Mathematics and Science for Sub-Saharan Africa (MS4SSA) Initiative

Wole Soboyejo
Worcester Polytechnic Institute (WPI)

Acknowledgements

- Jee-Peng Tan and Sajitha Bashir

- The World Bank

- The New Jersey Center for Teaching and Learning

- Worcester Polytechnic Institute (WPI)

- African Governments
  – Gambia, Ghana, Ethiopia, Zanzibar, Lesotho, Malawi, Mauritius, Mozambique, Nigeria, Rwanda, Burkina Faso, Benin, Guinea, Senegal, Togo, Niger, Mauritania

- Participating Institutions and Collaborators
  – From Africa, Japan, India, China and the United States

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The Context of S&T in Africa

- 83 Scientists and engineers per million people in Africa compared with 1000-4000 in the developed world

- Jim Wolfensohn and the African Heads of State

- The Origins of the Nelson Mandela Institutions
  — Interactions with Nasr El-Rufai and President Obasanjo
  — The government of Tanzania (Hippolyte Fofack, Burton Mwamilla, Evelyn Mwebede and Presidents Mkapa and Kikwete)
  — 2iE in Burkina Faso (Francophone team with strong support from the governments of France & Switzerland)

The Pan-African AIST Flower Model

Burkina Faso
Center for water and environmental engineering

Nigeria
AIST campus in Abuja

Tanzania
AIST campus in Arusha

Nigeria
Center for offshore petroleum engineering (G2i)

South Africa
Center for applied mathematics (partnering with the existing African Institute for Mathematical Sciences)

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More Recent Initiatives by the World Bank

- 46 new African Centers of Excellence (ACE) in West, Central, East, and Southern Africa

- Partnership for Applied Sciences and Technology (PASET)
  - Regional Scholarship Fund
  - Research and Innovation

- Focus on training of trainers at the tertiary level (University/Polytechnic professors)

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The Need to Now Focus on the Bottom of the Pyramid

MS4SSA

Math and Science for Sub-Saharan Africa

- The emerging challenge is the problem of the youth bulge in Africa

- 70% of the population is below the age of 30

- This are declining levels of achievement in STEM fields

- Need for a strategic STEM initiative at the K-12 level

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The MS4SSA Program

- The origin of the MS4SSA idea- Jee-Peng Tan

- Subsequent interactions with Sajitha Bashir, Harisoa Rasolonjatovo, Ryoko Tomita Wilcox, Toby Linden, Ekua Bentil at the World Bank

- Collaborations with NJCTL (Bob Goodman, Rosanna Satterfield, Michelle Lageman)

- Subsequent interactions within WPI (President Laurie Leshin, Provost Bruce Bursten, Kim Hollan, Alex Pottinger, Arthur Nzihou, Pam St. Louis, WPI faculty/staff/students)

- Participants from Africa, China, India, Japan, USA

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The Goal and Strategy of the MS4SSA Initiative

- The goal is to develop and diffuse modules for the training of the next generation of Africans in STEM fields that can contribute to the development of Africa

- The strategy involves

- The development of train the trainer modules

- The development of global best practices

- the training of students by trained trainers using MS4SSA modules

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The Implementation of the MS4SSA Vision

- The initial development of the vision and the modules- World Bank, NJCTL and WPI

- Interactions with 17 African countries and collaborators - US, Japan, India, China

- MS4SSA conference and training workshop (May 15th- 26th, 2017)

- Initiation of African nodes and individual country programs (June 2017 and beyond)

- Training of the initial cohort of trainers in Africa

- Scaling and assessment of program

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The Key Components of the MS4SSA Conference

- Welcome and opening remarks by President Laurie Leshin (WPI) and Mr. Makthar Diop (World Bank)

- Overview of World Bank Programs- Dr. Sajitha Bashir (World Bank)

- Global best practices and case studies (this conference)

- TTL and Advisory Board Meetings (this conference)

- Country perspectives and planning sessions (May 17th-26th)

- WPI/NJCTL Module Training Modules (May 17th- May 24th)
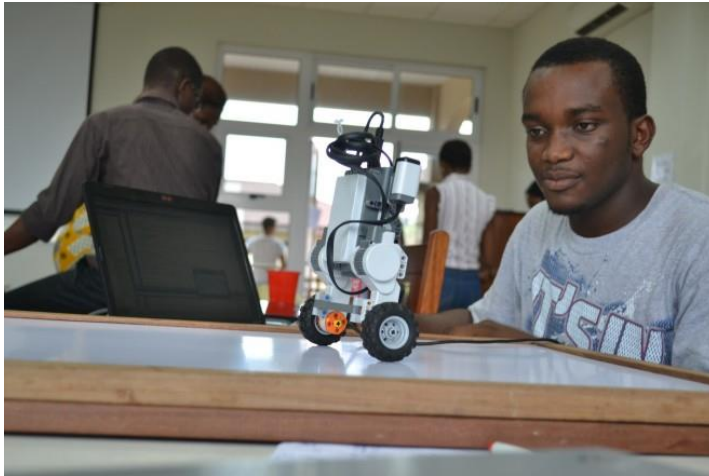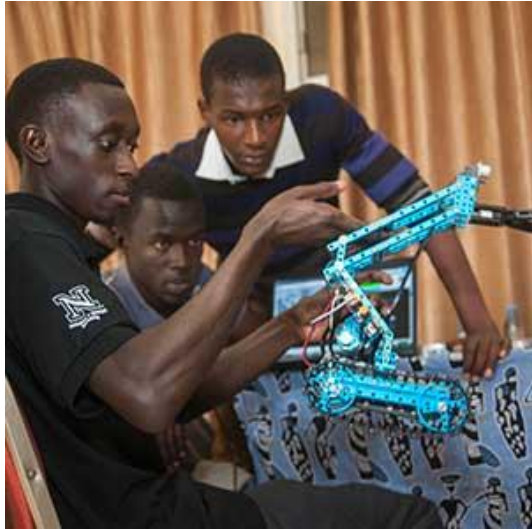
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Building on The Emerging Culture of Robotics in Africa

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Integrating Robotics Into the Culture: Battlecry WPI

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Global Best Practices- Lessons from the World

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Global Best Practices- Lessons from the World

- Presentations from different parts of the World
- African country perspectives and the African Institute for Mathematical Sciences (AIMS)
- Japan- JICA experience in Africa
- India- Perspectives from the Indian Experience
- China- The Shanghai Model
- US- NJCTL, Middlesex High School, WPI
- Integrate key concepts into African nodes/ country plans

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MS4SSA Advisory Board Members

- Nkem Khumbah (University of Michigan)

- Pradipta Banerji (IIT Bombay)

- Jee-Peng Tan

- Pete Gange (Middlesex High School)

- Martha Cyr (WPI)

- Shola Odusanya (AUST/SHESTCO)

- Xingfeng Huang (Shanghai Normal University)

- Shimpei Taguchi (JICA)

- Aissa Wade (AIMS & Penn State University)

Initial African Countries in the MS4SSA Initiative

- East Africa: Ethiopia, Rwanda, Zanzibar, Mauritius

- Southern Africa: Lesotho, Mozambique, Malawi

- West Africa: Mauritania, Guinea, Senegal, Ghana, Burkina Faso, Niger, Nigeria, Benin, The Gambia

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Responsibilities of the Regional Nodes

- The selected nodes will work closely with African countries in their regions to develop train-the-trainer programs and implementation programs

- More nodes may also emerge as additional countries meet the requirements

- The nodes will work closely with WPI, NJCTL and the World Bank on the implementation of national/regional goals

- They will gradually become independent and self-sustaining as time goes by…

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The Selected African Regional Nodes

- The initial nodes have been selected through an open and transparent process

- Proposals were evaluated by a panel and selected on the basis of clearly defined merit review criteria

- The initial nodes are
  — Nigeria
  — Rwanda
  — Niger
  — Gambia

- More nodes may emerge as additional countries meet the requirements

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MS4SSA Approach to Strengthening and Promoting a STEM Culture

- Work with African Nodes and Country Teams on Implementation Plans

- Strengthening STEM and access to STEM
  - Mathematics, physics, chemistry, biology in secondary school (NJCTL informed by global best practice partners)
  - Mathematics and science in primary/middle school (NJCTL informed by global best practice partners)

- Promoting a culture of STEM
  - Materials science and engineering (synthesis/creativity)
  - Robotics (problem solving, coding, logic and creativity)
  - Project-Based Learning (problem solving, team work)

- Assessment of programs and their effectiveness

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Summary and Concluding Remarks

- This talk summarizes the vision and implementation of the MS4SSA Initiative

- This is an initiative inspired by the need to train the next generation of African STEM experts

- The initiative involves an integrated approach to curriculum development/pedagogical approaches/ implementation strategies

- This conference will discuss global best practices and case studies for K-12 STEM fields

- It will be followed by a 8 day train-the-trainer workshop

- We welcome your involvement in our efforts to train a critical mass of world class Africans with expertise in STEM fields

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