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**ARCSSTE-E's Robotics Education Program:  
Using Robotics to make STEM Education Inspiring  
to Nigerian School Children**

Omowumi O. ALABI

African Regional Centre for Space Science and Technology Education in English (ARCSSTE-E), NIGERIA  
[mowumi.alabi@arcsstee.org.ng](mailto:mowumi.alabi@arcsstee.org.ng)

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# Outline

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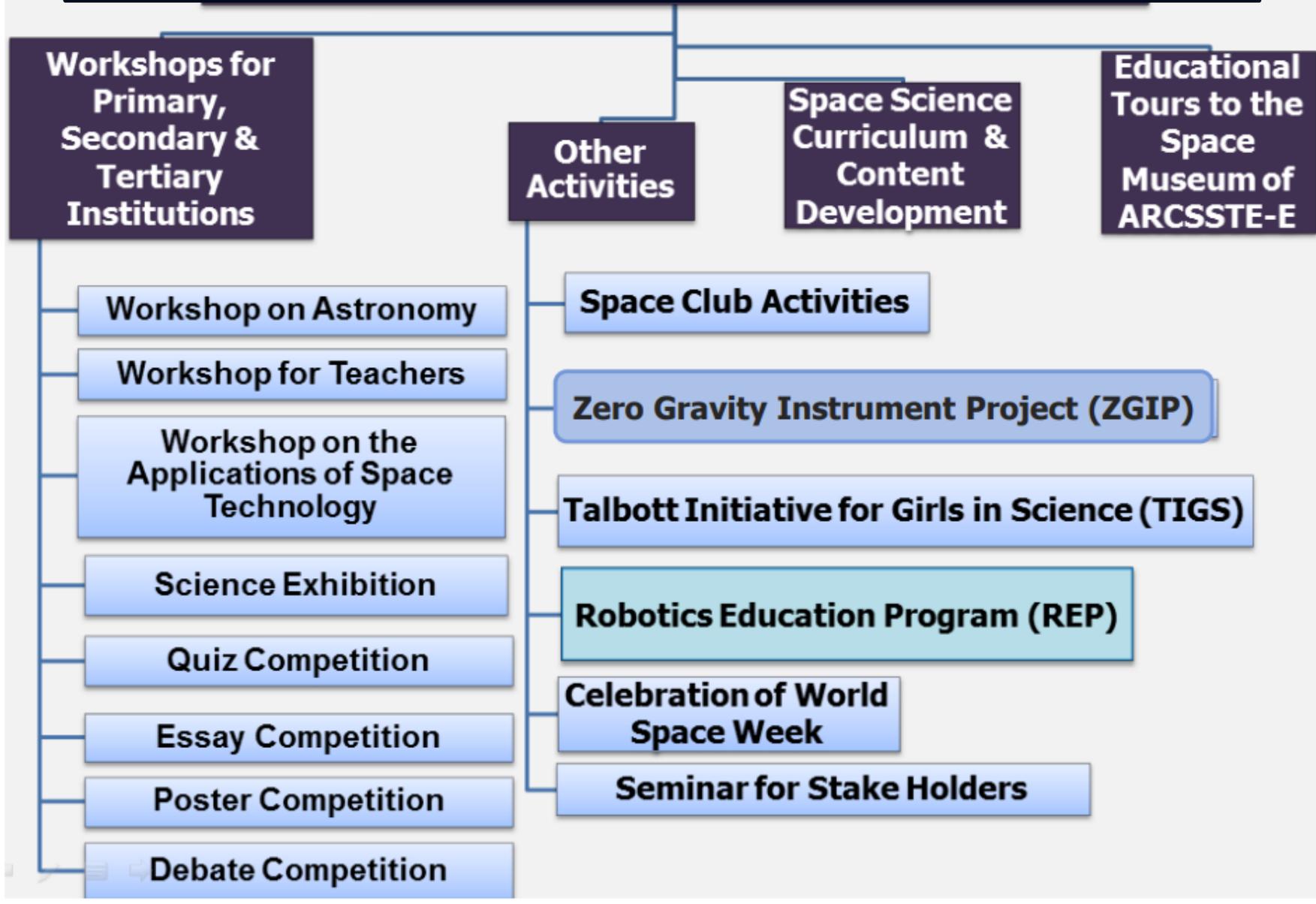
- Background
- Description of ARCSSTE-E's Robotic Education Program (REP)
- The most successful outreach methods of REP
- What worked in REP to get girls closer to STEM and space
- Lessons from REP that the audience can apply
- How can mentors, teachers, advocates be supported?

# Background

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- 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.
- The mandate of ARCSSTE-E is achieved through:
  - The Graduate Programs (Masters & PGD)
  - The **Space Education Outreach Program** (SEOP)

# SPACE EDUCATION OUTREACH PROGRAM



# **The Robotic Education Program (REP)**

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## **The Vision of REP**

- To cultivate mentorship skills from primary to tertiary educational levels;
- To inspire school children and develop their interest in STEM;
- To foster creative thinking and develop problem solving skills using hands-on approach;
- To promote scientific inquiry learning;
- To inculcate collaborative thinking and develop team spirit among Nigerian youths;
- To build indigenous robotic teams for Nigeria and Africa, with international level competence, and as part of the nation's aspirations towards the use of robots in space exploration.

# Most successful outreach methods for REP

## Collaboration between Academia & Commercial

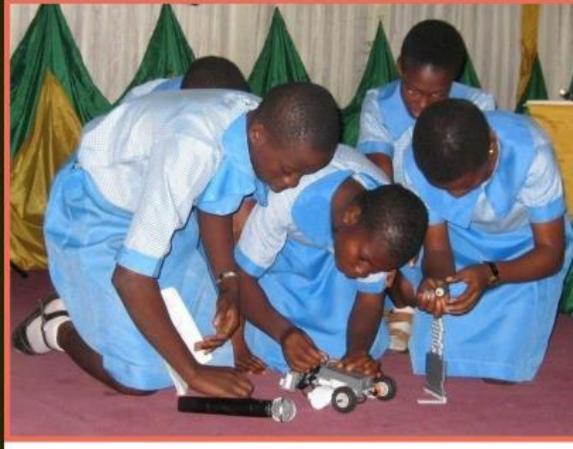
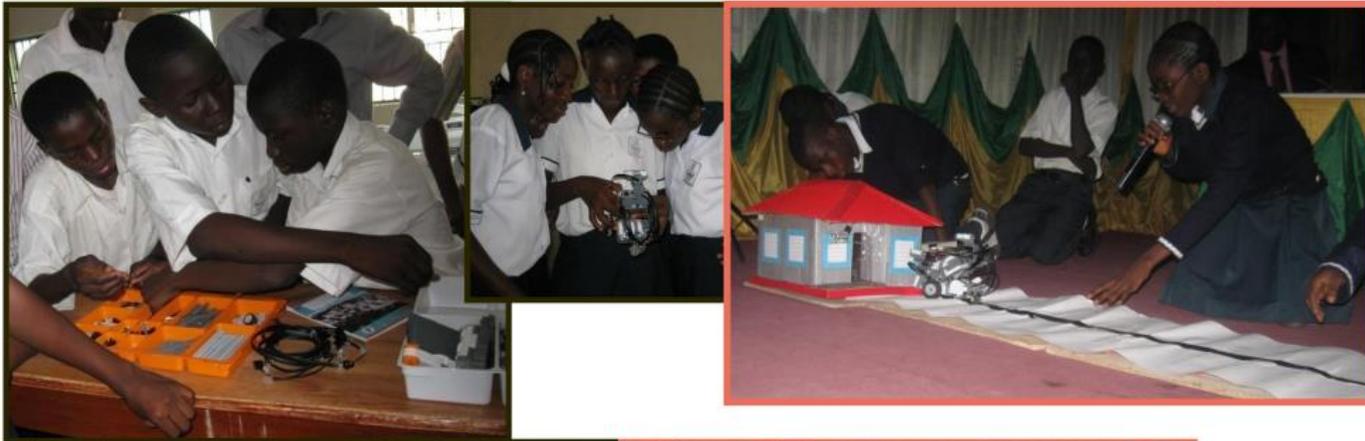


REP was organized by ARCSSTEE, in collaboration with:

- The Internet Laboratory of Obafemi Awolowo University (iLab--OAU): University Undergraduates served as Instructors/Trainers/Mentors
- Arc Lights Nigeria Limited (the exclusive distributors of LEGO in Nigeria): Provision of Robotics Kits
- ARCSSTE-E: Coordinated the Schools

# The most successful outreach methods for REP

## Started with a Pilot Phase



### Participants

- 30 students (male: female =1:1) from 3 schools were mentored in their schools for 6 weeks

### Mentors

- Undergraduate students from iLab-OAU

### Curriculum

- How to build and program robots using LEGO® MINDSTORMS robotics kits

### Assessment

- Quizzes (during the training session)
- Inter-School School Competition (at the end of the training session)

# Most successful outreach methods for REP

## REP produced Nigerian's first International Robotic Team



- The World Robot Olympiad (WRO) started in 2004, with organizations from **Korea**, China, Japan and Singapore as founding countries.
- REP culminated in the participation of Nigeria, for the first time, in the 8<sup>th</sup> WRO held in Abu Dhabi in 2011.
- Connecting REP with the international community through WRO encouraged professional self-development for the students

# Most successful outreach methods for REP

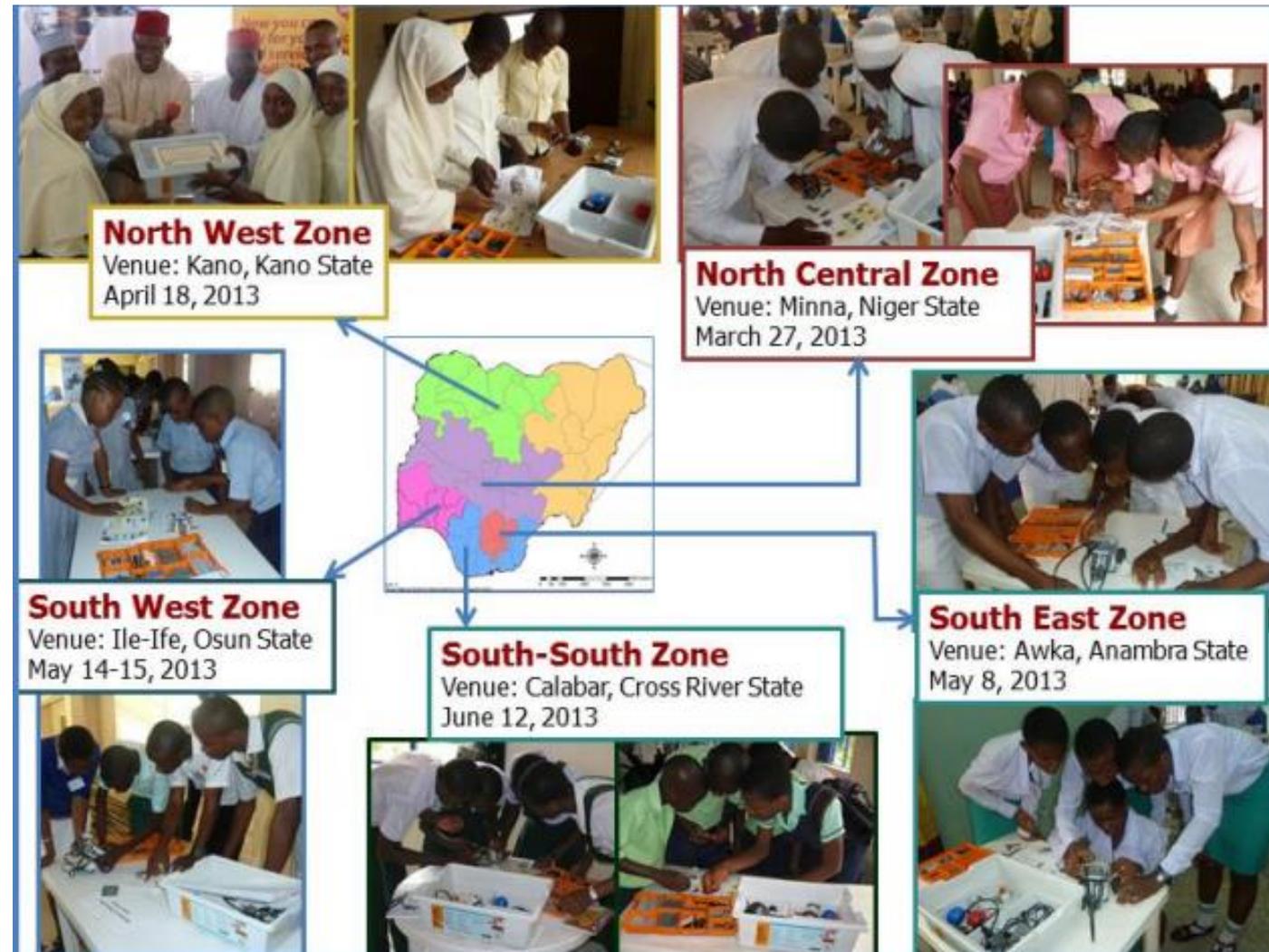
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## Evaluation of the Pilot Phase of REP

- An evaluation of the pilot phase of REP, through a structured questionnaire and interview sessions with students, indicated that the pilot phase promoted the interest of the participants in the physical sciences, especially in Physics.
- The response from the students also indicated that the programming aspect of REP enhanced their problem-solving ability, helped in logical reasoning, and promoted predictive thinking.
- Furthermore, this innovative scheme improved their interactive skills and ability to work together as a team.
- The positive impact of REP on the participants motivated ARCSSTE-E to coordinate a series of zonal workshops, dedicated to promoting robotics among pre-collegiate youths in Nigeria.

# Most successful outreach methods for REP

## Project Spiraled to National Outreach Workshops



### Zonal Workshops

- 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
- Participants of over 900 students and teachers
- 169 primary and secondary Nigerian schools
- Spatial coverage of 5 of the 6 geo-political zones of Nigeria
- In each zone, a school was selected to facilitate the assemble of other schools within the zone



# What worked in REP to get girls closer to STEM

## Workshop Evaluation: Interschool Quiz Competitions

### Identification of promising female students

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



### North Central Zonal Workshop

Theme: Applications of Space Science & Technology

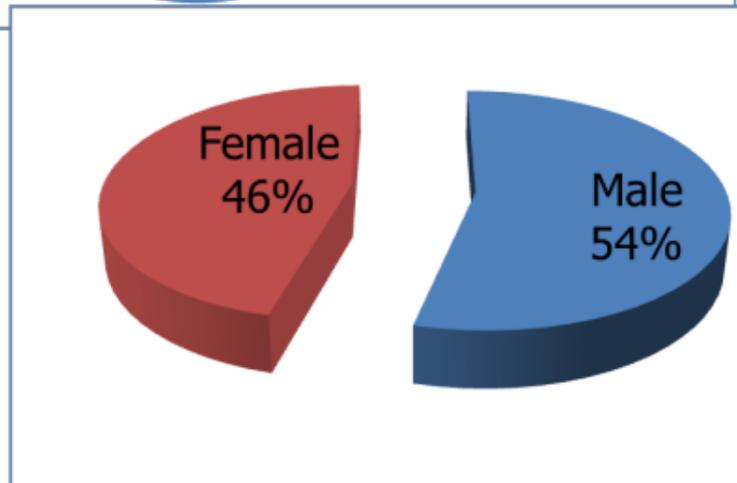
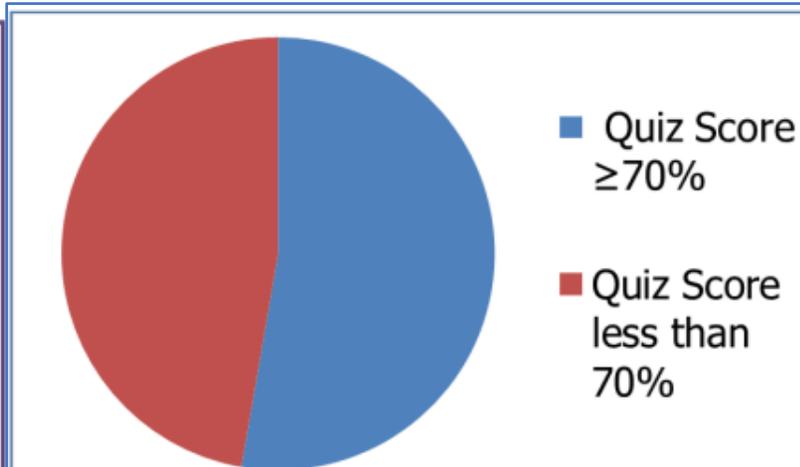
Venue: Scinbillate International Model School  
Army Barracks Road, Otokiti Village, Lokoja, Kogi State

Date: 20-21 May 2014

#### RESULT OF QUIZ COMPETITION

Name of School		
Salem Oxford International School		
S/N	Name of Student	Score
1	Uyouko Samuel	100%
2	Mene-Ejegi Bawo	85%
3	Sule Fatimah	75%
4	Aiyenibe Yemi	70%

Average Score of Participants: 83%



## Observations

- The scores obtained by the female participants in the quiz competitions compared favorably with that of their male counterparts.
- Given the same learning opportunities, the girls did as well as the boys eliminating the preconceived notion that the 'hard' sciences are reserved for "boys only".

# What worked in REP to get girls closer to STEM

## Follow-up on the Girls

### 1st Female Nigerian to participate in the World Robot Olympiad



- Miss Fiyinfoluwa Shoyoye
- Building and Programming Robots during REP sparked 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 Robotic kits, and participate in the National Robotic 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 years.
- 1 of 60, and the only female Nigerian to participate in the Millennium Youth Camp, and international program organized by the Academy of Technology, Finland in June 2014
- Completed bachelor and master's programs in Computer Science and Mathematics at the University of Helsinki, Finland.
- Currently works as a software developer and computer programmer in Helsinki, Finland.
- She affirmed that REP is the reason for her career path because she developed interest in computer programming during REP.

## **Lessons from REP that the audience can apply**

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- Thematic, linked to School Curriculum
- Project started from a pilot phase, and spiraled to national/international coverage
- Proper Documentation of Progress and Evaluation
- Participants included both male and female, but the focus was on the girls
- Follow-up on the girls

# How can Mentors, Teachers, Advocates be Supported?

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- Conferences like UN/ROK Space4Women Expert Meeting
- Mentorship Programs originating at the local level to feed into national and international mentorship programs, like the Space4Women Mentorship Program of UNOOSA
- Competitive Grants to support Mentors, Teachers, Advocates
- “Train the trainers’ program”
  - Outreach programs for teachers (in training colleges/schools) to identify brilliant female teachers, and provide professional development opportunities, mentorship and scholarship for them
- “Catch them young approach”
  - Outreach programs to schools to identify brilliant girls, mentor them, and provide scholarships to support girls with promising potentials