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Africa Centers of Excellence: Transforming Science & Technology Education

Africa's Higher Education Challenges

A strong focus on basic education has strengthened the foundation of Africa's education system. However, tertiary education in Sub-Saharan Africa is under-developed, and with the exception of a few in South Africa, universities in Africa do not figure in the top 500 in the world. African universities have also not kept pace with Africa's labor market needs. Given that sectors such as the extractive industries, ICT and agriculture are booming, Africa needs local graduates with up-to-date skills and knowledge in these productive areas. At present, such graduates are in short supply, and countries must act quickly to reverse this trend and produce more graduates who can both contribute to as well as benefit from new opportunities as economies grow and diversify.

Funding the expansion of higher education and raising the quality of tertiary programs cannot be the sole responsibility of country governments, because public funding is limited. In fact, in 33 low-income African countries, there has been a decline in per-student expenditure from US\$ 6,800 in 1980 to US\$ 981 in 2010. For higher education to be sustainable, households and companies must also invest in the system. The majority of higher education students come from households capable of substantially contributing to the

KEY MESSAGES

- Africa has experienced strong economic growth despite recent global downturns. There has been a resurgence of traditional sectors such as agriculture and the extractive industries, and promising new sectors have emerged such as Information and Communications Technology (ICT).
- African economies urgently need highly skilled technicians, engineers, medical workers, agricultural scientists and researchers to fuel these booming sectors.
- Higher education, particularly in science and technology, holds the potential to be absolutely transformative for Africa, because it can equip young people with critical knowledge and skills that are in short supply on the continent.
- Regional "centers of excellence" offer an optimal way to build and sustain excellence in higher education in Africa because they foster regional specialization, concentrate limited top-level faculty, and generate knowledge spillovers.
- The Africa Centers of Excellence (ACE) is an initiative of the World Bank and participating African governments in collaboration with the Association of African Universities. This innovative regional initiative will help make higher education in West & Central Africa more relevant to development through 19 competitively selected centers in Burkina Faso, Cameroon, Ghana, Nigeria, Senegal, and Togo.

costs of higher education. Public funding should target low-income students and strategic areas of higher education.

Tertiary institutions in Africa face severe constraints in attaining a critical mass of quality faculty. The average share of staff with PhDs in public tertiary education institutions in Africa is estimated to be less than 20 percent (estimate based on data from 10 African countries). Most departments do not have more than one or two senior professors, which prevents them from establishing vibrant research environments. Low salaries,

lack of research funding and equipment and limited autonomy are disincentives for faculty to remain in African universities. This is particularly challenging in fragile and post-conflict countries.

Dynamic and empowered institutional leadership is critical for institutional excellence. Legal frameworks for tertiary governance and leadership in many African countries are helpful because they require merit-based selection of chief executive officers (rectors/ vice-chancellors), governing bodies, academic autonomy, and reasonable financial autonomy. However, in countries where



legal frameworks and governance practices are not conducive to good governance, policy changes should aim to create greater financial autonomy, and enhance the accountability of the institution and the governing body. This will help institutions function without periodic disruption and delay.

The gap between labor market demand and programs offered by tertiary education institutions has led to a situation where jobs are available but there are not enough suitable graduates to fill them. Priority actions to address this gap should include expanding science and technology capacity at the university level, bringing in employer recommendations regarding curricula, tying up with industry to set up internships for students, and developing general skills that increase employability such as learning-to-learn, problem-solving, project and team-work, and communication skills.

Fast-tracking the growth of private sector involvement in higher education will offer more educational possibilities for youth. Over 1,000

private non-university institutions have emerged in Africa, and private institutions now cater to one in four students. Public funding could be oriented towards supporting equitable access to higher education, and investing in areas of low return for private institutions but high social return, such as expensive life-sciences programs.

Africa Centers of Excellence

To meet Africa's growing skills needs and higher education challenges, the World Bank in collaboration with West and Central African countries has launched the Africa Centers of Excellence project, which aims to:

- promote regional specialization among participating universities in areas that address specific common regional development challenges.
- strengthen the capacities of these universities to deliver high-quality training and applied research.
- meet the demand for skills required for Africa's development.

The project is focusing on strengthening 19 centers of excellence in West and Central Africa. About US\$ 8 million is proposed as investment in each center. Centers have been competitively selected using internationally benchmarked criteria. Participating countries include Benin, Burkina Faso, Cameroon, Ghana, Nigeria, Senegal and Togo and The Gambia.

The Association of African Universities (AAU) is the key regional partner in this initiative, in collaboration with regional bodies including the African Union, the Economic Community of West African States, West African Monetary Union (UEMOA), East African Community (EAC) and the African and Malagasy Council of Higher Education (CAMES) and through development partnerships with the African Development Bank, USAID, AusAID, French Development Agency (AFD), the Carnegie Foundation, and several higher education and research networks.

Table 1. Percentage of higher education graduates by field of study

	Benin (2009)	Burkina Faso (2011)	Cameroon (2010)	Ghana (2011)	Brazil (2010)
Agriculture	0.8	1.5	-	7.4	1.8
Education	-	7.6	10.3	25.6	22.8
Engineering, manufacturing and construction	5.6	2.8	4.0	3.9	5.8
Health and welfare	2.8	0.6	2.3	3.4	13.9
Humanities and arts	14.5	11.4	6.4	-	2.2
Social sciences, business and law	52.5	55.6	59.2	43.2	40.2
Science	3.5	15.0	17.0	15.5	5.5
Services	7.5	5.5	-	-	2.9
Unspecified programs	12.6	-	-	1.1	5.0
Total number of graduates	14,638	14,782	40,327	28,005	1,024,743

Source: UNESCO UIS, <http://stats.uis.unesco.org> retrieved March 25, 2013.

HOW CENTERS HAVE BEEN SELECTED

The Africa centers of excellence were selected through a process of rigorous independent evaluation facilitated by the AAU. An independent team of evaluation professionals, consisting of members from the African educational and scientific community, the African diaspora and global technical experts, reviewed 52 proposals. These proposals were subjected to several stages of evaluation including desk reviews, an external evaluation, site and leadership

evaluation and, finally, fiduciary capacity evaluation.

At the end of this thorough and transparent evaluation exercise, 19 proposals were selected (Table 2).

The idea is that the qualifying universities will:

- Strengthen post-graduate programs for a regional student body.
- Offer specialized courses for industry professionals in the region.
- Establish a regional faculty body and attract additional highly qualified faculty.

- Provide learning resources and laboratories, and rehabilitate existing facilities.
- Establish linkages with companies, government agencies, and research centers for workplace learning, input into curricula, consultancies, and joint research.
- Collaborate with partner institutions to share the benefits of the investments, for example, through training of faculty, sharing of curricula, and sharing of learning resources.

The project will support knowledge partnerships with universities and

Table 2. Competitively selected Africa Centers of Excellence

Africa Center of Excellence	Lead Institution & Country	Discipline
ACE for Agricultural Development and Sustainable Environment	Federal University of Agriculture, Nigeria	Agriculture
ACE for Training Plant Breeders, Seed Scientists and Technologists	University of Ghana, Ghana	Agriculture
ACE for the Poultry Sciences	Université de Lomé, Togo	Agriculture
ACE for Dryland Agriculture	Bayero University, Nigeria	Agriculture
ACE for Food Technology and Research	Benue State University, Nigeria	Agriculture
ACE for Genomics of Infectious Diseases	Redeemers University, Nigeria	Health
ACE for Cell Biology of Infectious Pathogens	University of Ghana, Ghana	Health
ACE for Neglected Tropical Diseases and Forensic Biotechnology	Ahmadu Bello University, Nigeria	Health
ACE for Phytomedicine Research and Development	University of Jos, Nigeria	Health
ACE for Reproductive Health and Innovation	University of Benin, Nigeria	Health
ACE for Maternal and Infant Health	Université Cheikh Anta Diop, Senegal	Health
ACE for Materials	African University of Science and Technology, Nigeria	STEM
ACE for Applied Mathematics	Université d'Abomey – Calavi, Bénin	STEM
ACE for Information and Communication Technologies	Université de Yaoundé I, Cameroon	STEM
ACE for Water, Energy, and Environment Sciences and Technologies	Institut International d'Ingénierie de l'Eau et de l'Environnement (2iE)	STEM / Agriculture
ACE for Oil Field Chemicals	University of Port Harcourt, Nigeria	STEM
ACE for Water and Environmental Sanitation	Kwame Nkrumah University of Science and Technology, Ghana	STEM
ACE for Science, Technology and Knowledge	Obafemi Awolowo University, Nigeria	STEM
ACE for Mathematics, Informatics, and ICT	University of Gaston Berger, St. Louis, Senegal	STEM

international research networks, allow universities to forge knowledge partnerships with the private sector to strengthen curricula and research, support institutions to meet international standards and generate income through consultancies.

A WIN-WIN SITUATION

The Africa centers of excellence will benefit individuals, institutions and industries. Students at the centers will benefit from quality research-based education in high-demand areas; companies, government or

non-governmental organizations that partner with the centers will gain interns and graduates with highly relevant training; and faculty and staff in the centers will benefit from improved teaching and research conditions.

Box 1. How the Africa Centers of Excellence will contribute to Africa's development

West Africa Center for Crop Improvement (WACCI), University of Legon, Ghana

This center will contribute towards significantly improving the quality of training in plant breeding at the PhD and the MPhil levels and ensure that the plant breeders and seed technologists have the capacity to develop superior varieties of staple crops to spark a green revolution in West and Central Africa.

The center will focus on developing superior climate-smart and resilient varieties of staple crops such as cassava, sweet potato, maize, sorghum, pearl millet, rice, groundnuts and cowpea to increase productivity using genomic and conventional tools. It will address both abiotic stresses (e.g. drought, heat, salinity) and biotic ones (pests and diseases) by identifying useful genes for plant breeding. To do this efficiently and effectively, the Biotechnology Center will collaborate with other partners on cutting-edge research necessary for quick progress in plant breeding. The center has already developed over 1,200 maize hybrids which have been under evaluation at the WACCI farm site, and these will now be evaluated at multiple locations in the sub-region. A genotyping platform will be accessed to genotype the advanced lines for detailed analysis of both phenotypic and genotypic data and mine genes of economic importance for use in breeding programs.

Center of Excellence for Neglected Tropical Diseases and Forensic Biotechnology (CNFB), University of Benin, Nigeria

Biotechnology tools and techniques are now widely applied to address environmental, food, health, security and socio-economic issues as well as to provide answers to research questions. However, this technology is still underutilized in Nigeria due to lack of adequate capacity. Executing these activities will create a learning environment that can train students at the postgraduate level. The objective is to produce students who are capable of generating ideas that will inspire critical thinking, and communicating and interpreting these ideas. Many will obtain postgraduate qualifications and fill existing human capital gaps in the control of neglected tropical diseases and forensic biology.

MORE ON THE TOPIC

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