Address: 'Enjoying Your Career While Promoting Science & Technology Education' by Dr Wumi Alabi

52 female students accompanied by the ICT teacher from 7 secondary schools located in Osun State (Ile-Ife, Oshogbo & Ilesha) participated in the program.

Participants filled a career questionnaire......

Physical Science/ Engeneering:19% Medical Field: 54% Other Professions: 27%

#### **Follow-up: Robotics Education Program**

1<sup>st</sup> Female Nigerian to Participate in the World Robot Olympiad



She wants to do a lot of Programming in her life, and in the future, she looks forward to a career in Robotics or Artificial Intelligence

- Miss Fiyinfoluwa Shoyoye
- Building and Programming Robots during REP sparkled her interest in Programming and influenced her to commence an undergraduate study in Mechatronics Engineering at Bells University in Nigeria (GPA: 4.8/5.0)
- At Bells, she influenced the University to purchase some Robotics kits, and participate in the National Robotics Olympiad. Her team represented Nigeria in 2014 WRO held in Russia
- During her summer vacations she taught building and programming Robots to about 20 (Female: Male= 8:12) primary school children aged between 7 to 10.
- 1 of 60, and the only female Nigerian to participate in the Millennium Youth Camp, an international Program organized by the Academy of Technology, Finland in June 2014.
- Presently an undergraduate at the University of Helsinki in Finland.

# Recommendation

This 'Catch them Young' approach to develop human capacity and prepare school children (girls) for careers in space science and technology can be effectively implemented to a larger audience if the UN-OOSA would act as a Coordinating **Center by setting up Work Groups who will** work with Regional Centres, Space Agencies and Academic Institutions in developing nations (such as Nigeria and other African countries)

## Acknowledgement

I would like to thank:

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