Promoting Innovation in Rwanda through Robotics Education

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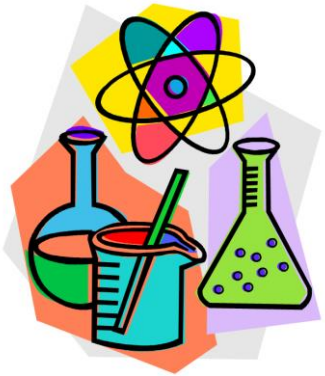
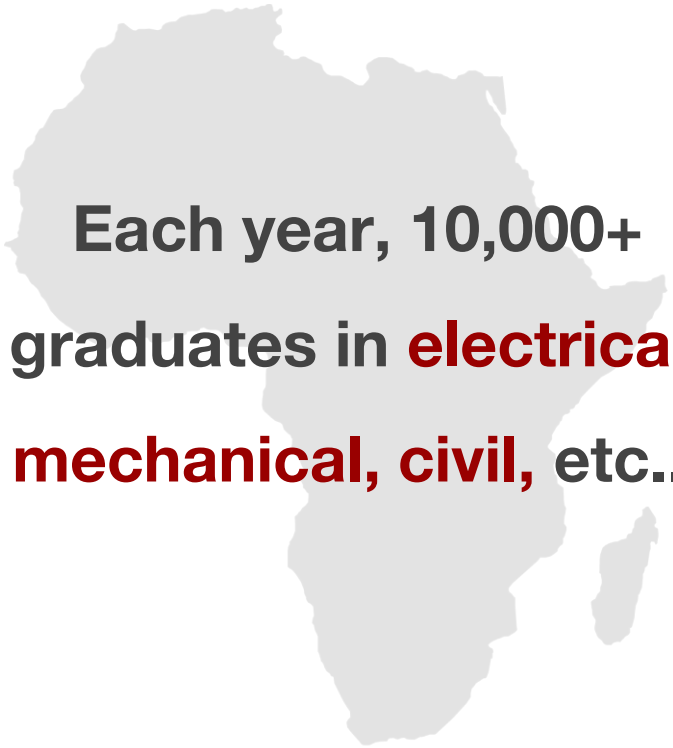
Mathematics and Science for Sub-Saharan Africa (MS4SSA):
A World Bank Initiative to Improve Student Learning in Africa
4 – 5th March 2018 | AIMS MS4SSA Training of Trainer's (TOT) Workshop

Why learn Science and Engineering?





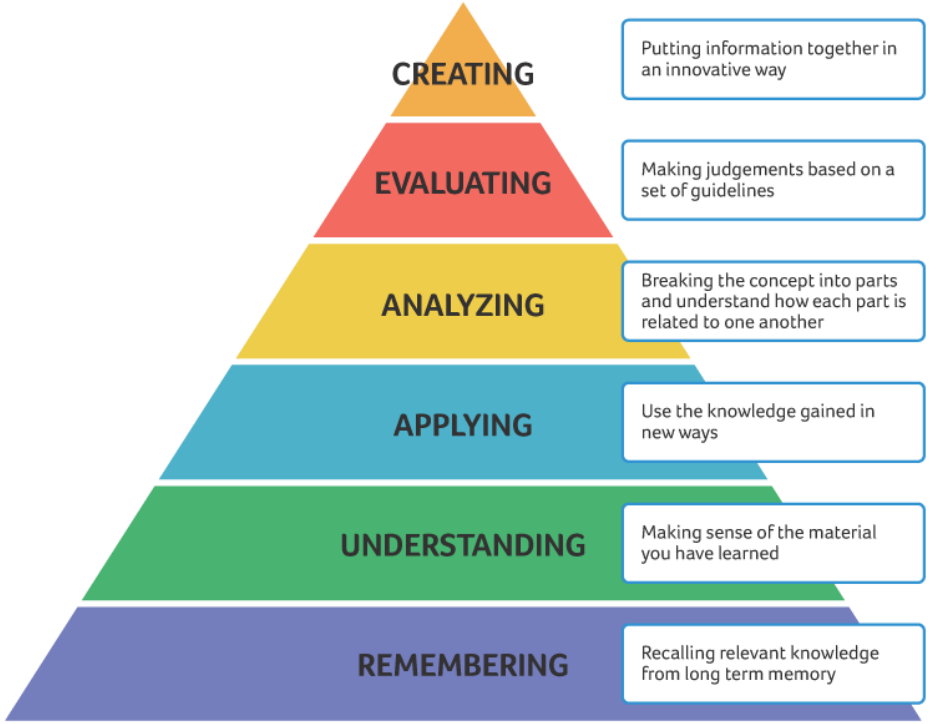
Each year, 10,000+ graduates in **electrical, mechanical, civil,** etc...

But,

we still have **major fundamental challenges** in power infrastructure, construction, water, agriculture,

Where is the **disconnect**?

The disconnect…



…practice

…application

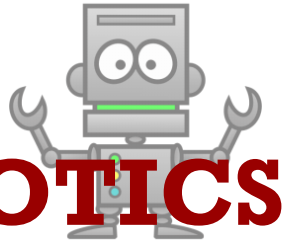
…skill

Little Background About Me

- Born and lived in Lagos, Nigeria all my life
- Strong desire to demonstrate the **nexus** between **human capital development** and **socio-economic development**
- PhD student in Robotics Engineering at WPI and Member of WPI Robotics Education Resources Team

What is **ROBOTICS?**

Why Consider Robotics Education?



ROBOTICS

ELECTRONICS

MECHANISMS

PROGRAMMING

Robotics - Electronics

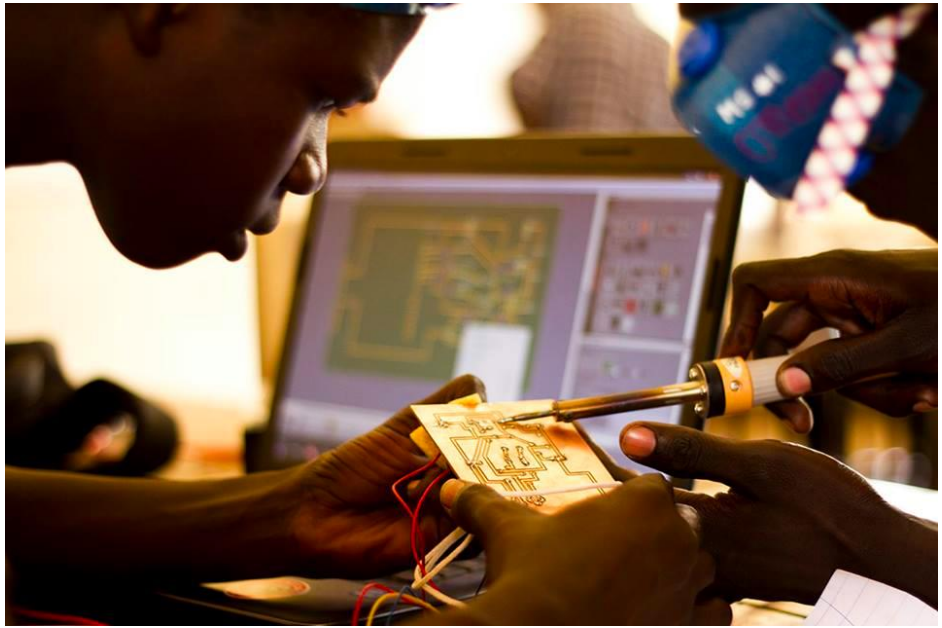


Image credit: FundiBot

- **Electronics:** Design of circuits using transistors, ICs, and other components.
- Other components: sensors, actuators, input devices, etc.

Robotics - Programming

Image credit: FundiBot

- **Programming:** Creating a set of instructions to tell a computer how to perform a task.

Robotics - Mechanisms

- **Mechanism:** Assembly of moving parts to accomplish a functional motion or task.

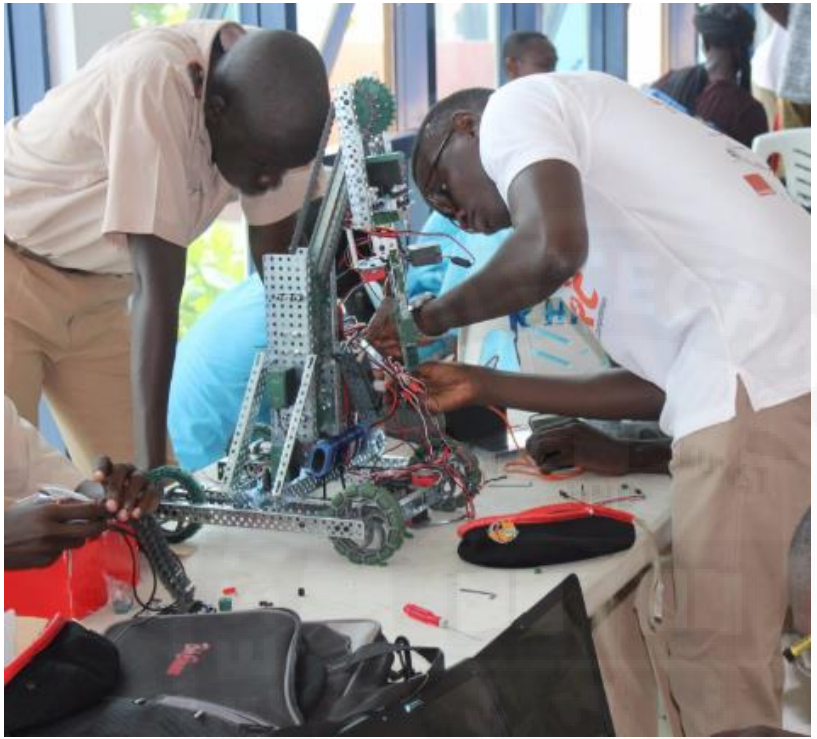
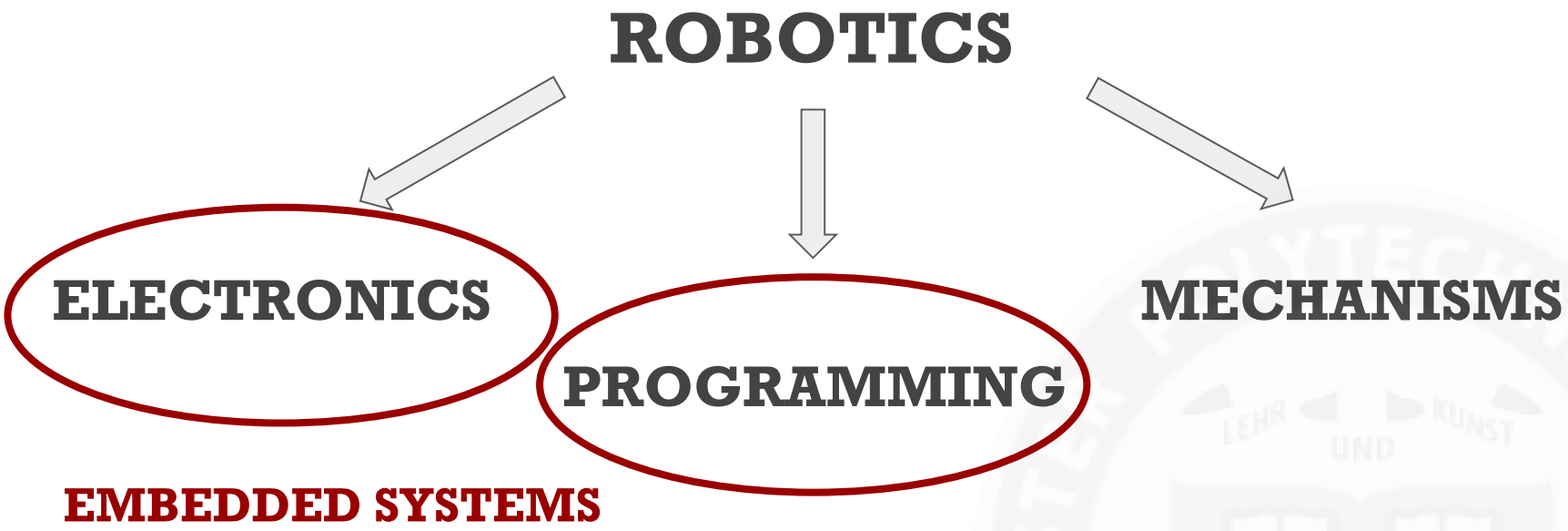


Image credit: PARC

Robotics: Automation



AUTOMATION

Robotics: Automation

- **Industrial:** Industrial robots
- **Military:** UAVs, UGVs
- **Vehicles:** Cars, Drones, Underwater vehicles, driverless cars

Image credit: FANUC, AMS South Africa

Robotics: Automation

- **Agriculture:** Irrigation systems, soil monitoring systems, etc.

- **Medical:** Prosthetics, clinical equipment, etc.

Image credit: SSWM, NiL, ABE Research UIUC

Robotics: Automation

- **Domestic:** Renewable Energy Devices, etc.

Image credit: Arnergy Nigeria

Robotics on the African Continent

Robotics and STEM programs are growing all over the continent

Summary: 81+

Top countries:

- South Africa (19)
- Nigeria (12)
- Kenya (6), Ghana (6)
- Senegal (5), others

Image credit: Wikipedia, Jan 2017 Update

Robotics on the African Continent

FundiBot

- **Reach:** 15 schools, 600 students
- **Founded:** 2011
- **Focus:** Robotics from local materials, programming, basic electronics
- **Approach:** Bootcamps, summer programs

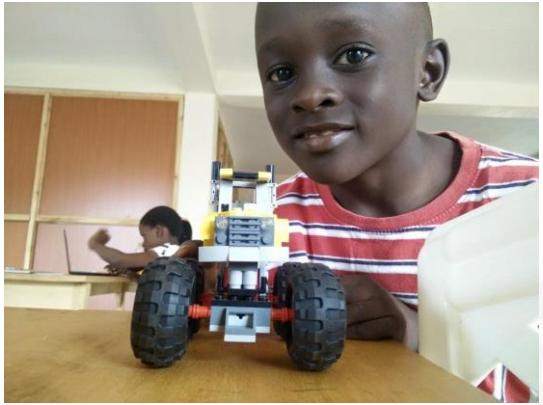
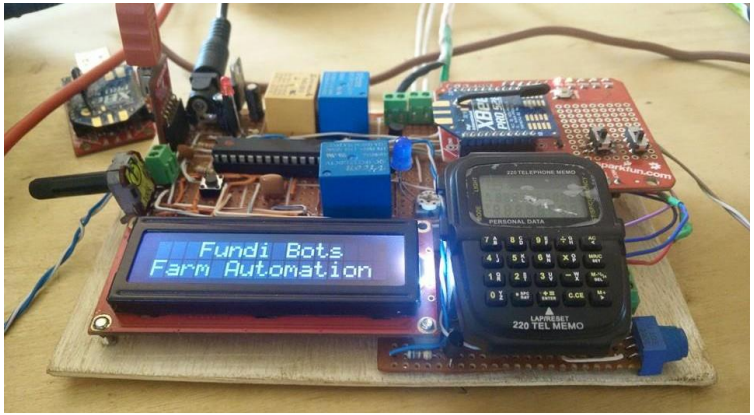


Image credit: Facebook - FundiBot

Robotics on the African Continent

FundiBot



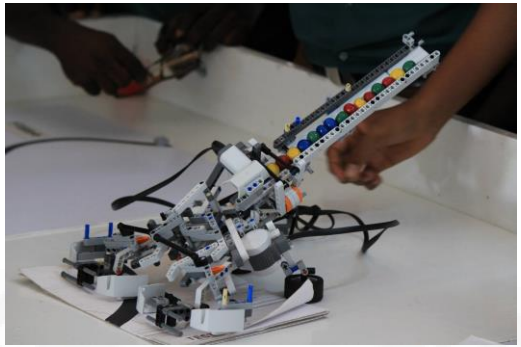
Fundi Bot Farm Automation System

Image credit: Facebook - FundiBot

Robotics on the African Continent

Ghana Robotics Academy Foundation

- **Reach:** ~500 students in robotics competitions annually
- **Founded:** 2011
- **Focus:** Robotics kits programming, assembly
- **Approach:** RiSE, World Robotics Olympiad (WRO)



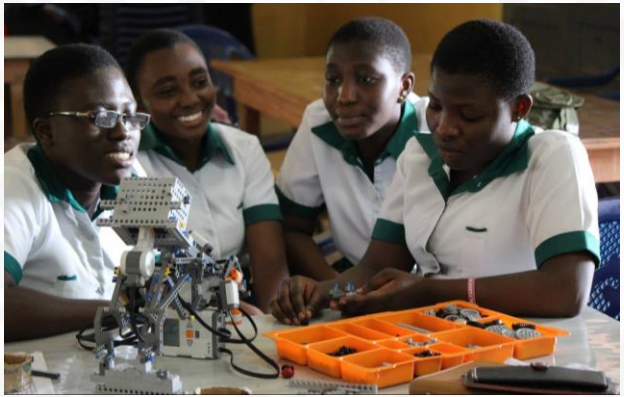


Image credit: Facebook - GRAF

Robotics on the African Continent

Ghana Robotics Academy Foundation

Image credit: Facebook - GRAF

Robotics on the African Continent

SenEcole

- **Reach:** Over 25 schools (as at 2016)
- **Focus:** Robot design, programming
- **Approach:** Summer STEM/robotics camps, competitions

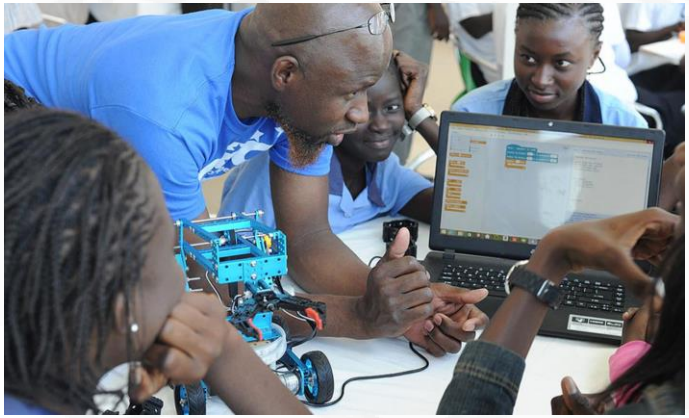
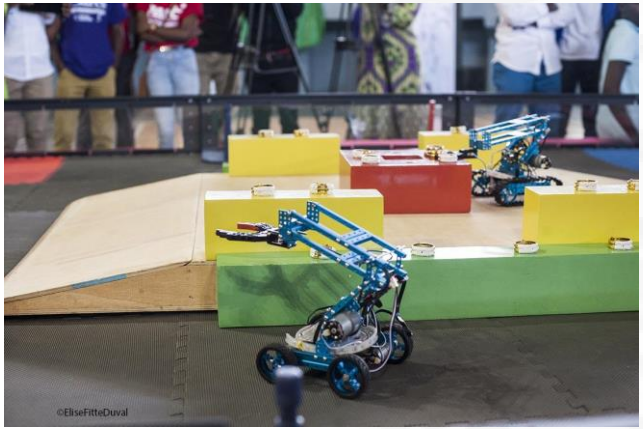


Image credit: senecole.com

Robotics on the African Continent

SenEcole - Pan-Africa Robotics Competition

PARC
Pan-African Robotics Competition

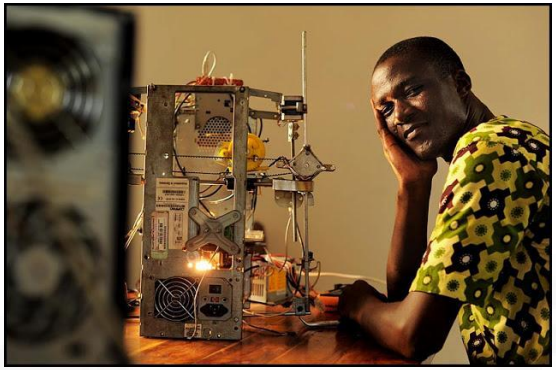


“Made in Africa”

Image credit: PARC, senecole.com

Robotics on the African Continent

WoeLabs



- **Focus:** Building innovative technology from available resources, e.g. e-waste.
- **Approach:** Shared workspace open to members for innovation

Image credit: woelabo.com

Robotics on the African Continent

WoeLabs

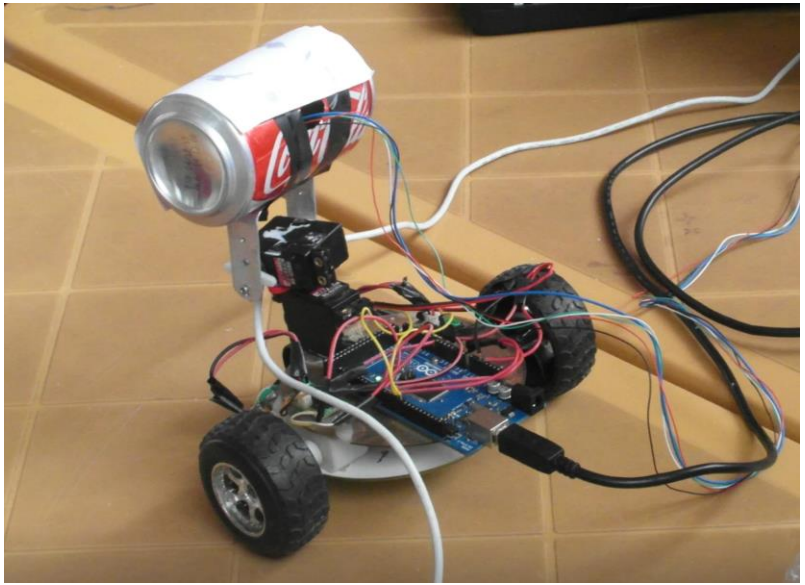
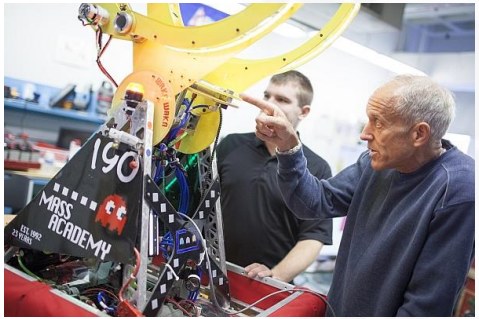
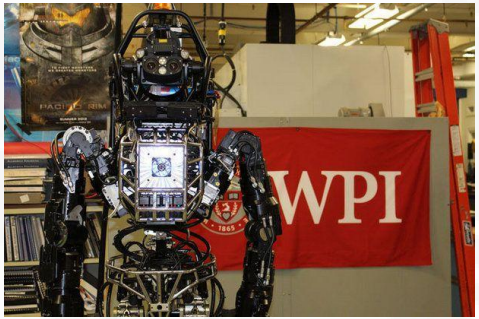


Image credit: woelabo.com

WPI Robotics Engineering

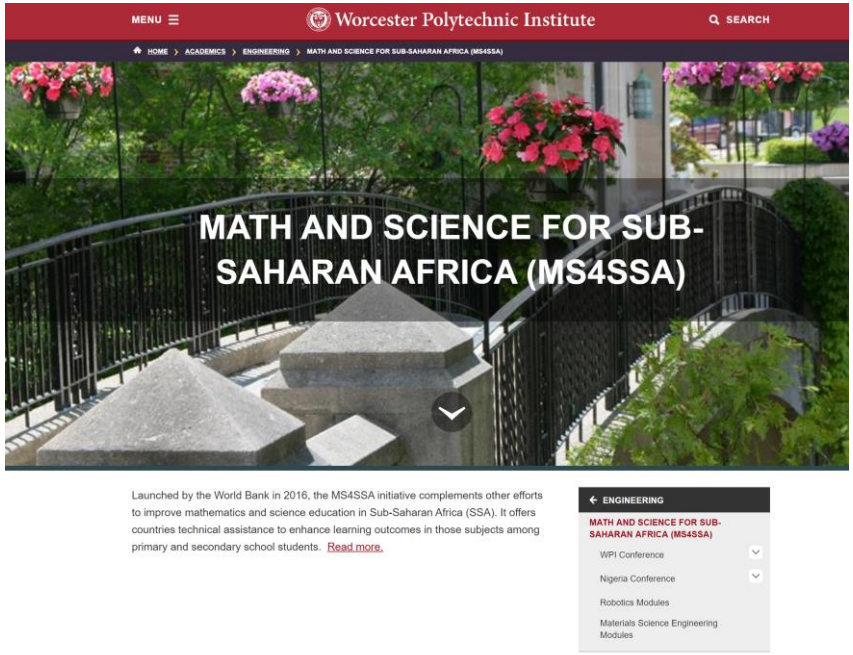
- First school in the US to offer **Robotics Engineering degrees** in the undergraduate level.
- Has **years of experience** in supporting **robotics competitions** all over the US.
- Has long history of successful **robotics summer camps** for middle and high school students.

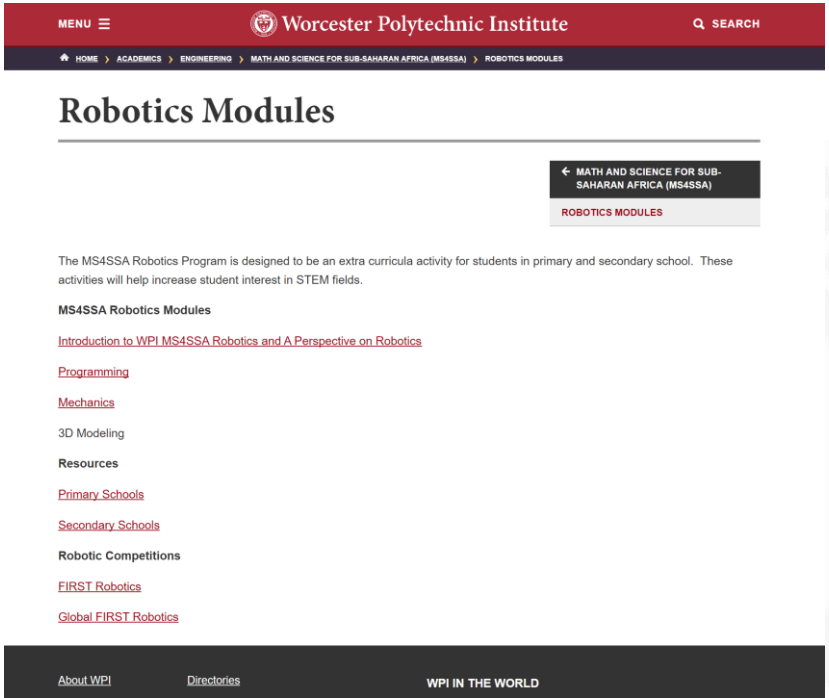




WPI MS4SSA Modules:

For free access, visit: www.wpi.edu/+ms4ssa





What We're Doing Today!

Goal is to demystify robotics...

1. Basics of **Computer Programming**
    - Learn to write simple, basic code
2. Basics of **Mechanism** - Introduction to Motors and Power Transmission
    - Understand what motors are, how they work and how power transmission functions
3. Basics of **Solid Modeling** and **3D Printing**
    - Design simple parts on CAD software and print it on the printer

“The **future** depends on us.

We are the **architects** of the society

our children will inherit.

Let’s do our best to **make it great!**”

Thank you for listening!