

Workshop on Human Value Chain Development and Management: Training the next generation university teachers in STEM areas

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Executive Summary

For decades, government and private sector executives have learned that people are their most important assets. In today's global and highly competitive world, human capital has been so important that finding, developing, and retaining highly qualified workers, that can function in high demand and high growth sectors such as STEM is very critical. The higher education sector of Africa has been decimated by the **effects of "brain drain" for the past 50 years**. Although several approaches have been used during the past 20 years to reverse the brain drain, the current state of higher education in Africa still shows that there is a significant shortage of qualified scientists and educators with advanced degrees. A possible solution that can be used to slow down and eventually reverse the brain drain that constantly affects higher education institutions throughout Africa is to utilize the contact and experience provided by Africans in the Diaspora to create partnerships with higher education institutions in North America, Europe and Asia. This will lead to new collaborations that will provide **effective and targeted training** to the next generation **college and university teachers from Africa while they remain in their native countries**.

Dr. Astatke held a very successful 1.5 day training workshop in May 2012 that was **attended by around 15 teaching faculty and staff members from 5 universities in Ethiopia** (see: <http://awardsforafrica.com/>). Dr. Astatke will provide similar training workshops at **5th African Regional Conference on Engineering Education (ARCEE) that will be held in Lagos Nigeria on September 9-12 2013**. He conducted a preliminary workshop when he visited the University of Lagos on June 12-14 2013. The workshop was **attended by close to 100 participants from five universities throughout Nigeria**. The conference will be held in collaboration with the **International Federation of Engineering Education Societies (IFEES)**, and the **Global Engineering Deans Council (GEDC)**. We plan to invite additional subject matter experts in engineering education from the USA and around the world to **conduct highly effective training and skill building sessions in the STEM areas**.

The workshops are intended to give the participants important information and **hands-on practice related to effective teaching**, based on the **Dimensions of Learning (DOL)** teaching pedagogy. They include: **course planning, effective lecturing, active learning, and assessment of learning**. Finally, the workshops are also intended to provide new and experienced faculty members with instructional materials and teaching methods that they can use and share with other faculty members on their own campuses. **We will provide hands-on training sessions that will allow the participants to return to their respective higher education institutions with new knowledge and skills. We hope that the training workshops will have a "multiplicative effect" on the teachers that participate.**

Introduction

The Electrical and Computer Engineering (ECE) department of Morgan State University (MSU), in collaboration with Rensselaer Polytechnic Institute (RPI) and other partner institutions has been testing a new state of the art ECE laboratory equipment called the Mobile Studio I/O Board™ to conduct and teach ECE laboratory experiments from anywhere at any time. The Mobile Studio I/O Board™ technology and teaching pedagogy has been used by RPI and its partner institutions to teach engineering, physics, and other STEM area courses. Dr. Yacob Astatke has been testing the effectiveness of the Mobile Studio I/O Board™ technology in the ECE departments of Addis Ababa University (AAU) and Hawassa University since 2009. The goal of the training workshops we plan to conduct in Addis Ababa during the last week of May 2013 is to share the knowledge and experience gained from the use of the new laboratory teaching technology at the five universities in Ethiopia with ECE and other STEM area teachers from other universities in Ethiopia and East African Countries.

The Mobile Studio Technology™ to teach STEM courses

The Mobile Studio Project, funded and supported by the National Science Foundation (NSF) has developed and is continuing to develop pedagogy and supporting hardware and software which, when connected to a PC (via USB), provides functionality similar to that of standard laboratory equipment (oscilloscope, function generator, power supplies, Voltmeters, etc.) typically associated with a highly instrumented studio classroom or lab. The Mobile Studio I/O Board is a small, inexpensive (\$150) hardware platform for use in a home, classroom or remote environment. When coupled with the Mobile Studio Desktop software, the system duplicates a large amount of the hardware valued at around \$10,000 (see Fig 2). Specifically, **Mobile Studio Pedagogy** promotes **nontraditional education** as its focus is on student-centered experimentation anytime, anywhere utilizing hands-on learning to support more comprehensive, long-term knowledge retention of engineering concepts in a “real world” approach.

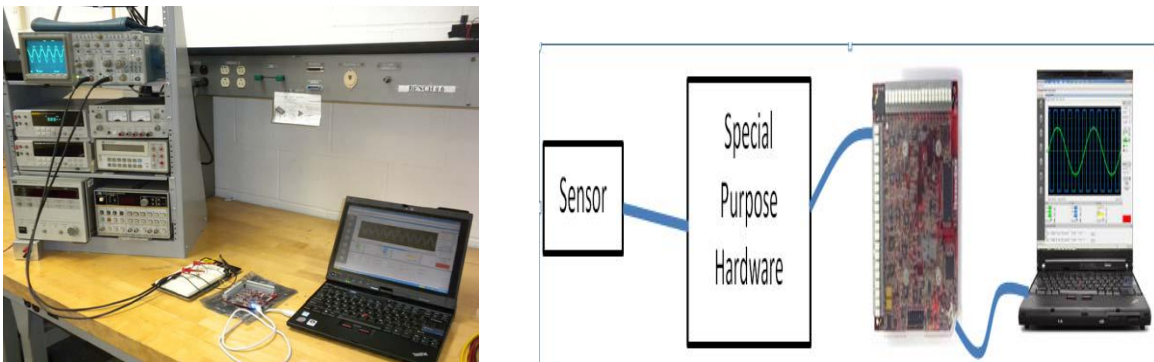


Figure 2: Mobile Studio Technology compared versus regular lab equipment

The project’s major goal is to enable hands-on exploration of STEM education principles, devices, and systems that have historically been restricted to expensive laboratory facilities. The Mobile Studio has been used to teach courses in electrical engineering, computer engineering, and general engineering electronics; physics courses; and high school technology-oriented courses. It has been used extensively at RPI, MSU, Howard University and Rose-Hulman Institute of Technology, and Boston University. A generic experimental configuration for a Mobile Studio based activity is shown in Fig #3. The laptop, USB cable and Mobile Studio I/O Board and Desktop software provide the necessary measurement capabilities usually provided by an oscilloscope. The Mobile Studio Desktop software is used to store any data to a useful file format for spreadsheet or other analysis tools.

University of Lagos (UniLag) Visit pictures (June 2013)



FACULTY OF ENGINEERING, UNIVERSITY OF LAGOS

ONE-DAY WORKSHOPS

DATE: **12th June, 2013** TIME **10.00a.m**

PROGRAMME OF EVENTS

- 10:00-10:05** Welcome Address by the Coordinator and LOC Chairman, Prof. Funso Falade
10:05-10:10 Welcome Address by the Vice Chancellor, Prof. Rahmon A. Bello, FNSE, FNSchE, FAEng
10:10-10:15 Goodwill Message by the President of Nigerian Academy of Engineering, Prof. A. F Ogunye, FNSE, FNSchE, FAEng, FIChemE
10:15-10:25 Introduction of Workshop Presenters
10:30-13:00 WORKSHOP I

(i) Curriculum Development in Engineering Education: What, Why and How?

Certified by IIDEA (International Institute for Developing Engineering Academics)

PRESENTER

Prof. Duncan Fraser

Centre for Research in Engineering Education and Department of Chemical Engineering, University of Cape Town, Rondebosch, South Africa

13:00-13:30 SHORT BREAK

13:30-15:00 WORKSHOP II

(ii) Improving Engineering Education in Africa using Online Courses and Portable Laboratory Equipment

PRESENTER

Prof. Yacob Astatke

*Electrical and Computer Engineering Department
Morgan State University
Baltimore, Maryland, USA*

15:00-16:00 QUESTIONS AND ANSWERS SESSION

16:00-16:30 Closing Remarks

Pictures from training workshop at University of Lagos (UniLag) (June 13 2013)



Meeting with dignitaries from UniLag before the presentations (left side). Officially presenting the portable electronics kit to UniLag and to Prof. Ogunye (President of Nigerian Academy of Deans)



Prof Astatke (Morgan State Univ) demonstrating the portable electronics kit to 4th and 5th year UniLag university students (left side). Conducting the workshop for administration officials, faculty, and staff from UniLag and five other institutions throughout Nigeria.