Education Systems in Eastern Africa: Creating Life-Long Learners for Development

A Forum on the Nexus of the Arts, Sciences, and Humanities (NASH) Consensus Study Report

Sciences for Prosperity

Ethiopian Academy of Sciences

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A Collaborative Consensus Study by the Uganda National Academy of Sciences, the Kenya National Academy of Sciences, the Tanzania Academy of Sciences, and the Ethiopian Academy of Science

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List of Acronyms

AERC	African Economic Research Consortium
AKU	Aga Khan University
AU	African Union
CA	Continuous Assessment
BIIC	Chandaria Business Innovation and Incubation Centre
CDP	Consensus Development Panel
CHE	Commission for Higher Education
ETP	Extra Teacher Program
FII	Faith-Inspired Institution
FTBIC	Makerere Food Technology Business Incubation Center
GEC	General Education Course
GER	Gross Enrolment Ratio
GPI	Gender Parity Index
HEAC	Higher Education Accreditation Council
HERQA	Higher Education Relevance and Quality Assurance Agency
IUCEA	Inter-University Council for East Africa
LMIC	Low and Middle-Income Countries
NASEM	U.S. National Academies of Sciences, Engineering, and Medicine
NCHE	National Council for Higher Education

NSFC	National Natural Science Foundation of China
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment
PSFU	Private Sector Foundation Uganda
QA	Quality Assurance
SACMEQ	Southern and Eastern Africa Consortium for Monitoring Educational Quality
SBM	School-Based Management
SDI	Service Delivery Indicators
SoT	Statement of Task
STEAM	Science, Technology, Engineering, Art, and Mathematics
STEM	Science, Technology, Engineering, and Mathematics
STI	Science, Technology, and Innovation
STREAM	Science, Technology, Reading, Engineering, Art, and Mathematics
TIMSS	Trends in International Mathematics and Science Study
UNESCO	United Nations Educational, Scientific and Cultural Organization

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Executive Summary

It is now widely accepted that the Eastern African region is experiencing a crisis in learning. Despite impressive and sustained improvements in enrolment, it remains unclear how much students are actually learning in the classroom. This crisis in learning is multi-dimensional, and extends from the primary level to post-secondary education. Despite decades of efforts to improve outcomes in the education sector, patterns of teacher absenteeism, poor parental involvement, outdated examination methods, and highly siloed disciplinary teaching persist. As a result of these challenges, a growing number of private sector employers are expressing concerns that graduates from the region are not well-prepared to participate productively in the workforce.

At a time when countries are increasingly placing science, technology, and the "knowledge economy" at the centre of their development agendas, it is imperative to address these persistent challenges. In the past, reforms have typically targeted different levels of the education system in isolation. While this approach may be necessary in many cases for simplicity and measurable impact, it is equally important to recognize the interlinkages of all levels of the education system. The quality of graduates exiting from post-secondary programs depends to a large degree on the type and quality of education they receive at lower levels. If primary and secondary education does not inculcate a genuine curiosity and love of learning in students, then the higher education system is unlikely to successfully produce the calibre of graduates necessary to engage in the competitive global knowledge economy.

Recognizing these important linkages, in June 2018 the Uganda National Academy of Sciences (UNAS) convened experts from the Ethiopian, Kenyan, Tanzanian, and Ugandan national science

academies to begin work on a consensus study on education systems in the Eastern African region. This report is the result of that consensus study process. The conclusions and recommendations included in this report represent the perspective of the leading academicians in the region on the primary challenges facing the region's educational systems, and some possible solutions to address those challenges. Based on the evidence considered, the Expert Committee on Eastern African Education Systems puts forward the following conclusions and recommendations to guide policymakers and other stakeholders on the way forward.

High-quality primary and secondary education is crucial to the success of the higher education system.

Therefore:

- Governments should pursue a holistic education agenda that clearly acknowledges and addresses the linkages between primary and secondary levels of schooling and the quality of the tertiary education system.

Excessive teacher absenteeism in primary-level classrooms is a major issue in the region, driven both by social factors and by gaps in official policy.

Therefore:

- Governments should fund research to track the root causes of authorized and unauthorized teacher absenteeism for more targeted, evidence-informed decisions in the future.

- Governments should implement the use of more rigorous attendance registers to empirically determine the worst offenders of unauthorized absenteeism.

- In the short term, governments should seek to limit administrative and policy gaps that promote excessive authorized absences from the classroom, including but not limited to possible ICT solutions for salary disbursements.

- Education and health ministries should work closely together, possibly through the creation or strengthening of inter-sectoral working groups, to improve access to health services on school premises.

Decentralization and devolution of education have not necessarily led to quality service delivery and better learning outcomes.

Therefore:

- Education ministries should more forcefully implement existing quality control standards, or revise existing standards where necessary.

- National governments should ensure that allocated public funds are disbursed expeditiously and in an accountable manner.

Exam-centred curricula detract from creativity in teaching and learning.

Therefore:

- Governments should promote continuous and varied progressive assessment to promote creativity and innovation in learning.

Current STEM curricula are dull, focus too much on rote learning, and unnecessarily discourage student interest in STEM subjects. Programs that integrate arts and science curricula show some promise to reverse this trend.

Therefore:

- Curriculum review bodies should strive for a complementary balance between the sciences, humanities, and the arts, and encourage experimentation in integrated teaching.

Liberal arts-based general education programs were a key part of higher education programs in the past, but have since been discontinued. In general, such programs help to develop civic-minded and ethical graduates with solid critical thinking and communication skills.

Therefore:

- Institutions of higher education should reintroduce or reinvigorate mandatory liberal arts-based general education courses with a view to fostering critical thinking and communication skills.

Interdisciplinary research has clear benefits both to students and to society through its ability to help solve wicked problems. Although there are interdisciplinary success stories from the region, siloed thinking and research continue to dominate the higher education system.

Therefore:

- Institutions of higher learning should strengthen their promotion of interdisciplinary research and training.

Marketization and liberalization of the higher education system has produced some important benefits, but has also had major distortionary effects, particularly by making the roles and responsibilities of institutions unclear.

Therefore:

- Governments and regulatory agencies should establish clear guidelines to differentiate the responsibilities of

different institutions in the higher education system, and ensure that funding and financial incentives accurately reflect the requirements of those different responsibilities.

Massification of the higher education system has negatively impacted the quality of education and research. As a result, in recent years a widespread perception has grown in the region that Eastern African graduates are not adequately equipped to participate productively in the workforce.

Therefore:

- To maximize the benefits of marketization, institutions of higher education should partner with private sector organizations to carry out regular tracer studies of their graduates to ensure their labour market suitability.

- Governments should contribute financial resources and seek to expand quality internship and apprenticeship programs.

- Governments and education institutions should consult stakeholders, including the private sector, in the formulation of policies and the development of curricula.

- Private sector organizations should partner more frequently with higher education institutions to generate industry-relevant applied research.

The major challenges faced by education systems are generally related to funding, coordination, and implementation of existing policies.

Therefore:

- National planning agencies should work closely with universities to implement the findings of human resource foresight studies into program curricula.

- Governments should establish cross-sectoral policy coordination bodies to streamline the delivery of education services.

Quality assurance mechanisms are best implemented internally, but this requires strong leadership and resources.

Therefore:

- To limit administrative burdens, national regulatory agencies should offer oversight exceptions to institutions that adequately prove they have the leadership and resources to implement strong internal QA mechanisms.

- The criteria for oversight exceptions should be enforced universally on all institutions, and transparently communicated to all institutions through outreach programs.

Regulatory agencies in the region unevenly enforce policies and rules between private and public institutions because of unclear roles and responsibilities.

Therefore:

- Instead of enforcing policies by institution type, regulatory agencies should take a risk-based approach and focus their efforts primarily on those institutions that have been shown to repeatedly violate established quality standards.

Unrest within higher education systems produces major disruptions and has negative impacts on student learning outcomes. Public institutions and governments are not doing enough to learn from unrest and take mitigating actions.

Therefore:

- Higher education institutions, and in particular public universities, should implement transparent structures for institutional learning and adaptation following periods of student unrest.

Introduction

It is now widely accepted in Africa that education is a fundamental building block of development and economic growth (Cloete et al., 2018). Traditional mid-twentieth century economic thinking tended to emphasize that the accumulation of capital was a fundamental driver of growth, and that growth was the root cause of improvements in health, education, and overall wellbeing (Evans & Heller, 2013). Current research on human development has reversed this causality, showing that improvements in human development indicators (such as educational attainment) cause national incomes to grow (Barro, 1996; Ranis et al., 2000; Ranis & Stewart, 2006). In recognition of this evidence, many, if not all, African leaders have made the accumulation of "knowledge capital" a centrepiece of their national visions and strategies for development(Bashir et al., 2018, p. xxxi).

As a result of this focus, the Eastern African region has seen astounding growth in school enrolment, particularly at the primary level. According to UNESCO, for example, in 1999 the region[1] had 12.5 million out-of-school children. By 2010, the same countries had reduced that number to 4.6 million out-of-school children, largely by eliminating school fees (UNESCO, 2013). Some countries recorded particularly impressive improvements, such as Tanzania, which reduced its number of out-of-school children from 3.2 million in 1999 to just 137,000 in 2010 (a reduction of more than 95%) (UNESCO, 2013). At the same time that total primary enrolment rates have improved, Eastern Africa has also reached gender parity in primary education. Uganda, for example, improved its gender parity index (GPI) from 0.84 in 1995 to 1.01 in 2013 (World Bank,

[1] In the UNESCO document, "East Africa" refers to Comoros, Djibouti, Ethiopia, Eritrea, Kenya, Madagascar, Mauritius, Rwanda, the Seychelles, Somalia, South Sudan, Tanzania, and Uganda.

2017). Ethiopia saw an even more dramatic improvement, from 0.56 in 1997 to 0.9 in 2015 (World Bank, 2017). Today, most countries in Eastern Africa have reached gender parity in primary education. These numbers show that more children—and in particular more girl children—now enter primary school than ever before.

And yet, despite these impressive statistics, the region is experiencing what can easily be called a "crisis in learning." Many students are attending school, but they are not learning. Studies have demonstrated, for instance, that after three years of compulsory mathematics teaching, students in Uganda cannot accurately place numbers between 0 and 999 in the correct order. According to the Service Delivery Indicators (SDI), a comparable cross-country dataset sponsored by the World Bank and the African Economic Research Consortium (AERC), in both Uganda and Tanzania the percentage of primary four students who can read a single sentence is well below 50%(Bashir et al., 2018, p. 74). Kenyan students do much better on this metric, with more than 70% of primary four students able to read a sentence—but less than half can correctly multiply two single-digit numbers (Bashir et al., 2018, p. 74). Although there are important variations between countries, in general students attending school do not appear to be gaining sufficient numeracy and literacy skills.

Concurrent to this crisis in learning, countries in the region are facing growing pressure from multiple sides to emphasize science and technology education as the knowledge base that can stimulate economic development and transformation (Jamme, 2014; Sichangi, 2018; Yusuf, 2018). In response, the African Union (AU) has set forth extremely ambitious continent-level targets for enrolment in science, technology, engineering, and math (STEM) programs (Tikly et al., 2018). The justification for investment in most of these programs is the need to create a "world-class workforce" to compete in global markets (Manteaw, 2012). As the AU states, "Math and science at [the secondary] level are critical to the development of a well-equipped human capital [sic] capable of competing in an increasingly science and technology-driven world as well as the foundation for knowledge-based economies (AU, 2016, p. 18)."In

other words, science and technology-based education is understood as a primary driver of development at the highest levels.

However, the stark division that exists between the humanities, social sciences, and sciences, and the emphasis on science and technology to stimulate innovation, has largely been absorbed passively by African countries. For instance, this focus mirrors the experience of Western countries that now face widespread de-industrialization, and innovation- and knowledge-based economies (Unger, 2018). Eastern Africa also faces low levels of industrialization, but at a much lower per capita income than Western countries, and in an economy that is completely different on a structural level. Development economists increasingly posit that sub-Saharan Africa will follow an entirely alternate path to development, as the manufacturing route that East Asia followed is cut off for a variety of reasons (Coulibaly, 2018; Economist, 2017). In this unique context, is an overriding focus on science and technology education likely to have the same effect it has in the West? Perhaps in some cases, but it will not offer a panacea.

Beyond the developmental benefits of improved knowledge capital through interdisciplinary learning, recent research has also pointed to the critical role of higher education in knowledge production. For instance, it is suggested that the ability of developing countries to absorb, use and modify technology developed at home or elsewhere will drive higher levels of development and standards of living (Cloete et al., 2018). The role of higher education in facilitating this knowledge production is thus crucial to broader development agendas, in particular through their production of graduates who are better able to generate and adapt new technologies.

Research universities that train graduates at this high level, and enable them to engage with the global knowledge society, are essential to achieving the goal of improved knowledge production. While it is unlikely that research universities in Eastern Africa will soon ascend to the top tiers of global rankings, they nonetheless play an important role in their countries and regions, both as drivers of the knowledge production necessary for development, and as a way to gradually improve their nation's reputation and competitiveness

on the global stage (Cloete et al., 2018). A key point is that research universities across the world are part of an active community of institutions that share values, foci, and missions. Engagement with this active community has many ancillary benefits besides direct knowledge production.

To garner the potential benefits of education, both at the level of research universities and technical training schools, the core challenge is about inculcating a mindset of thinking, in a critical manner, among students. Are we educating our young people to truly engage with the dynamic challenges that our countries now face? We need young people who can analyse and synthesize evidence from diverse sources, and who have the leadership skills, confidence, and initiative to act on their interpretations of that information—whether they are working in the public civil service, in private sector companies, or as entrepreneurs. We need young people who can set specific goals, critically analyse various routes to get there, select options informed by evidence, and then apply the necessary effort and hard work to move towards those goals (Akwap, 2019). These are the soft skills necessary for successful development—whether students graduate from the humanities, social sciences, or sciences.

Many of these soft skills can be strengthened in tertiary education, but the foundation is laid much earlier. Creating a tertiary education system that can produce critical thinkers and leaders begins at the earliest stages of the education system. The focus of this consensus study report is on tertiary education, and improving student outcomes from both universities and technical skills colleges. But since education begins from the earliest levels, much of the discussion and recommendations go beyond the tertiary level of education. One of the primary challenges that the Expert Committee identified as standing in the way of integrative critical thinking skills is the continued entrenchment of siloed thinking in academia. In the spirit of moving beyond traditional silos, this report has not confined itself to one aspect of the education system—in practice, all are interconnected.

The remainder of this report proceeds in the following sections:

- The ***Consensus Study Processs*** ection provides a brief overview of the methodology employed by the African science academies to reach a multi-disciplinary consensus on the future of education systems in the region.

- The ***Problem Statement*** section provides a brief theoretical background to the study, and lays out the specific research questionsthat were addressed.

- The section on ***Primary and Secondary Education*** lays out some key pieces of evidence regarding the challenges and opportunities of instilling critical thinking skills in the youth, before they ever reach tertiary institutions.

- The ***Higher Education in Eastern Africa*** section explores some of the key strategies that have been identified as successful for developing critical thinking skills later in life.

- The ***Marketization of the Higher Education Sector*** section presents evidence on both the benefits and challenges introduced by the most profound shift ever experienced by the tertiary education system in Africa.

- The section on ***Education Sector Governance*** then presents some of the key implementation and coordination challenges that policymakers face when trying to effectively manage a complex system like the education sector.

- Finally, the report ends with some C***oncluding Remarks from the Expert Committee*** for relevant decisionmakers.

Each section of the report is followed by a series of concise conclusions and recommendations targeted to specific relevant stakeholders.

Throughout the report, you will find a number of success stories and anecdotes about innovative educational approaches in the region. As there is unlikely to be a one-size-fits-all solution to improving learning outcomes in Eastern Africa, these stories provide some qualitative data points on how contextually-relevant adaption can take place.

Consensus Study Process

All UNAS consensus studies follow a Consensus Development Panel (CDP) process. The CDP process has been used widely by the U.S. National Academies of Sciences, Engineering, and Medicine (NASEM), and has been adapted for use in the African context. The CDP process brings together an interdisciplinary team of subject matter experts, and provides a formal structure to seek areas of agreement in relation to a specific Statement of Task (SoT). The SoT presented to the Expert Committee for this consensus study was the following:

> *Describe the current landscape of education systems in Eastern Africa, including the primary challenges and opportunities facing the region. Examine and comment on lessons that can be extracted from success stories in the region. Come to consensus on key findings from the available evidence. Craft actionable, actor-specific policy recommendations to address these consensus findings.*

To cultivate a multi-disciplinary consensus position in response to this SoT, UNAS convened experts from the fields of mathematics, law, arts education, history, agricultural sciences, veterinary medicine, biochemistry, and educational management for an in-person meeting in Kampala, Uganda, at the end of June 2018. The Expert Committee received a series of presentations from civil society groups working in the education sector, the Uganda Ministry of Education and Sports, and the Private Sector Foundation Uganda (PSFU) regarding their work to support primary-level and technical training initiatives. The Expert Committee also considered an in-depth literature review drafted in response to the SoT. At this initial

meeting, the Expert Committee developed preliminary conclusions based on the gathered evidence and their own experience, and crafted policy recommendations for key actors based on those conclusions. The conclusions, recommendations, and content of the study report have since been refined in an iterative series of remote committee feedback sessions. This study report therefore represents the considered consensus position of this interdisciplinary committee of experts.

Problem Statement

To fully analyse the problem of learning in Eastern Africa, it may help to return to basic concepts. First, what is the purpose of education? Different schools of thought approach this question differently. One common view about the purpose of education is the idea that what matters most is academic achievement in a small number of curricular domains (Biesta, 2009). This view might be best encapsulated by cross-country studies such as TIMSS, PISA, and SACMEQ,[2] which seek to create league tables to provide information about how national education systems perform in comparison to each other. Others might emphasize the role of education in creating critical thinkers and active citizens to engage in a democratic society, or in creating skilled and efficient workers to enter the globalizing market economy (McMahon, 2013).At a more general level, the purpose of education can be stated as successfully preparing the next generation to engage meaningfully in society.

If we follow this broad definition, then it becomes clear that although today we tend to associate education with the institution of mass schooling, this need not be the case. In Africa, education has been synonymous with formal schooling since the colonial period. Formal education of this nature emphasizes the extrinsic transfer of knowledge from teacher to student. In pre-colonial Eastern Africa, we also prepared our youth to play meaningful roles in society. Rather than relying on formal schooling, however, the necessary knowledge was usually transmitted intrinsically—through what might be called "learning by doing." The Haya,in what is modern-day Tanzania, for instance, transmitted the complex technical knowledge required to smelt steel through participatory songs, dances, and oral traditions

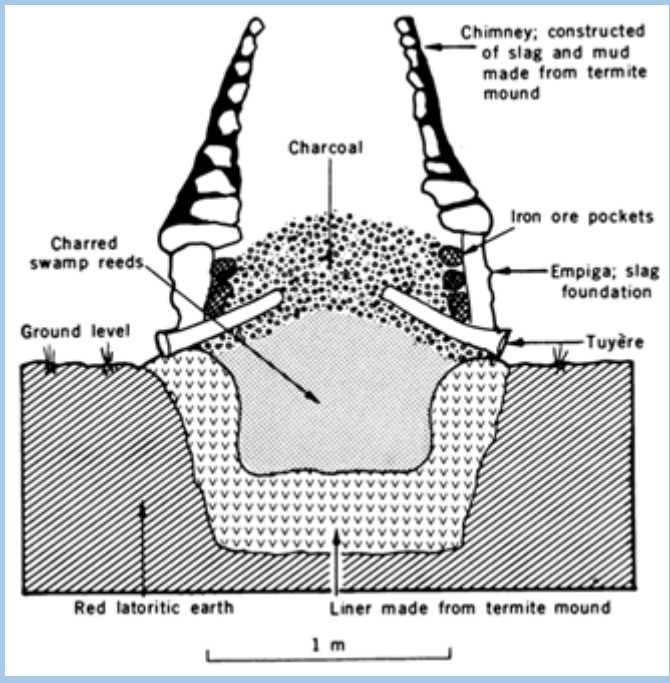
[2] Trends in International Mathematics and Science Study (TIMSS), Programme for International Student Assessment (PISA), and Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ), respectively.

(see Text Box 1for a more thorough discussion).Of course, we now live in modern societies, and a great deal of technical expertise and knowledge is necessary to meaningfully engage with a market economy. A formal education system is likely the best way to transmit much of that technical expertise and knowledge. The important point, however, is that the concept of "education" is not static. It has shifted over time, and should shift in the future to ensure that we are truly preparing the next generation to engage meaningfully in society.

TEXT BOX 1
The Haya Steelmakers

In 1978, Assistant Professor of Anthropology Peter Schmidt and Professor of Engineering Donald H. Avery reported in Science that as long as 2,000 years ago the Haya people in northwest Tanzania were producing carbon steel in preheated forced-draft furnaces, a method more technologically sophisticated than any developed in Europe until the mid-nineteenth century (Schmidt & Avery, 1978). Previous research in the area had turned up ceramic tuyères (a nozzle through which air is forced into a smelter, furnace, or forge) that appeared to have been placed inside ancient furnaces. As shown in the figure below, this novel structure suggested that the tuyères could have acted as conduits that preheated the air passing through them, allowing the furnace to achieve much higher temperatures, and therefore to smelt a higher quality steel product (Shore, 1983).Schmidt and Avery based their findings on the reconstruction of an ancient furnace by Haya men whose ancestors had passed on their steelmaking methodology orally for centuries. Although it took five tries, the Haya men eventually followed all the steps of the ancient method by referring to their oral tradition, and successfully carried out a smelt. Tests on the slag (fused refuse separated from metal in smelting) from the reconstruction demonstrated that it had been formed at temperatures of 1350° to 1400° C, matching tests on slag from early Iron Age furnaces (Shore, 1983). "It's a very unique and original process that uses a large number of sophisticated

techniques," Avery commented to the Brown Alumni Monthly. "This is really semi-conductor technology—the growing of crystals—not iron smelting technology (Shore, 1983, p. 162)." For thousands of years the Haya harnessed highly specialized knowledge to produce a technologically sophisticated and useful product. But that knowledge was communicated and passed down from the ancestors through a participatory oral tradition that included stories, song, and dance. For those living in precolonial Eastern Africa, the distinction between scientific and humanistic modes of knowledge would have made little sense and been of little utility.



The problems that our societies face today are not linear equations calling for the simple application of expert knowledge. They are, for the most part, what scholars have termed "wicked problems" (Rittel & Webber, 1973). This term doesn't refer to the moral dimension of these problems, but rather to their resistance to resolution. Wicked problems are the opposite of "tame" problems:

the type encountered by scientists and engineers that have a discrete solution and can often be modelled mathematically (Gawande, 2012). This distinction does not mean that tame problems are easy—they include, for example, constructing a freeway through a steep mountain pass, or developing a new vaccine—but they are solvable. They have a right or a wrong answer (Gawande, 2012). Wicked problems, by contrast, only have better or worse solutions. They always involve trade-offs, unforeseen consequences, and there are no opportunities to learn by trial-and-error (Kolko, 2012). The problems faced by Eastern Africa in the 21st century are, for the most part, wicked problems (see Text Box 3 and "The Importance of Interdisciplinary Thinking" for more details on so-called wicked problems.). Poverty is linked to education, which in turn is linked to nutrition, which is influenced by overall health, of which sanitation is a component, which is connected to the national economy, which will be impacted by climate change, and so on and so forth.

Even improving our scores on literacy, numeracy, and basic science tests can only take us so far in addressing problems of this nature. Faced with this challenge, a broad range of experts support the idea that developing the skill of being trainable is more important than possessing specific knowledge. What this skill essentially refers to is the quality of being adaptable in changing circumstances; of being able to analyse a specific situation or problem, understand the type of knowledge or skills that are necessary to help solve that problem, and taking the initiative to acquire and apply the necessary knowledge or skills—in essence, being a life-long learner. Skills like trainability are difficult to standardize, quantify, and compare across countries, which is why they don't often feature in global publications by organizations like UNESCO or the World Bank. And yet, across disciplines, the Expert Committee identified trainability as the most essential skill that our educational systems should impart to students.

Creating education systems that turn out life-long learners is not an easy proposition. It defies simple solutions like carrying out curricular reforms or implementing internship programs, although these may be instrumental parts of a solution. At base, producing life-

long learners requires a mindset shift among everyone—students, parents, teachers, policymakers—at every level of the education system. How can we develop a society that values education—not just the achievement of certifications and high grades, but the actual process of learning itself? That is the difficult, multi-faceted research question this consensus study set out to address.

Primary and Secondary Education: The Building Blocks of Success

Early notions of development approached education with a ladder-like conceptual model. Under this metaphor, you had to establish good secondary schooling before focusing on universities, and before you could do that you needed universal primary education. This common model aligned with advice issued by the World Bank, which produced studies that "…claimed to show that the rate of return on investment in higher education was much lower than that in secondary or primary education, and that the benefit was mainly private (Mamdani, 2007, p. 261)."In other words, higher education was viewed as an expensive and inefficient public service, the benefits of which went primarily to the wealthier segments of society. The Millennium Development Goals also included the target of "universal primary education," without reference to secondary or tertiary levels of schooling (Staff, 2015). As a result of these studies and international targets, governments in Eastern Africa received advice that they should minimize investment in higher education, and instead focus on expanding access to secondary and especially primary education.

In more recent years, a growing acknowledgement has emerged regarding the broader necessity of a strong higher education system to a successful society. The World Bank, for instance, began producing new studies that showed the crucial role that higher education plays to "boost productivity, competitiveness and economic growth (Bloom et al., 2006, p. i)."A growing body of evidence also suggests that tertiary education indirectly improves both primary and secondary education through more skilled and knowledgeable teachers and policymakers (Bloom et al., 2006). While an individual might still progress along the "ladder" of education, from primary to secondary, and subsequently to higher education, it is now widely

recognized that policymaking and investment needs to happen in a more cohesive and balanced manner across the whole education system.

In one specific sense, however, the ladder concept is correct. Extracting the societal benefits from higher education requires that students have first passed through the primary and secondary levels of the education system. If students passing through these earlier levels do not gain a genuine curiosity for learning and basic critical thinking skills, it will be extremely difficult for the higher education system to actually produce the calibre of graduates we want and need. Therefore, it is no exaggeration to say that a quality university education begins in primary one.

Despite the critical importance of primary and secondary education, all of the countries in Eastern Africa face major deficiencies in the actual learning experience that students face at these levels. In 2012, Uwezo, an independent initiative that aims to improve basic service delivery across Eastern Africa, collected a variety of data on children's literacy and numeracy in Uganda, Kenya, and Tanzania. The Uwezo dataset presents a shocking pattern, with high rates of enrolment but low levels of learning across the region. For example, less than one third of children enrolled in primary three possess basic literacy and numeracy skills (Uwezo, 2014). Even among those children in primary seven, two out of 10 could not pass basic literacy and numeracy tests (Uwezo, 2014). Despite these disturbing findings, there is a huge degree of variability in the data both between and within countries. For instance, while 63% of Kenyan children over 10 years of age could pass both the literacy and numeracy tests, only 38% of Ugandan children could (Uwezo, 2014). Additionally, both the best and worst performing districts out of all the countries surveyed are in Kenya (Uwezo, 2014). There are many possible reasons for these disappointing patterns, but some of the key contributors are outlined below.

Absenteeism

Concern over teacher absenteeism is quickly reaching a fever pitch in the region. Available data confirm that absenteeism rates

are disturbingly high, and have a direct negative impact on student learning (Bashir et al., 2018; Miller et al., 2008). In Zambia, for instance, a five percent increase in teacher absences was found to decrease test scores by an estimated four to eight percent (Das et al., 2007).Many studies also emphasize the crucial need to address teacher knowledge and skills, as it has been shown that very few teachers possess a minimum level of pedagogical knowledge or regularly deploy teaching practices that have been shown to promote learning (Bold, Filmer, Martin, Molina, Stacy, et al., 2017). However, interventions to increase teacher quality will prove futile if teachers are not showing up to their classrooms in the first place. Addressing teacher absenteeism is thus a necessary but insufficient pre-condition to improving learning in Eastern Africa.

Table 1 shows teacher absenteeism rates for selected years between the early- to mid-2010s in primary schools. Data were collected through unannounced visits to a representative sample of school sites, and a random selection of 10 teachers from each school roster (SDI, 2017). The data are highly variable between countries in the region, but some important patterns emerge. Teacher absenteeism ranges from very low in Ethiopia (just 5%) to quite high (24%) in Uganda. Most countries do not show major rural-urban differences, except for Uganda where it appears that urban teachers are significantly more likely to be present at school. Scattered data from 2000-2005 suggest that absenteeism has declined in both Kenya and Tanzania, but stagnated at an elevated level in Uganda (Bashir et al., 2018, p. 264). Even in countries where teacher absenteeism from school has been improved, however, teachers may not actually be attending classes. Class absenteeism in Kenya, for example, is almost 300% that of school absenteeism. Data are similar in Tanzania, and in Uganda class absenteeism is double school absenteeism (from its already elevated level). Even in Ethiopia, class absenteeism is documented at 22%. These data imply that even in countries where teachers report to school for work, a great number of them are not teaching their classes.

In general, it is true that teachers in the region do not receive adequate training, preparation, supervision, and support at the school

level (Bold, Filmer, Martin, Molina, Rockmore, et al., 2017). Many teachers lack adequate knowledge and skills, as well as conducive workplaces, that make it very difficult for them to be effective at their jobs (Bashir et al., 2018). Despite this generalized lack of preparation and support, however, there is limited evidence that simply increasing teacher pay has any meaningful impact on absenteeism (Patrinos, 2013). In Table 1, for instance, private contract teachers across all countries have significantly lower absentee rates than public school teachers, despite the fact that private contract teachers are typically paid less than regular civil service public school teachers (Patrinos, 2013). In other words, while education systems in the region do require greater investment, it is not clear those resources would be best spent on salary increases.

TABLE 1 School Absenteeism Rates among Primary School Teachers

Country	Year	Work Venue		School Location		Teacher's Contract	
		School	Class	Urban	Rural	Public	Private
Ethiopia	2014	5%	22%	5%	5%	5%	0%
Kenya	2013	15%	43%	13%	16%	17%	13%
Tanzania	2014	15%	47%	15%	15%	15%	n/a
Uganda	2013	24%	53%	16%	28%	27%	14%

SOURCE: SDI, 2017.

Importantly, there are different types of teacher absenteeism, with widely different causes. Identifying and differentiating the different reasons for teacher absenteeism are crucial for the development of targeted and effective interventions to improve teacher attendance. At a broad level, teacher absenteeism can be divided into authorized and unauthorized absences (ADEA, 2013). Teachers can, for example, be granted the right to be absent from teaching their allocated pupils on a number of valid grounds. These include, among others: personal or familial illnesses, official leave, assigned administration duties, in-service training, and the need to collect salaries from distant locations (this is especially problematic in rural areas with limited government infrastructure)(ADEA,

2013). Unauthorized leave, by contrast, occurs for very different reasons, including: truancy, tardiness, moonlighting, poor security at schools, teacher strikes, or outright fraud (ADEA, 2013). There is currently a scarcity of information in the region regarding which of these various factors are the most influential in determining the high rates of observed absenteeism. Further research will almost certainly be required to determine the most prevalent factors at a granular school- or even teacher-level.

Somewhat surprisingly, existing data suggest that a relatively high proportion of teacher absences in the region are due to authorized leave. See Figure 1, for example, which shows a comparison between a selection of nine sub-Saharan African countries, including four countries in Eastern Africa. Such a high proportion of authorized leave suggests a problem at the policy level, as even with the need to improve teacher capacity through training they should not be absent for up to a quarter of the school days. Head teachers provide the critical link to manage teacher absenteeism, but in some cases their ability to do so may be hampered by system-wide rules such as the scheduling of trainings, or teachers' needs to travel to collect their salaries (Bashir et al., 2018, p. 268). Alternate teachers are only available roughly 50% of the time to fill the gaps created by authorized leave, and as a result the head teacher will often make do by combining classes or serving as the alternate themselves (Bashir et al., 2018, p. 266). However, as the data above indicate, even when alternate teachers are assigned, they may actually skip class.

One study from the *International Journal of Education and Research* that investigated teacher absenteeism at secondary schools in Kenya found a few interesting patterns. First is that perceptions of teacher absenteeism differ somewhat from the empirical reality. Researchers found that most surveyed principals believed that female teachers had higher rates of absenteeism than their male colleagues, and that married teachers were more likely to be absent than their unmarried colleagues. However, neither gender nor marital status were found to be statistically significant influencers of absenteeism (Obiero et al., 2017). These findings point towards the need to establish objective measures of absenteeism at the

teacher level, rather than relying on the subjective perceptions of administrators. Secondly, the study found that illness—either of the teachers themselves or of close family members—was in fact the most common reason for teacher absenteeism. This finding points to the need to both strengthen health systems, and to link healthcare provision more closely to schools to limit teacher absenteeism. Such inter-sectoral conclusions do not provide easy, silver-bullet solutions to the problem, but they are more likely to lead to positive systemic change if pursued effectively.

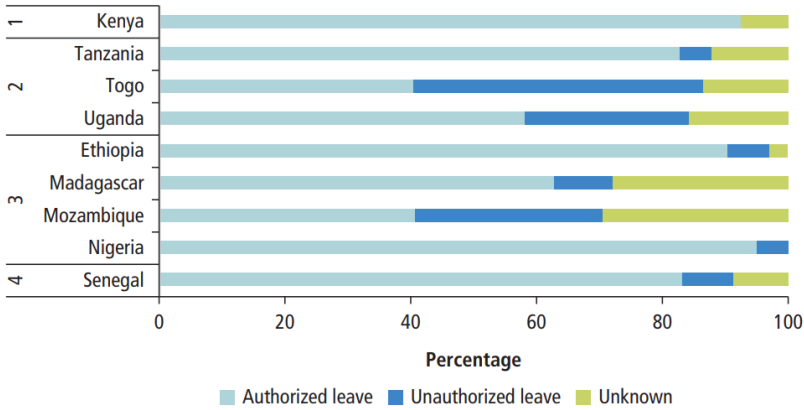


FIGURE 1 Reasons for teacher absence from school and incidence of "orphaned classrooms" in selected sub-Saharan African countries, by group, mid-2010s.
SOURCE: Bashir et al., 2018, p. 265.

Anecdotal evidence from the region also suggests that the need to collect salaries from distant locations may be a structural reason for authorized teacher absenteeism. Teachers posted to remote locations not serviced by financial institutions may be required to travel long distances to collect their salaries (ADEA, 2013). The length of these trips is largely a function of road and transport networks, which lie beyond the mandate of education ministries to address. When salary payments are delayed without notice, as is the case for many countries in the region, it may further oblige teachers who have already travelled to wait long periods of time until their payments are processed, further prejudicing their in-class teaching

time (ADEA, 2013).Although potential technological solutions exist to address these challenges (such as, for example, transferring salary payments through mobile money), central government ministries have generally been slow to fully take up and implement such IT-based solutions (Bustinza, 2018; Ng'weno, 2017).

In some countries, unauthorized leave also seems to account for a significant number of empty classrooms. From the available data this is particularly the case in Uganda, with Ethiopia and Tanzania also recording modest levels of unauthorized leave. In these cases, absenteeism could be decreased with stronger disciplinary protocols, although this would require head teachers to engage in difficult and confrontational situations (Patrinos, 2013). In many cases it would also require a level of collaboration between head teachers and communities to report unauthorized absences, and would also require a clear hierarchy structure for higher authorities to act on reports from head teachers (Bashir et al., 2018).

At a broad level, it is likely that the problem of teacher absenteeism results from low levels of motivation at an individual level, non-enforcement of rules at the school level, and a general lack of societal pressure to adhere to professional standards. Thus, although some targeted interventions—such as policy reform to limit authorized absenteeism and more rigorously enforced attendance registers—are likely to yield positive results, they are unlikely to have the desired transformative impact if not coupled with a broader mindset shift among teachers, administrators, and parents towards a deeper commitment to high professional standards.

In some cases, it is possible that the security of tenure and guaranteed pay increases that are part of civil society regulations may underpin the observed lax institutional culture, and even contribute to collusion between teachers and managers (Bashir et al., 2018). Changing behaviours in this institutional context presents significant challenges, and there are currently no good international examples of successful large-scale reform in this area. A gradual shifting of societal norms to value professional conduct and sanction bad behaviour like excessive absences (even when authorized) will likely be required.

Parental and Community Involvement

Teachers often receive the brunt of the blame for the crisis in learning in the region. As a result, a variety of metrics and indicators have been deployed by governments and international organizations to quantify and rank the effort, knowledge, and ability teachers put into their work (SDI, 2017). While teachers certainly play a central role in the education of the next generation, they are not solely responsible. The role of parents and communities in providing an encouraging and supportive atmosphere, building strong and trusting relationships, and generally valuing the process of education, are also important—although much less frequently quantified.

At a theoretical level, communities can play an important role in school ownership, and ensuring accountable practices, transparency, and compliance with policies (Afridi et al., 2014). Community participation through mechanisms like local transparency committees, appeal boards, social audits, and informal whistleblowing are often identified as the key actions to combat corrupt practices in the education system (Poisson, 2014). Practitioners also often point to the fact that most of a child's life takes place outside of the classroom (Nabuzale, 2018). While teachers and administrators play a crucial role in formal schooling, parents and communities are important instructional partners to help inculcate a natural curiosity and desire to learn among students. This section will address each of these points in turn: parental involvement in school governance, and parental involvement as instructional partners.

Parents and communities are identified as key stakeholders in School-Based Management (SBM) programs that have been rolled out across most of the region. SBM programs have been part of a general move towards governance decentralization (and, in fact, a response to problems with education service delivery at the subnational and local level) that give schools some limited powers and funding (Bashir et al., 2018). The intention of SBM programs is to empower stakeholders, including parents and communities, to hold schools directly accountable for service quality (Afridi et al., 2014). SBMs differ widely across sub-Saharan Africa, but have

some common characteristics. They typically involve establishment and training of a school management committee (on which parents sit), the creation of school development plans, and the management of some form of financial grant from the central government (Bashir et al., 2018).

A global review of SBM programs in low- and middle-income countries (LMIC) found that common decentralized responsibilities include: employment and remuneration of teaching and administrative staff, facility maintenance, procurement of educational materials, and monitoring and evaluation(Barrera-Osorio et al., 2009). In contrast to other regions, however, sub-Saharan Africa has very few examples where critical functions such as hiring and firing teaching staff, choice of learning materials, or the power to set the school calendar have actually been transferred to schools. In Kenya, for instance, "[s]chool committees make suggestions to education officials on teacher promotions and transfers, oversee expenditures from capitation grants, and participate in the design and implementation of school development plans (Bashir et al., 2018, p. 386)." They do not, however, have responsibility for directly supervising teachers, selecting textbooks, or setting the school calendar. Research from Uganda and Zimbabwe similarly concludes that core education-sector decisions are almost never decentralized in a way that allows meaningful local participation (Dunne et al., 2007).

Community and parental involvement in governance is thus limited in the region, but it is also not a panacea to improve learning. The available evidence on whether local involvement improves learning is rather mixed, with a number of examples of negative outcomes (Bashir et al., 2018). Several recent evaluations on the impact of particular SBM reforms in sub-Saharan countries have used experimental and randomized techniques. In high-income countries, SBM is positively correlated with learning outcomes, which largely justified its expansion in Eastern Africa (Bashir et al., 2018). In sub-Saharan Africa, study results have depended on the type of SBM reform implemented, although the overall effect size is negative across studies (Bashir et al., 2018). Evaluations of small grants to SBM committees in the Gambia, Senegal, and Niger, for

example, found no impact on learning outcomes (although in some cases they seemed to decrease teacher absenteeism)(Snilstveit et al., 2016). In Eastern Africa, a randomized control trial conducted in Kenya between 2005 and 2007 that provided funds for an Extra Teacher Program (ETP) along with an SBM training program for parents did show improved test scores (Duflo et al., 2012). Ultimately, however, there is very limited empirical evidence demonstrating a direct link between parental involvement in school governance and improved learning outcomes (Afridi et al., 2014). Decentralizing service delivery using an SBM framework and encouraging parental participation are not silver bullet solutions to improve learning, although they are widely promoted as such(Bashir et al., 2018; Ocan, 2017). To succeed, SBM reforms probably require a relatively well-educated general population around the school, particularly among teachers and parents (Afridi et al., 2014; Bashir et al., 2018). In the absence of this population, SBM reforms can create more harm than benefit.

The same conclusion is not true, however, for the role of parents as instructional partners. A small body of evidence suggests that encouraging parents to become directly involved in the education process offers some promise of success. For instance, Nag et al. (2014) write about "decontextualized teaching," meaning that in the classroom lessons come without context. The process often involves simply copying answers to certain questions, disconnected from students' spoken languages, practical knowledge, or daily lives. This type of decontextualized teaching is common in many developing countries, and is especially problematic in Eastern Africa. Some research documents the important role of parents in overcoming this problem to "contextualize," or make implicit the knowledge that is formally transmitted at school (Nag et al., 2014). As instructional partners, parents can help students connect concepts learned in the classroom to lived experience. Interventions that showed the most success, for instance, coached mothers as they practiced problem solving with their own children (Rochdi, 2009). Mothers with sufficient knowledge of school language and literacy were most able to support their children in this way (Nag et al., 2014). More

research is needed on how this type of supportive, contextualized learning environment can be best fostered and achieved, as current research specifically in Eastern Africa is limited.

There is also some global evidence that active parent involvement can support teachers by making them feel more valued. For instance, people who have close contact with schools also tend to have more positive impressions of teaching staff, which translates to stronger working relationships and the perception of a more supportive overall atmosphere (OECD, 2006). This sense of value and support subsequently translates indirectly to better teacher motivation and commitment (Afridi et al., 2014).Some qualitative research from the region suggests that poor literacy and poverty in the general population contributes to systemic barriers to productive parental involvement in education (Berg & Noort, 2011). Parents who never attended school or learned to read well themselves have a very difficult time helping their children with homework, or interpreting the concepts their children bring home. Similarly, many parents are not able to provide a supportive environment simply because they must work to provide food, school fees, and other essentials. There may, however, be some partial routes around these systemic constraints. Field work from rural Uganda, for instance, found that parents were particularly skilled in agriculture and music, even if they could not read (Berg & Noort, 2011). When schools took the lead by asking parents to demonstrate their knowledge to the class or by assigning students simple tasks like taking care of a plant or animal, then parents were made to feel like their knowledge and skills were valued, and subsequently became more involved in their children's education (Berg & Noort, 2011).

Overall, existing evidence suggests that parents play a crucial role in ensuring accountability for quality education delivery, and that they are also teachers in their own rightswith the responsibilityto help students transfer formal lessons into real life applications. Although more research is required into the best way for parents to be involved, it is clear that they are crucial stakeholders with responsibility for improving education outcomes in Eastern Africa.

Teaching for the Exam

Many public commentators and education experts have pointed to the pre-eminent position that exams hold in our societies as a fundamental problem in our relationship with education (Rwagatare, 2018). For example, Mr. Fagil Mandy, a renowned Ugandan educationist, remarked to a journalist on taking over the chairpersonship of the National Examinations Board in 2012:

> …our education system is wasting too much time on tests and preparing for examinations. That is why students come out of school empty, and grow to be book-hating adults… we need to define what education is. It is not passing examinations… What most people are interested in is how many points a student got. They don't ask whether the child can work, debate, sing, think, play, design, etc. (Nyanzi, 2012).

In other words, an inordinate focus on assessment actually undermines the learning process. The focus on assessment, in turn, comes partly from the need for schools to demonstrate performance, but is also reinforced by a society that values the appearance of achievement over real learning. Although this diagnosis of the educational paradigm in Eastern Africa is prevalent among experts, there is relatively little published literature to support it.

In most of sub-Saharan Africa, national examinations still comprise the main focus of educational assessment, as was the case in colonial times. The nature and structure of these national exams differ widely across the region, but the common feature is their certification and selection function (Sayed & Kanjee, 2013). National examinations—whether they are held at the primary level or for admission into the post-secondary sector—serve to certify that an individual has reached a specified level of formal knowledge, and admits them into the next stage of the education system. As education is one of the primary enablers of social mobility, the

results of these national examinations are incredibly high-stakes for the children taking them.

Beyond certifying and selecting students, national examinations serve a number of other purposes that are not always explicitly acknowledged. First, examinations can serve as valuable tools for teachers to identify and monitor what learners know and can do, and to design specific teaching interventions to address shortcomings (Ngware, 2017). Second, for parents, examinations serve as a useful source of information to monitor progress and certify participation (Sayed & Kanjee, 2013). Third, for education ministry officials, national examination results assist in policy design and help them to evaluate strengths and weaknesses (and hence potential areas for investment) across the education system broadly (Sayed & Kanjee, 2013). Fourth, for development partners national examinations represent a key tool to evaluate "return on investment" and the "impact" of their supported interventions (Sayed & Kanjee, 2013). Unsurprisingly, designing a tool that meets the divergent needs of these various stakeholders is not an easy task.

For the first two of these goals (monitoring student progress for teachers and parents), other strategies already exist. To mitigate the negative impacts of once-off high-stakes examinations, and also to enhance the validity of those same examinations, a number of countries in eastern and southern Africa have implemented "continuous assessment" (CA) or "classroom-based assessment" policies (Chulu, 2013; Iipinge & Kasanda, 2013; Kanjee & Sayed, 2013). In essence, these strategies refer to smaller, lower-stakes tests and assignments completed throughout the year that form the basis for assessment. Implementing this type of assessment has been a recurring topic of conversation in the region (Mbabaali, 2019), especially in Kenya where it has been part of the national debate on education sector reform for well over a decade (Muya, 2003; Oduor, 2011; Wanzala, 2016d).

Typically, the challenges with CA involve low teacher capacity and insufficient institutional infrastructure. Tests, exams, and assignments designed by teachers tend to call for restating memorized factual knowledge, rather than providing a structured method to

demonstrate higher-order thinking skills (Sayed & Kanjee, 2013). Other systemic issues constrain teachers' abilities to implement CA, including large class sizes, limited access to pedagogical resources, and limited training and capacity-building exercises related to assessment (Sayed & Kanjee, 2013; Siyum, 2016). As a result of these constraints, research in Ethiopia found that more primary teachers used CA only for providing marks to student performance, rather than using it to identify learning difficulties and weaknesses and tailor curricula accordingly (Abejehu, 2016).

Policymakers also worry that CA will undermine standardization and reliability of assessment across the education sector—and they may have a point. In South Africa, for instance, Van der Berg and Sheppard (2010) found a weak correlation between CA results and exam marks, implying that CA marks are often highly inflated. Of more concern, grade inflation under CA seemed to be more prevalent in poorer and more disadvantaged districts. CA in affluent areas tended to mirror examination results (Van der Berg & Shepherd, 2010). Malawi was able to implement continuous assessment as part of a larger primary education reform by including extensive training for teachers and supplemental assessment materials (Chulu, 2013).However, this reform was implemented with support from development partners, and could not be scaled up because of funding limitations. According to the authors of this study, the Malawi experience demonstrates the clear limits of donor-sponsored education reform (Chulu, 2013).

In theory, incorporating more CA into the curriculum could free national examinations to fulfill their other goals—providing a planning tool for ministries, and accountability information for donors. Additionally, as CA requires higher-level critical thinking and engagement on the part of teachers, reforms to build CA capacity could potentially have broader positive impacts on teaching quality throughout the education system. Currently, a lack of empirical evidence makes it difficult to determine how successful such a strategy could prove, although it would likely depend on a long-term process of capacity building at multiple levels.

Innovations in Science Education: From STEM to STEAM to STREAM

> The difference between science and the arts is not that they are different sides of the same coin… or even different parts of the same continuum, but rather, they are manifestations of the same thing. The arts and sciences are avatars of human creativity. –Mae Jemison; doctor, dancer, and first African-American woman in space (Jemison, 2002).

Skills and knowledge in science, technology, and innovation (STI) are frequently cited as a developmental necessity for the African continent (Juma & Serageldin, 2016). The logic is clear: most African economies continue to be dominated by low value-added resource extraction, and the production of goods and services for local consumption. To move up the value chain, thereby increasing productivity and income levels, expertise in STI subjects will be required (Khumbah, 2018). Most economists today agree with these statements. The foundation of this expertise is usually identified as STEM (Science, Technology, Engineering, and Math) education (Khumbah, 2018; Lobe, 2015).

STI expertise is a clear necessity in the region, but it is far from clear that existing STEM education programs are capable of imparting the necessary skills and knowledge in a useful format to the youth. Despite the growing rhetorical emphasis on STI, for instance, sub-Saharan countries perform significantly below other LMICs in international assessments such as TIMSS; some countries have even seen their share of students able to reach the low international benchmark in mathematics decrease in recent years(Bashir et al., 2018, p. xxxv).[3] Part of the reason for this poor performance may be due to the factors outlined above: teacher absenteeism, limited parental support, and an inordinate focus on passing exams over

[3] The low international benchmark in TIMSS requires that students have some basic mathematical knowledge, can add and subtract whole numbers, and recognize parallel and perpendicular lines and familiar geometric shapes(Bashir et al., 2018, p. xi).

actual learning. However, another crucial reason is that STEM education in Eastern Africa is resoundingly dull.

In the popular imagination, science is usually associated with discovering facts, delivering proofs, and disseminating objective truths. Science education, then, is the process of accumulating and itemizing all of these objective facts in the mind (Smith, 2017). The purpose of all this itemizing and memorizing is supposedly to help devise practical solutions to real world problems; create new vaccines, engineer new GMOs, or develop new mineral processing techniques. Such stereotypes are prevalent in society—the problem is that they are almost entirely wrong. The actual practice of science that leads to practical solutions involves a great deal of creative problem solving, subjective reflection, and re-examination of the supposed facts (Smith, 2017). The static stereotype of science in the public imagination comes mainly from the way that science is taught, rather than the practice of science itself.

To overcome static teaching practices in STEM, some jurisdictions have experimented with STEAM curricula—inserting an "A" to account for the arts (Lachman, 2018; Pomeroy, 2012). Several studies in the United States, for instance, have correlated participation in the arts to improvements in math and reading scores, while others show that the arts boost attention, cognition, working memory, and reading fluency (Gazzaniga, 2008; Grafton & Cross, 2008). As these results suggest, the arts may not only help students to develop healthy brains and well-rounded interests, but can also improve scientific literacy. Some experimental programs, for instance, have taught neuroscience concepts through literature (McFarlane & Richeimer, 2015), robotics concepts through origami (a Japanese folding paper art)(Dempsey, 2012), and math and geometry concepts through dance (Jensen, 2016). In general, these creative integrations of the arts and STEM education have been shown to excite students about science, and in particular those students who did not previously express interest in STEM subjects (Pomeroy, 2012). See Text Box 2 for an example of STEAM in practice beyond the classroom.

TEXT BOX 2
Responding to the Ebola Epidemic with STEAM

When the Ebola epidemic struck western Africa, STEM disciplines were critical in responding to the disease. But the arts and humanities also played crucial roles in effectively managing the spread of the virus. Popular songs broadcast widely on the radio, for instance, informed people about transmission mechanisms, and methods they could use to protect themselves and their families. International teams used design principles to develop protective suits for healthcare workers that were easier to use. A U.S.-based professor and artist joined the effort in Liberia, and attached photographs of healthcare workers' faces to the front of their protective suits. The goal of this initiative was to make patients and communities less alarmed about the impersonal, white-clad medics entering their homes and villages. Beyond responding to specific diseases, this anecdote demonstrates that the arts and sciences are essential partners when it comes to solving real world problems. Text adapted from: (Skorton & Bear, 2018, p. 13).

Artist and professor Mary Beth Heffernan affixes a PPE portrait to Zoe Dewalt, RN, at an Ebola treatment unit in 2015 in Paynesville Liberia.

More recently, some educationists have begun pushing for the inclusion of another letter in the expanding acronym: "R," for "Reading"(and "wRiting")(Sidhu, 2019). A STREAM curriculum acknowledges the importance of both the arts and STEM subjects

to a well-educated individual, but goes a step further to emphasize the crucial importance of communication skills to effectively use the competencies gained through a well-rounded education. Writing is not just wordsmithing—it is an enabler of clear thinking and the creative process (Root-Bernstein & Root-Bernstein, 2011). As such, reading and writing skills are as important to a successful career in the sciences as they are to one in the social sciences or humanities. Ultimately what all of these acronymized curricula point to is the unity of knowledge, and the importance of integrated learning for well-developed adults.

Empirical data on the relative effectiveness of STEM, STEAM, and STREAM curricula are scarce, and inevitably influenced by context to such a degree that theyare likely not comparable between countries. Nevertheless, some general statements can be made from the global literature. First, standard STEM curricula are dull, encourage narrow, fact-based teaching, and switch many students off of the subject (Howes et al., 2013). Second, research has repeatedly shown that learners can be excited by science and math when it involves creativity, problem solving, modelling, and interest-led projects (Howes et al., 2013). Specific reforms to integrate the arts, reading, and writing into STEM curricula can take various forms, and multiple international examples exist. Any vision for reform that seeks to integrate these principles is likely to have a positive effect on science and mathematics learning outcomes.

Conclusions and Recommendations

Based on the evidence discussed above, the Expert Committee issues the following conclusions and recommendations for the way forward:

1. High-quality primary and secondary education is crucial to the success of the higher education system.

Therefore:

a) Governments should pursue a holistic education agenda that clearly acknowledges and addresses the linkages

between primary and secondary levels of schooling and the quality of the tertiary education system.

2. Excessive teacher absenteeism in primary-level classrooms is a major issue in the region, driven both by social factors and by gaps in official policy.

Therefore:

a) Governments should fund research to track the root causes of authorized and unauthorized teacher absenteeism for more targeted evidence-informed decisions in the future.

b) Governments should implement the use of more rigorous attendance registers to empirically determine the worst offenders of unauthorized absenteeism.

c) In the short term, governments should seek to limit administrative and policy gaps that promote excessive authorized absences from the classroom, including but not limited to possible IT solutions for salary disbursements.

d) Education and health ministries should work closely together, possibly through the creation or strengthening of inter-sectoral working groups, to improve access to health services on school premises.

3. Decentralization and devolution of education have not necessarily led to quality service delivery and better learning outcomes.

Therefore:

a) Education ministries should more forcefully implement existing quality control standards, or revise existing standards where necessary.

b) National governments should ensure that allocated public funds are disbursed expeditiously and in an accountable manner.

4. Exam-centric curricula detract from creativity in teaching and learning.

Therefore:
a) Governments should promote continuous and varied progressive assessment to promote creativity and innovation in learning.

5. Current STEM curricula are dull, focus too much on rote learning, and unnecessarily discourage student interest in STEM subjects. Programs that integrate arts and science curricula show some promise to reverse this trend.

Therefore:
a) Curriculum review bodies should strive for a complementary balance between the sciences, humanities, and the arts, and encourage experimentation in integrated teaching.

Higher Education in Eastern Africa

Eastern Africa is producing a greater number of high-level experts than ever before. Many of these graduates are already taking up leadership roles in the government, business, and non-profit sectors. Others are developing new products and starting their own businesses. Too many, however, are unemployed and not fulfilling their true potential—either for themselves, or for their countries (see Figure 2). According to business and academic leaders, one of the reasons for the poor employability of Eastern African graduates is a lack of basic soft skills, including the abilities to interpret information and make informed judgements, communicate effectively, think critically, and work independently (Ngalomba, 2018; Nganga, 2014). Regardless of the technical field, each of these skills is essential to a successful career.

Ethiopia, Kenya, Tanzania, and Uganda have all dramatically increased their gross enrolment ratios (GER) in tertiary education in recent years.[4] See Figure 3 for an illustration of enrolment trends over time. Tanzania, currently with the smallest change, increased its GER from 0.68% in 2000 to 3.65% in 2013. Ethiopia, with the largest change, increased its GER from 1.19% in 2000 to 8.13% in 2014. Kenya and Uganda both fall between these outer bounds. Although all four countries still fall below the sub-Saharan average in tertiary GER, all have recorded significant increases in a short period of time. At the same time, all four countries have seen significant improvements to their GPI in tertiary education. Both Ethiopia and Tanzania have nearly doubled their GPI between 2000 and 2014 (from 0.28 to 0.48, and from 0.3 to 0.5, respectively). Kenya and Uganda both have 2014 GPIs of 0.7, an increase from around 0.5 in 2000. While all four countries still fall well short of

[4] GER refers to the percentage of student enrolled in tertiary education out of the five-year age group starting from the official secondary school graduation age.

parity, these relatively rapid changes are encouraging. Patterns in tertiary education funding have fluctuated across time and across countries, but in general these expansions in access have been underpinned by increased public investment.[5]

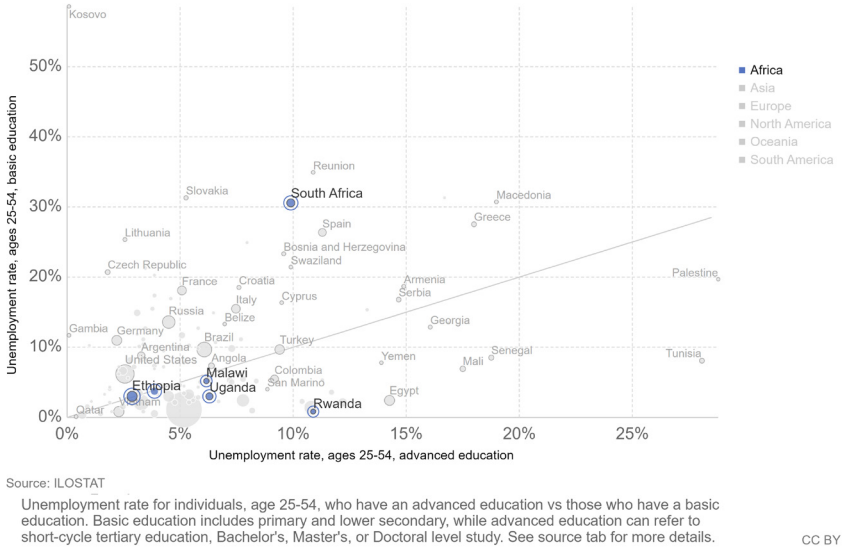


FIGURE 2 Unemployment rate, basic versus advance education, 2016, for a selection of eastern and southern African countries. Most countries in eastern Africa Fall on or under the international trendline, suggesting that unemployment for those with advanced education may be particularly problematic in these countries.
SOURCE: ourworldindata.org.

Eastern Africa is producing a greater number of graduates from tertiary institutions than ever before, and yet, in many cases, it is not clear that these graduates are fully prepared to enter the workforce. In a survey of employers conducted by the Inter-University Council for East Africa (IUCEA), respondents indicated that between 51% and 63% of university graduates in the region were either "half-baked,""unfit for jobs," or "lacking job market skills (Mohamedbhai,

[5] All data from the World Bank Open Data platform at: https://data.worldbank.org.

2014).” Uganda and Tanzania recorded the worst survey results, with 63% and 61%, respectively (Nganga, 2014). Regulatory and professional bodies in the region are also recognizing a worrying trend of under-prepared tertiary graduates. In 2011, the Engineering Registration Board of Kenya refused to recognize the degrees offered by three leading public universities because of inadequate curricula, lack of qualified lecturers, and shortage of appropriate facilities (Mohamedbhai, 2014). In the same year, and for similar reasons, the Council of Legal Education of Kenya rejected applications to practice law from the graduates of a number of public and private law schools in Kenya (Mohamedbhai, 2014). Poor quality tertiary education not only provides a great disservice to young Eastern Africans, but also exacerbates problems of youth unemployment as employers prefer older applicants with work experience over new graduates (Nganga, 2014).

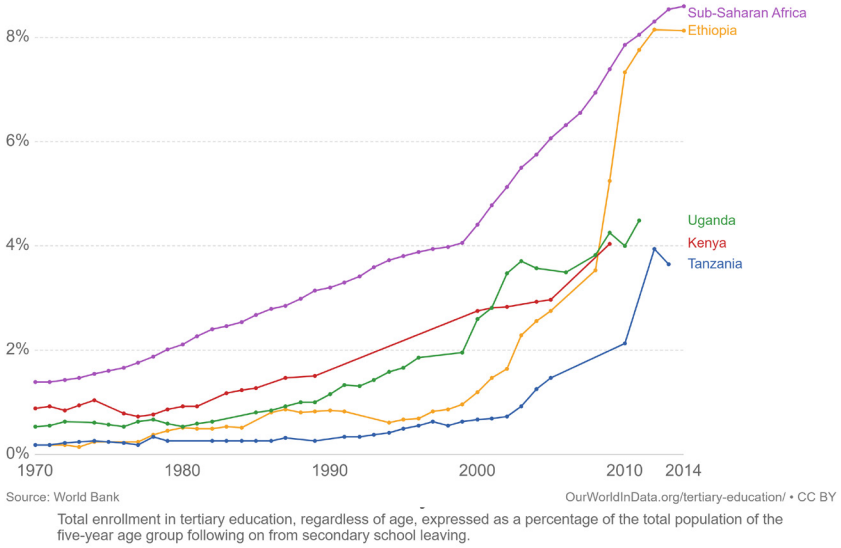


FIGURE 3 GER in tertiary education over time for Ethiopia Kenya, Tanzania, and Uganda.
SOURCE: ourworldindata.org/tertiary-education.

One contributing factor to this distressing scenario is probably a simple lack of resources. Chief among those resource constraints is the lack of qualified teaching staff. As demand for tertiary education grows rapidly, student enrolment quickly outstrips the training of new professors (it takes approximately 10 years to train a prospective lecturer through undergraduate and graduate degrees, making them a scare resource) (Chipperfield, 2016). In sub-Saharan Africa as a region, there are already 50% more students per lecturer than the global average, putting teaching quality under pressure (McCowan, 2014). See Figure 4 for an illustration of the growth in pupil-to-teacher ratios at the tertiary level in the region. Similar to the experience of primary education during the MDGs, in which rapid expansion put great pressure on existing infrastructure and staff, Eastern Africa's recent higher education boom is leading to concerns about quality and the employability of graduates.

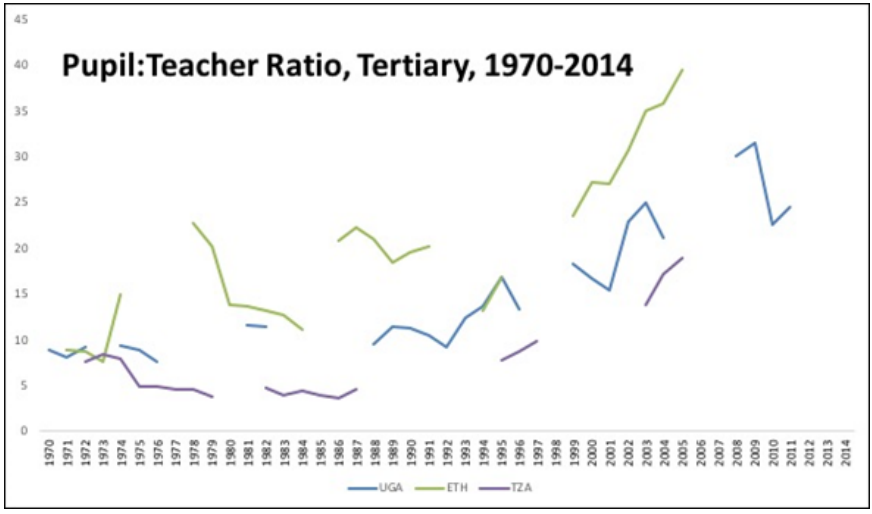


FIGURE 4 Trendlines of student:teacher ratio at the tertiary level in Uganda, Ethiopia, and Tanzania between 1970 and 2014. Note: Data for Kenya were not available.

SOURCE: data.worldbank.org.

Even if students are successfully acquiring the necessary technical knowledge and skills, it may be difficult for potential employers to

tell because of graduates' abysmal communication skills (Malanga, 2017; Maxel, 2013; Mwesigwa, 2014; Ngalomba, 2018). Data from Tanzanian employers, for example, reveal a perceived skills shortage among graduates, with most employers indicating that "expertise in verbal and written communication is an important factor in employability (Ngalomba, 2018)."Partly as a result of this soft skills gaps, research shows that private employers in the labour market—which is offering growing opportunities in the oil, gas, and hospitality industries—prefer to recruit abroad for skilled positions (Changarawe, 2014; Mutagwaba & Kyetema, 2013).

The intellectual atmosphere of Eastern Africa has changed dramatically over the past two decades. From independence to the late 1990s, higher education was understood largely as the preserve of the elite and of governments. Since then, the appeal of tertiary education has exploded; in some cases, this growth has produced benefits, and in others major challenges. More citizens than ever before are engaged in the education system and interested in securing post-secondary credentials. But as Peter Anyang' Nyong'o, a Kenyan political scientist and parliamentarian, pointed out at a workshop in Nairobi, the market response to these pressures has been to lay less emphasis on basic research, and many institutions have become mere "mills for processing students for getting university degrees (Nyong'o, 2016)." Given the current situation of education in Eastern Africa, policymakers are faced with a number of competing priorities. Determining where and how to devote financial and human resources into the education system to leverage the greatest benefit for national development therefore presents an immense challenge. The following points of evidence may help to navigate this challenge.

History and Purpose of General Education Liberal Arts Modules

One method that higher education systems have historically sought to instil more developed soft skills in graduates is through some form of liberal arts education. The concept of liberal arts originated in ancient Greece as a method for educating the most elite

members of society (Davidson, 2017). In many parts of the world, it continues to serve the same purpose. However, over the centuries the content and structure of a liberal arts education has changed. The factor that has remained constant is the central idea that free citizens need systematic training in deep critical thinking to participate in society (Davidson, 2017).

In ancient Greece, the topics considered necessary for a free citizen included grammar, logic, and rhetoric—what would come to be known as "the Trivium." Proficiency in these three competencies was understood as an essential precondition to participation in public debate, as well as to serving in the courts and the military (Davidson, 2017). Today, many liberal arts programs attempt to instil the same competencies, usually through rigorous, cross-disciplinary thinking in both the arts and the sciences that focuses more on training students how to think than training them what to think (Bloom & Rosovsky, 2003).

Today, advanced economies across the globe are embracing a liberal arts approach to higher education to foster more innovative human capital to compete in the global economy (Davidson, 2017; Redden, 2009). The creativity, critical thinking, broad cultural understanding, and clear and effective writing skills that are imparted by a liberal arts education are all essential in modern knowledge-based economies (Davidson, 2017). Whether a similar educational philosophy is appropriate for developing regions such as Eastern Africa, however, remains a controversial topic.

Development partners, such as the World Bank, tend to emphasize the need for infrastructure and strong institutions as the keys to successful socio-economic development (Bloom & Rosovsky, 2003). Both of these priorities require skilled workers—engineers to build bridges, doctors to work in hospitals, and accountants to run the tax system. Education in Eastern Africa has therefore tended to focus on vocational training (Bloom & Rosovsky, 2003). Deep subject matter knowledge and "job ready" graduates are valued over generalists (Awuah, 2012). On top of the perceived economic benefits of specialist education, families may also have an incentive to send their children to acquire specialized technical skills.

Education represents a significant financial and time investment. Families therefore might value quick returns on their investment, and specialized professional education is often seen as a faster and more secure route to returns than a broader liberal education (Bloom & Rosovsky, 2003).

Proponents of liberal arts education in developing countries point to the complicated and integrated nature of the problems that such societies face. If engineers learn only the technical aspects of their profession, for example, how will they account for the social and environmental impacts of their work? The technical skills to design and construct highways are clearly essential for all countries. But if policymakers have not learned to critically think through all the possible impacts of projects, and take into account the views of local populations, then the negative externalities of a project may outweigh its economic benefits (Bloom & Rosovsky, 2003). In fact, HIV/AIDS in Eastern Africa already provides a grim warning about the dangers of overspecialization. In the 1990s, as the AIDS pandemic swept through Ugandan society, the unexpected deaths of colleagues often left survivors unprepared for new duties (Lilford, 2017, p. 158). While specialist knowledge is clearly important for the development of any country, the adaptability and critical thinking skills imbued by a liberal education may offer many societal and personal benefits, even for developing countries.

The basic idea of liberal arts is nothing new in Africa. African traditional knowledge systems, for example, blur the distinctions that have existed in European education since Aristotle. Medicine, theology, psychology, music, dance, and poetry are all features of healing. Cultural knowledge and literature are inseparable, as oral praises, applying a poetic formula, serve as the repository for history and genealogy (Lilford, 2010). This type of integrated knowledge system fits comfortably into the concept of the liberal arts. In British Imperial East Africa, formal education was provided primarily by missionaries. Course offerings were quite limited, but in some cases also surprisingly broad, as the missionaries frequently also worked as engineers, medical doctors, builders, and dentists (Lilford, 2017). However, missionary education did not offer a planned or coherent

system. The one notable exception to this ad hoc, missionary-driven system at the time was Makerere University in Uganda, which in the early 1940s served all of Eastern Africa (Lilford, 2017).

In its early years, Makerere represented the ideal of a progressive, African-centric liberal arts education. The 1937 De la Warr Educational Commission Report, for example, promoted higher education in Eastern Africa through a comprehensive and rigorous liberal arts education that specifically incorporated African culture and thought, and aimed for a "synthesis of both African and European elements (Ashby, 1966, p. 198)." Makerere pursued this vision up to the early 1970s, becoming the most prestigious university on the continent (Lilford, 2017). In 1955, a group of Makerere social scientists published an article in Higher Education Quarterly examining an interdisciplinary course that emphasized Eastern African examples of politics, sociology, and economics (Ehrlich et al., 1955). The course, however, was ahead of its time, and was ultimately abandoned because of the "special relationship" between Makerere and the University of London (Sicherman, 2005). As one scholar has noted:

> The course was a brave experiment destined to extinction because it was not "examinable" by London, yet its underlying premise—that enquiry into local topics should be the bedrock of East African higher education—grew stronger and, as research accelerated exponentially in the 1960s, resulted in curricular change (Sicherman, 2005, p. 29).

The standards set by the University of London thus clashed with the creativity needed to respond directly to African curricular needs, and ultimately undermined the expansion of such programs. Some programs at Makerere, such as the medical school, music, dance, and drama, remained beyond London's influence. But ultimately, despite these innovative experiments, the highly specialized "Honours Degree" became the de facto norm (Lilford, 2010).

Contemporary examples of liberal arts curricula in higher education in Africa are few and far between. But they do exist. The University of Botswana, for example, introduced a series of required general education courses (GEC) as a part of its broader "Semesterisation" reforms in 2002(Lilford, 2010). GECs address crosscutting issues such as employer expectations, competence in communication skills, IT and information skills, gender, HIV/AIDS, the environment, energy, and globalization (Garg & Garg, 2007). The stated purpose of GECs are to complement specialist programs by broadening students' knowledge, promoting critical thinking, ethical judgement, intellectual growth, a larger perspective in the analysis of issues, and general skills for life-long learning and thinking (Tanna & Kumar, 2002, p. 59).The implementations of such GECs are, of course, not without their challenges. A survey of graduating students at the University of Botswana, for instance, documented that up to a quarter of engineering students were ambivalent about the GECs they had taken, and did not understand how such courses were important or relevant to their chosen careers (Uziak et al., 2012). Close faculty-student mentoring and advisory services may therefore also be important to ensure that students receive the greatest benefit from GECs.

Today, faith-based universities seem more inclined and able to lead a push for liberal arts education in the region (Lilford, 2010). In Uganda, for instance, growing demand and the liberalization of higher education has led to the proliferation of private, and usually faith-based, universities, including the Anglican Uganda Christian University, the Roman Catholic Uganda Martyrs University, and The Islamic University in Uganda. Many of these new institutions base their curricula on more holistic models of education shaped by their various religious traditions (Lilford, 2017). The private non-profit Aga Khan University (AKU) in Pakistan, for example, expanded into the liberal arts in 2013. Speaking at the university's convocation ceremony that same year, His Highness the Aga Khan, founder and chancellor of the university, said "The Liberal Arts, I believe, can provide an ideal context for fostering interdisciplinary learning, nurturing critical thinking, inculcating ethical values, and

helping students to learn how to go on learning about our ever-evolving universe (Aga Khan, 2013)." To support this vision, AKU uses some of its endowment to extend scholarships specifically for its liberal arts courses to disadvantaged groups (Bloom & Rosovsky, 2003).AKU has since made plans to extend its Faculty of Arts and Sciences to their Eastern African campus in Arusha, Tanzania(AKU, 2019). Ashesi University, presented in Text Box 3, exhibits another example of the liberal arts adapted to a modern African context.

Whatever form such general education or liberal arts courses might take, the overall aim is to bestow graduates with a solid grounding in African history and society so that they can engage with the word in a more intellectually confident manner. Such a goal was articulated more than 100 years ago in 1911 by the journalist J. E. Casely Hayford, in one of the first novels written in English by an African:

> I would found in such a University a Chair for History; and the kind of history that I would teach would be universal history with particular reference to the part Ethiopia has played in the affairs of the world. I would lay stress upon the fact that while Ramses II was dedicating temples to "the God of gods and secondly to his own glory," the God of the Hebrews had not yet appeared unto Moses in the burning bush; that Africa was the cradle of the world's systems and philosophies, and the nursing mother of its religions. In short, that Africa has nothing to be ashamed of in its place among the nations of the earth. I would make it possible for this seat of learning to be the means of revising erroneous current ideas regarding the African; of raising him in self-respect; and of making him an efficient co-worker in the uplifting of man to nobler effort (Hayford, 1969).

TEXT BOX 3
Ashesi University in Ghana—Educating Ethical, Entrepreneurial African Leaders

In 2002, a former Microsoft product manager named Patrick Awuah returned to Ghana to found Ashesi University College. Awuah's alma mater is Swarthmore College, a private liberal arts college in Pennsylvania, U.S.A., and he hoped to bring a similar rigorous and comprehensive education as the one he received to Ghana (Lilford, 2017). He believes that many of the governance problems plaguing the continent today stem, to a certain extent, from the education that leaders receive:

> When I asked my peers what should be done, they shrugged. Their reaction led me to explore the educational system, which looked grim. Africa's universities are overcrowded and underfunded. Students line up hours before class, hoping for a seat. Students learn a narrow subject matter, and are tested on recall. Academic dishonesty is too common. How can Africa's future leaders possibly learn to think and behave differently if we don't educate them in a different way (Awuah, 2012)?

Awuah believes that the critical thinking and ethical education inherent to the liberal arts might provide a solution to this problem. Ashesi, however, takes a 21st century and specifically African approach to its liberal arts curriculum. The university focuses on science and technology subjects—but all of them wrapped around a liberal arts core (Mills-Tettey et al., 2007). Students at Ashesi can major in Engineering, Computer Science, Business Administration, or Management Information Systems, and they are also required to take a broad collection of liberal arts courses, including African Music and Dance, Philosophy, Political Science, and Sociology (Ashesi, 2018; Mills-Tettey et al., 2007). Ashesi has also secured a variety of international collaborations, with faculty from the University of Washington, Swarthmore College, and the University of California, Berkeley participating in curriculum design and occasionally teaching as visiting faculty (Mills-Tettey et al., 2007). The Ashesi model therefore directly tackles both the technical and ethical challenges facing Africa, as well as providing a variety of connections to global expertise.

Importance of Interdisciplinary Thinking

The problems of sustainable development are, by their very definition, wicked problems. They frequently involve socio-ecological interactions, they are highly interconnected, and available data are frequently insufficient or contradictory (Esler et al., 2016). Interdisciplinary education, which has grown in popularity across all academic disciplines in recent years, holds much promise to help resolve the problems of sustainable development. As shown in Text Box 4, one of the defining characteristics of wicked problems is that there are always multiple explanations for the cause of the problem, and that the appropriateness of any one explanation depends greatly on the perspective of the planner addressing the problem (Kolko, 2012). In other words, the way we understand sustainable development problems depends greatly on our background and discipline. Interdisciplinary education and research, therefore, seeks to bring together as wide a variety of backgrounds and perspectives as possible to gain a multi-faceted view of the causes and possible solutions to a problem.

TEXT BOX 4
Interdisciplinary Research in Action—Integrating Traditional Healing and Western Medicine

In Swaziland, as in much of sub-Saharan Africa, there is a deep and persistent divide between traditional healers and Western-trained healthcare workers. Collaboration between the two is rare, despite the fact that up to 80% of the population in Swaziland regularly consult alternative therapists, including traditional healers (Sun et al., 2017). The Ministry of Health does not engage with traditional healers, and there are no clear guidelines or policy for how the sector should function. As a result, illnesses are often poorly managed, with patients visiting both traditional healers and doctors and combining treatments, leading to either over-dosing or under-dosing (Sun et al., 2017).

To help address this problem, researchers established a participatory scientific inquiry to understand the best design for a framework to encourage collaboration between the two sectors. The inquiry involved an interdisciplinary process of examining national and international laws

and agreements around intellectual property and indigenous knowledge, conducting in-depth qualitative interviews with traditional healers, and carrying out a six-month pilot quantitative study in partnership with the WHO to determine the efficacy and safety of traditional medicines for the treatment of hypertension and diabetes (Sun et al., 2017).

Key findings that emerged from this interdisciplinary research project included, 1) there were no adverse effects from the use of traditional medicine over the study period, 2) lack of legal recognition for traditional healers is extremely disruptive to any attempts to collaborate with the official healthcare system, and 3) traditional healers were largely not knowledgeable about the laws governing their profession, such as Traditional Knowledge Systems and Folk Lore Protocols of the African Regional Intellectual Property Organization (ARIPO) (Sun et al., 2017).

Major outcomes of this interdisciplinary inquiry included the appointment of a nurse researcher as director of the Institute of Research on Traditional Medicines and Indigenous Food Plants to carry out further quantitative studies. Additionally, the research team worked with traditional healers to establish a committee, formulate a constitution, and receive official recognition from the registrar of companies in Swaziland. It is expected that the established committee will eventually serve as the official association to regulate all alternative and complementary therapies in Swaziland.

More broadly, this success story demonstrates that the value-addition of interdisciplinary research is its ability to tackle questions of implementation. By engaging study populations in a participatory process, interdisciplinary research can also contribute to positive changes in the short-term, rather than just the production of research reports and journal articles.

Interdisciplinarity is not a new concept, although it has recently grown in prominence in direct relation to the challenges of sustainable development. The term first appeared in the *Oxford English Dictionary* in December 1937, although at that time there were already those who complained that the term was overused (Ledford, 2015). In a report to the U.S. Social Science Research Council in that same year, a sociologist from the University of Chicago lumped the term interdisciplinary in with other "catch phrases and slogans

which were not sufficiently critically examined (Frank, 1988)." Despite this early criticism, the idea of interdisciplinarity persisted, and truly caught on as an academic movement in the 1970s (Ledford, 2015). It has been growing ever since, given a particular boost by the recent focus on applied research to solve the world's sustainable development problems.

Today, more than one third of references in scientific papers now point to other disciplines (Van Noorden, 2015). A major reason for the idea's current popularity is its assumed ability to help address wicked problems. Especially when it comes to sustainable development, academics have long identified a "knowing-doing gap (Esler et al., 2016)." Disciplinary depth of knowledge is required, but it often does not provide the tools or skills necessary to actually implement a solution. Interdisciplinary collaboration, both in education and in research, is therefore proposed as a method to overcome the gap and achieve better implementation of existing disciplinary knowledge for sustainable development goals (Esler et al., 2016).

The rationale for interdisciplinarity as a useful tool to help resolve wicked problems is relatively clear. However, many challenges persist. Institutions in the developed world that have prioritized interdisciplinary research have frequently encountered major structural challenges. For example, faculty heads jealously guard their faculties—and their respective grants—and can be reluctant to let them participate in interdisciplinary teams (Ledford, 2015). Additionally, those who engage in interdisciplinary work may find themselves at a disadvantage when applying for their own grants, when seeking promotions, or when submitting papers to high-impact journals (Ledford, 2015). In essence, participating in interdisciplinary research pushes academics away from the core of their field, and leaves them on the periphery (Kanakia, 2007). This risk is particularly acute for early career academics seeking tenure (Bridle et al., 2013). There can also be damaging stereotypes and issues over lack of respect between academic faculties. In the United Kingdom, for instance, the natural sciences are often deemed more "rigorous" by funders and researchers (Bridle et al., 2013). Such

imbalances can lead to suspicion and communication breakdowns, undermining the possibility for interdisciplinary collaboration.

Despite such challenges, a number of developing countries have made substantial investments into interdisciplinary research, understanding its promise to help resolve real-world policy problems. In 2000, for instance, the National Natural Science Foundation of China (NSFC) rolled out a plan for a national network of interdisciplinary institutes, including the Academy for Advanced Interdisciplinary Studies at Peking University in Beijing (Ledford, 2015). In Singapore, the Nanyang Technological University launched the Interdisciplinary Graduate School in 2012—by 2015, it already accounted for about 17% of the graduate student body (Ledford, 2015). In part, these interdisciplinary initiatives in Asia are likely aimed to expand the university's fundraising opportunities. As industry is usually focused on solving real-world problems, interdisciplinary institutes may be able to secure more funding and sponsorships from the private sector than traditional research institutes (Ledford, 2015).

As the above discussion points out, barriers between the disciplines have been overcome in many different ways over the years. Scientists have successfully collaborated across disciplines, finding innovative ways to unify insights and come to new applications. However, some disciplines are more amenable to interdisciplinary interaction than others, as indicated by Figure 5. In general, health-related disciplines appear to be the most interdisciplinary, as they incorporate many fields that cover the social determinants of health (Van Noorden, 2015). Papers from clinical medicine rarely cite or are cited by outside disciplines, possibly because the topic deals with highly specialized medical practices (Van Noorden, 2015). Figure 5suggests that humanities disciplines are also fairly insulated, with all of them appearing in the bottom left quadrant of the chart. This isolation could have to do with the very different research methods used in the humanities and the sciences. Alternatively, stereotypes within academia regarding the rigour and practical usefulness of different fields could build resistance to collaboration between the humanities and sciences.

A separate study conducted with the publisher Elsevier found that some countries are also more interdisciplinary than others. Although African countries were not considered in the study (their total research output was too low), Elsevier found that emerging countries that have grown their research output rapidly in recent years demonstrate a higher share of interdisciplinary publications than more developed countries (Elsevier, 2015). In China and Brazil, for example, the two leading countries in the study, 12.3% and 11% of their total publications in 2013, respectively, belonged to the world's top 10% of interdisciplinary papers (Elsevier, 2015).[6] There are many possible explanations for the relatively high ratio of interdisciplinary studies emanating from developing countries, but it could be an indicator of greater institutional flexibility and academic cultures. If these conditions also hold in Eastern Africa, then interdisciplinary research could be expected to grow as total research output increases. However, more research on the Eastern African context is required.

On top of research benefits, interdisciplinary techniques also hold the potential to improve student learning outcomes. On a cognitive level, Repko (2008) asserts that interdisciplinary education gives students the ability to understand multiple perspectives on a given topic, to develop structural knowledge,[7] and to integrate conflicting insights (i.e. expert opinions) from two or more disciplines. Other researchers have established different beneficial outcomes of interdisciplinary education, including: increased sensitivity to ethical issues, more humility and better listening skills, more creative, original, or unconventional thinking (Newell, 1990), a greater tolerance for ambiguity or paradox, and an ability to demythologize experts (Field et al., 1994). To many proponents of interdisciplinary education, these outcomes may seem self-evident. However, one of the primary challenges to interdisciplinary education is the difficulty of monitoring and evaluating its outcomes (Cooper et

[6] For this study Elsevier defined interdisciplinary papers as those that reference journals that are rarely cited together (Elsevier, 2015).

[7] The synthesis of both declarative knowledge (factual information) and procedural knowledge (process-based information).

al., 2001). Methodological approaches to evaluating outcomes are diverse, and the quality of evidence between studies varies greatly (Cooper et al., 2001). In general, students do appear to benefit from interdisciplinary programs of study, although it remains unclear if those benefits transmit through to professional practice (Cooper et al., 2001).

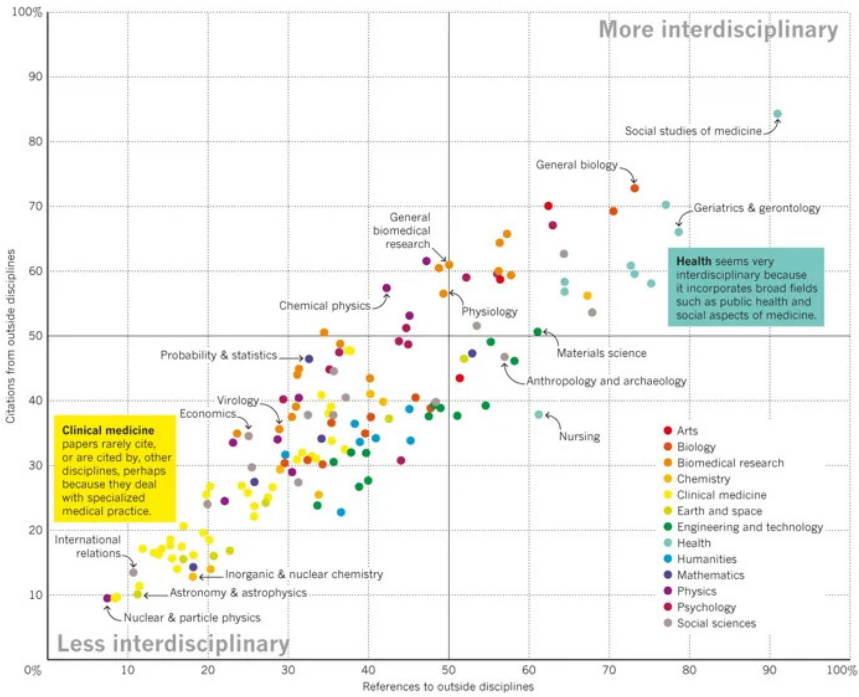


FIGURE 5 A measure of interdisciplinarity. In this chart, more interdisciplinary subjects are in the top right quadrant. A field's position in tihs chart is determined by how much its papers cite outside disciplines (X-axis), and by how much outside disciplines cit its papers (Y-axis). Data refer to 2014. For an interactive version of this chart, please see Van Noorden, 2015.
SOURCE: Van Noorden, 2015.

In Eastern Africa, as in many other parts of the world, study programs and curricula largely continue to reflect disciplinary silos (Esler et al., 2016; Kariuki, 2016). Academia at both public and private institutions remains dominated by a highly competitive, disciplinary approach that tends to separate issues of research and training

from the problems and issues of everyday practice. It is relatively uncommon for students, while pursuing their specialized degrees, to participate on project teams that extend beyond disciplines and institutions (Esler et al., 2016). Thus, while significant theoretical benefits from interdisciplinary research and education exist, they remain largely untested in the context of Eastern Africa.

Conclusions and Recommendations

Based on the evidence discussed above, the Expert Committee issues the following conclusions and recommendations for the way forward:

1. Liberal arts-based general education programs were a key part of higher education programs in the past, but have since been discontinued. In general, such programs help to develop civic-minded and ethical graduate with solid critical thinking and communication skills.

Therefore:

a) institutions of higher education should reintroduce or reinvigorate mandatory liberal arts-based general education courses with a view to fostering critical thinking and communication skills.

2. Interdisciplinary research has clear benefits both to students and to society through its ability to help solve wicked problems. Although there are interdisciplinary success stories from the region, siloed thinking and research continue to dominate the higher education system.

Therefore:

a) Institutions of higher learning should strengthen their promotion of interdisciplinary research and training.

Marketization of Higher Education: A Question of Quality

As shown in Figure 3, tertiary-level enrolment in Eastern Africa has been growing exponentially since the 1970s. And yet growth is still insufficient to meet demand. In most countries, public investment in higher education has not matched the massive increase in demand (ICEF, 2015). The result is painfully clear across the region in decrepit physical infrastructure (Hyuha, 2017), overcrowded lecture halls(Tessema, 2009), and prevalent academic misconduct in the absence of adequate supervision and enforcement capacity (Maxel, 2013; Wanzala, 2016b).

Vertical and Horizontal Diversification

In response to this pressure, tertiary education systems have diversified, both vertically and horizontally. Vertical diversification occurs when distinct types of institutions emerge in response to labour market demand, complementing traditional research universities. These new institutions include polytechnics, professional institutes, non-research universities, and junior colleges (Darvas et al., 2017, p. 12). Vertical diversification is usually the result of pressure from the labour market for "job ready," or "finished product" graduates from more vocationally-focused institutions. Horizontal diversification occurs as new types of providers—non-profit, for-profit, religious, international, and local government entities—emerge to fulfil unmet demand (Darvas et al., 2017).

To fill the gap between supply and demand, countries in the region have seen rapidly increasing horizontal diversification in the higher education sector. In all of sub-Saharan Africa between 1990 and 2014, the number of public tertiary institutions increased from 100 to 500; over the same time period, the number of private tertiary institutions increased from approximately 30 to over 1,000 (Bloom

et al., 2014). As Figure 6 shows, most countries in Eastern Africa have also seen significant growth in this segment of the tertiary education market over at least the past decade. In some countries, such as Uganda, the share of private tertiary education provision has more than quadrupled (Darvas et al., 2017, p. 13).

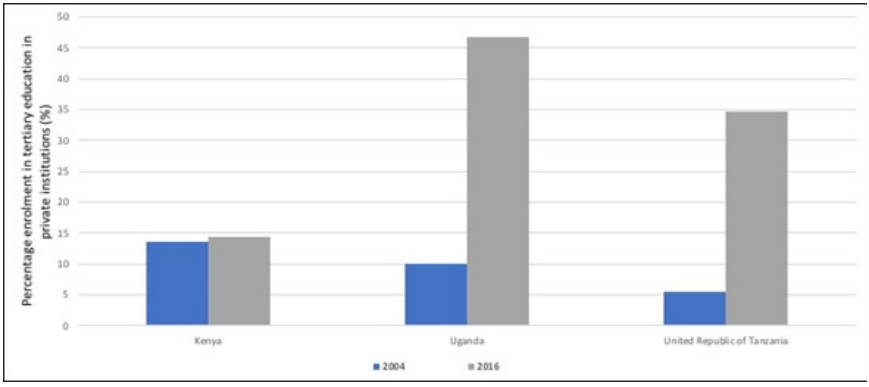


FIGURE 6 Share of tertiary enrolment in private institutions in Kenya, Uganda, and Tanzania between 2004 and 2016. Data for Ethiopia were not available, but in 2008 (last available data point) the percentage of tertiary enrolment in private institutions was 18.5%. The relatively low increase in Kenya could possibly be due to the country's much longer history with private tertiary education provision (Mulinge & Arasa, 2017). Note: 2016 Uganda data are actually from 2011, the closest available year.

SOURCE: UNESCO database: http://data.uis.unesco.org.

According to Varghese (2004), this rapid horizontal diversification is driven by a number of factors, including (i) the inability of the public sector to meet growing social demand for tertiary education; (ii) declining subsidies to the social sector; (iii) demand for programs and courses more appropriately aligned with the needs of the labor market; (iv) the perception that operations in the private sector are comparatively more efficient than those of the public sector; and (v) the privatization of public universities in line with broader economic policy shifts away from state planning, and toward market forces(Varghese, 2004).

Horizontal diversification implies a range of institutional arrangements in the education sector, some more market-oriented

than others. World Bank analyses have looked into the differences in market share, cost structure, and student satisfaction between public, private, and "faith-inspired" tertiary institutions (FII). As sample sizes are small, the results for specific countries are not robust, but the continent-level data tell a broad story. In general, the market share of FIIs is relatively small across the continent, although Kenya seems to have the highest, at 8.4% (Wodon, 2014, p. 117). The market share of private secular tertiary institutions is higher in most countries, and usually substantially so. Nevertheless, in most countries the public sector remains the largest player in tertiary education (Wodon, 2014). In general, private secular institutions appear to cost more than public institutions, although these data suggest that is not the case in Kenya. FIIs were found to be more costly than public institutions, but less so than private secular institutions. In terms of student satisfaction, the results fell somewhat close to those on cost. Student's at FIIs appeared to be more satisfied with their educational experience than those at public institutions, and somewhat close to but slightly lower than the satisfaction of those at private secular institutions (Wodon, 2014). In conclusion, both FIIs and private secular institutions appear important to the tertiary education system. Although they are typically more expensive than public institutions, students seem more satisfied with their learning experiences.

These aggregate statistics, however, conceal a much more complex picture in the Eastern African region. The transformation that has taken place in the region is not just the spread of new private (whether for-profit, non-profit, or faith-based) tertiary institutions. The transformation has been much deeper, involving the "marketization" of all aspects of tertiary education, as these institutions—both public and private—are now expected to source revenue from the market rather than from public funds (Munene, 2015). As with any large-scale innovation, there are bound to be doubts, false starts, and challenges along with achievements. The marketization process of higher education is likely to take place very successfully in some contexts, and disastrously in others.

One of the first and most important achievements of the marketization of higher education is the expansion in access; never before have so many individuals had access to specialized tertiary-level training (Darvas et al., 2017). Next, and just as important, is the revenue generated for public university treasuries from tuition fees paid by private students. As Munene (2015) notes, "In older state universities such as Makerere in Uganda and the University of Nairobi and Kenyatta University in Kenya, tuition revenues have been the major sources of monies to cater for rehabilitation of dilapidated teaching facilities, construction of new ones, and stocking of once-empty academic libraries (Munene, 2015, p. 9)." These revenue streams have also allowed universities to supplement state-determined academic staff salaries, and thus helped stem the tide of brain drain from the region (Munene, 2015). Finally, in some instances the marketization of higher education has allowed public universities to achieve a greater degree of independence from central government. With their own source of discretionary funding, they are now able to make important decisions about new academic programs, facilities construction, and joint partnerships with international entities free of influence from the state(Munene, 2015). In many respects, therefore, marketization has been a boon both for private and public tertiary institutions in Eastern Africa.

Another important benefit of marketization is that it has pushed all institutions to forge closer linkages with industry and to make their programs more relevant to the world of work. Most university administrators, for example, will be very familiar with the criticism that their institutions offer courses (especially in more technical fields like engineering, science, and business) that are out of sync with industry needs. Employers complain that courses are outdated, or students don't receive enough practical experience and as a result require additional training at graduation to be considered competent (Munene, 2015). Most universities, however, have responded vigorously to this criticism bycourting much closer relationships with industry for training, mentorship, and business incubation purposes. As part of this push, for example, virtually all programs

in Kenya's state universities now require an internship to graduate (Munene, 2015).

Linkages with the Private Sector

Many universities have also established joint venture business incubation centres. Some of the most prominent examples include the Chandaria Business Innovation and Incubation Center (BIIC) at Kenyatta University in Kenya. BIIC is a joint venture between the university and the leading industrialist in the region, Manu Chandaria, and provides space for students and faculty to incubate business ideas (CBIIC, 2015). In Uganda, the Makerere University Food Technology Business Incubation Center (FTBIC) serves a similar purpose (Wamai, 2014). In Ethiopia, Addis Ababa University has established the Office of University-Industry Linkage and Technology Transfer that establishes industry-funded research projects, assists with patent registration, and provides space for business incubation (AAU, 2019). Private universities have also been active in this area. In Kenya, Strathmore University established iLab, an IT business incubation centre founded in collaboration with a leading telecommunications provider (@iLab, 2017). Other innovative partnerships, such as that between Dodoma University in Tanzania and Hecate Energy (explored in Text Box 5), have matched private investment in physical infrastructureto the development of relevant new academic programs.

These types of public-private partnerships are now commonly identified as a crucial mechanism to ensure that graduate skills match the actual needs of the labour market (Moja, 2019). Although many of these joint ventures have been successfully established and funded, it remains unclear what their long-term impact will be (Munene, 2015). Rigorous evaluations are scarce, and in many cases the partnerships are too young to fully judge their success. One evaluation from Makerere found, for instance, that although the university successfully established many partnerships with international businesses and civil society organizations, bringing local industry on board was significantly more challenging (Rabwoni, 2008). The general perception was that local industry

was sceptical about the value addition of engaging with academia. As a result, the sustainability of these donor-driven partnerships may be in question (Rabwoni, 2008).It will also be important for universities to remember that private sector involvement does not necessarily only refer to industry. Design, music, fashion, film, and software development all play large roles in the regional economy, and there is thus a great deal of space for private enterprise to play a role in humanities curricula (Nordling, 2015). Very few initiatives to date have leveraged these potential strategic partnerships.

Text Box 5
UDOM, Hecate Energy, and Tanzania's Largest Solar Power Project

A joint venture between Dodoma University (UDOM) in Tanzania and Hecate, one of the United States' largest developers of renewable energy, will soon light the dormitories, lecture halls, research centres, and medical complex of the university (Makoye, 2015). The centrepiece of the project will be a huge solar farm, the biggest ever built on a university campus, capable of generating 55MW of power (Makoye, 2015). The second phase of the project will aim to extend the grid and provide power to the central Dodoma region (Makoye, 2015). This joint venture is part of a larger move by UDOM to position itself as one of Africa's leading research and training institutions in renewable energy (Hecate, 2015). As part of this strategy, UDOM has developed a series of programs to produce trained workers, research scientists, and entrepreneurs in the field of renewable energy. The Hecate solar farm will provide students and researchers with valuable opportunities to gain experience working with cutting edge renewable energy technology. UDOM has also established a strategic partnership with Ohio State University, one of the United States' largest research universities, to support its programs. The two universities have together agreed to retrofit 125 village wells in the area with solar-powered pumps that can provide clean water and improve health and sanitation for rural Tanzanians (Hecate, 2015).

Achieving a Clearly Differentiated Higher Education System

Marketization has had some clear benefits in expanding access, securing much needed funding, strengthening institutional

independence, and encouraging better alignment with private sector needs. In a number of other crucial areas, however, the process has produced less than ideal outcomes. The strongest criticism of marketization typically comes from those documenting the decline in academic quality across the higher education system (Akplu, 2016; Mgaiwa & Poncian, 2016; Oketch, 2003).The transition from elite to mass education institutions has resulted in the enrolment of more students than existing facilities can accommodate, and overcrowded lecture halls, libraries, and residence halls are now the defining trait of higher education across the region (Munene, 2015). The near inability to properly supervise so many students has led to a surge in academic dishonesty and plagiarism (Maxel, 2013).

In some cases, these characteristics may be more pronounced in private institutions, where the economic imperative is even more of a driving force in decision making. For example, Uganda's Bugema University had a branch campus in Kenya shut down after it was alleged to be operating illegally and offering sub-standard degrees (Khisa, 2010). In a more recent example, Kisii University had 10 branch campuses across Kenya closed, and five PhD graduates had their degrees revoked, after an audit from the public watchdog found that the institution was not meeting minimum standards (Wanzala, 2016a, 2016b). Also in Uganda, the Kampala International University continues to face claims that it preferentially awards degrees to politicians contrary to the prescribed time required for study (Munene, 2015; Ndurya, 2014; Spaull, 2015; Sylivester, 2013).

Market-based reconfiguration has additionally contributed to an unhealthy mission creep among large universities, both public and private. For instance, many of the major research institutions in the region have branched into applied courses allegedly based on market demand(Munene, 2015). As Mahmood Mamdani explained in regards to Makerere University:

> The Makerere reform went alongside a proliferation of interdisciplinary academic programmes, but without an anchor in core disciplines. The result has been

> to devalue higher education into a form of low-level training lacking a meaningful research component. The "innovators" of the Makerere reform called this training "professionalisation." I argue that this low-level training is better described as "vocationalisation" that is traditionally associated with community-based colleges (Mamdani, 2007, p. x).

In other words, exposure to market forces has led public research institutions—previously characterized by their theory-based and methodology-oriented rigour—to expand into vocational-level programs. In many cases, this expansion in focus has accompanied an overall decline in academic quality across programs. Similarly, many universities now offer courses that ideally belong in middle-tier colleges. Most public universities in Kenya, for example, now offer training programs in a variety of technical fields such as certificates and diplomas (associate degrees)on information technology software (Munene, 2015). The revenue-generation imperative has thus caused many public universities to stray from their original intended purpose to "train high-level manpower and engage in advanced research (Munene, 2015, p. 11)."

At the same time that public research universities are experiencing this "vocational drift" towards job-focused programs, non-university tertiary institutions are experiencing "academic drift" in their aspirations to become fully certified universities. In Kenya, for instance, many polytechnics have been elevated to university status (Ng'ethe et al., 2008, p. xviii). This two-way mission drift is caused partly by the exposure of tertiary institutions to market forces, and partly by a lack of policy clarity regarding the purpose of different entities within the higher education system and the appropriate boundaries between them (Ng'ethe et al., 2008).The end result of these processes is a higher education system that has expanded both horizontally and vertically (new providers and new types of institutions), but become highly un-differentiated in the sense that intended roles, responsibilities, and boundaries between institutional types have become muddier than ever.

The political and economic forces animating these transformations are not unique to the region—they are a local twist on broader global patterns. In the case of Eastern Africa, these forces have had both negative and positive outcomes. Achieving a healthy mix between entry into the market and retention of quality academic standards is a crucial challenge for regional governments in the years ahead.

Conclusions and Recommendations

Based on the evidence discussed above, the Expert Committee issues the following conclusions and recommendations for the way forward:

1. Marketization and liberalization of the higher education system has produced some important benefits, but has also had major distortionary effects, particularly by making the roles and responsibilities of institutions unclear.

Therefore:

a) Governments and regulatory agencies should establish clear guidelines to differentiate the responsibilities of different institutions in the higher education system, and ensure that funding and financial incentives accurately reflect the requirements of those different responsibilities.

2. Massification of the higher education system negatively impacts the quality of education and research. As a result, in recent years a widespread perception has grown in the region that Eastern African graduates are not adequately equipped to participate productively in the workforce.

Therefore:

a) To maximize the benefits of marketization, institutions of higher education should partner with private sector organizations to carry out regular tracer studies of their graduates to ensure labour market suitability of graduates.

b) Governments should contribute financial resources and seek to expand quality internship and apprenticeship programs.

c) Governments and education institutions should consult stakeholders, including the private sector, in the formulation of policies and the development of curricula.

d) Private sector organizations should partner more frequently with higher education institutions to generate industry-relevant applied research.

Education Sector Governance

The term governance refers to the structures and processes of decision-making. Structures mainly refer to organizations, offices, positions, and formal roles within institutions. Processes refer to both the official and unofficial, commonly accepted ways of making decisions, including which stakeholders are involved and to what extent. Governance reform, then, refers to the creation of new structures or the re-empowerment of existing structures; it might also refer to the establishment of new official processes through formal policy, or to a normative shift in the informal but commonly accepted way that decisions are made(Varghese, 2016).In environments of rapid change, such as the one in which Eastern African higher education systems currently find themselves, governance structures and processes can experience a great deal of stress and face major challenges to achieving their desired outcomes. This section will address some of the important governance successes and challenges in the higher education system in Eastern Africa.

Quality Assurance and Regulatory Enforcement Challenges

As noted in the preceding sections, all of Eastern Africa has seen a rapid increase in higher education enrolment, coupled with increasingly alarmed calls for the need to maintain academic standards. At national and regional levels, the typical response to such calls involves reform to the policy, legal, and regulatory frameworks to establish governance structures and processes that can encourage high-quality service delivery (IUCEA, 2014). What this response usually means in practice is the creation, funding, and empowerment of some form of quality assurance agency (Hayward, 2006). Every country in the region now has such an agency, although they exist at varying stages of maturity and capacity to enforce their mandates (see Table 2). The major stimuli for governments to

encourage quality assurance (QA) in the higher education system are (i) concerns about declining quality and accompanying global or regional competitiveness, (ii) the perception that private institutions are of lower quality and are more concerned with making money than providing quality education, and (iii) employer concerns about the poor performance of graduates(Hayward, 2006). While some less altruistic motivations may also be at play, in general governments try to enforce QA in the higher education system to improve quality, be internationally competitive, protect the public from fraud, and make tertiary institutions more accountable.

TABLE 2 National Quality Assurance and Accreditation Agencies in Eastern Africa

Country	Agency	Date Established
Ethiopia	Higher Education Relevance and Quality Assurance Agency (HERQA)	2003
Kenya	Commission for Higher Education (CHE)	1985
Tanzania	Higher Education Accreditation Council (HEAC)	1995
Uganda	National Council for Higher Education (NCHE)	2005

SOURCE: Hayward, 2006, p. 19.

These QA agencies play a crucial role in minimizing the negative effects on quality that can result from massification of the higher education system. Recently, some of these agencies have taken a more assertive role in identifying institutions that do not meet quality standards or offer unaccredited degrees (Mukhaye, 2018). In the past, however, they have faced significant challenges enforcing sanctions on such violating institutions. In Kenya, for instance, professional associations have had to step into the gap left by the CHE to sanction certain institutions by refusing to recognize their degrees. In 2011, The Engineers Registration Board declined to recognise engineering degrees from three of Kenya's leading universities: Egerton, Kenyatta, and Masinde Muliro (Nganga, 2011). Some law graduates from public and private institutions suffered a similar fate when the Council of Legal Education

rejected their papers (Mohamedbhai, 2014). What is of even greater concern is that one of those private institutions, Kabarak, had received accreditation from CHE, suggesting the QA problem may extend beyond just enforcement issues (Nganga, 2011). As a result of these sanctions, other professional associations pledged to look into institutions granting degrees in their field and sanction those of insufficient quality (Nganga, 2011). Unfortunately, these professional associations have no statutory authority and have thus been sued in their attempt to enforce quality standards (Wanzala, 2016c). While the situation may have improved since 2011, these anecdotes point to serious QA challenges in the region.

The first key point to make about QA in higher education is that it can be divided into two complementary components. Most literature on QA highlights the role of both internal and external systems of evaluation, somewhat analogous to the roles of internal and external audits (see Figure 7). Internal QA refers to those policies and practices that higher education institutions use to monitor and improve their own performance (Machumu & Kisanga, 2014). In some cases, the structure and scope of internal QA mechanisms are mandated externally (for example, in national-level policies requiring that every tertiary institution establish internal QA systems, as HERQA has done in Ethiopia (Tamrat, 2019)). External QA, in contrast, is carried out by an entity separate from the tertiary institutions themselves (possibly an agency such as those listed in Table 2) to ensure that institutions and their programs are meeting established standards (Martin & Stella, 2007). External QA entities may not always be in the ideal position to accurately and fairly judge the quality of academic institutions and programs, but they are necessary to establish trust amongst the public that higher education institutions are maintaining sufficiently rigorous internal QA processes (Machumu & Kisanga, 2014).

Internal and external QA mechanisms are therefore both necessary in a rapidly massifying higher education system, and build on each other to improve learning and ensure accountability. The tensions between internal and external QA systems, however, become apparent when considering the definition of "quality

higher education." For instance, there is no consensus on the exact objective of higher education—although some objectives can be identified, such as to produce a qualified workforce, train people for a career in research, or to produce general life prospects (Martin & Stella, 2007, p. 30). Different stakeholders use different visions of the objective of higher education to further their own interests. Additionally, higher education—like any other type of education—is a multi-dimensional and complex process. Learning is based on the relationships formed among and between learners and teachers, and it is thus very difficult to associate inputs to the system with the exact determinants of outputs (Martin & Stella, 2007, p. 31). Essentially, we know what the outcome of learning looks like, but we do not know what official, high-level mechanisms will assist that learning.

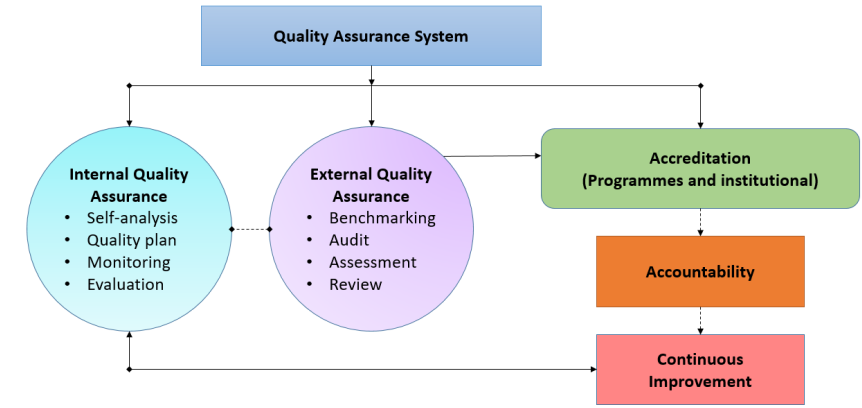


FIGURE 7 Generalized model of the higher education quality assurance system. Internal and external mechanisms work together and build on each other with the ideal of producing continuous improvement.
SOURCE: Machumu & Kisanga, 2014.

As a result of these tensions, external entities face a number of challenges when all national responsibilities for QA are delegated to them (Tamrat, 2018). When establishing criteria to judge "quality" at a national level, for instance, agencies face the danger of falling

back on things that can be easily measured (number of books in the libraries, computers per student, percentage of faculty members with PhDs)(Hayward, 2006). In this way, QA agencies try to avoid criteria that could be interpreted as "subjective" or prone to bias. The problem with such practices is that easily quantified input measurements are only very weakly correlated with quality education outputs (Hayward, 2006). In general, reviews of QA agencies in Africa note that most have managed to evade this danger, and to focus on value addition, outcomes assessment and performance measures (Hayward, 2006). Nevertheless, there is a need to ensure that future evaluations do not succumb to this pitfall. Effective external QA mechanisms seek to work collaboratively with faculty to foster improvements, and establish systems that will help point institutions towards resources for improvement (Materu, 2007).

Limited human capacity and issues of high turnover are persistent challenges facing most external QA agencies (Materu, 2007; Tamrat, 2019). Accreditations, audits, and academic reviews are intensive processes and particularly demanding of human capacity. They are also dependent on the quality, dedication, and integrity of the individuals who serve on peer review panels (Hayward, 2006). Sufficient peer reviewers can be particularly hard to secure, as they must be experts in their field and also sufficiently independent that their judgements are accepted as a neutral arbitration of the facts (Materu, 2007). Even in South Africa, with a very large base of experienced university faculty, there is a general acknowledgement that audit and accreditation processes take up far too much of the time of administrators and teaching staff (Hayward, 2006). Peer reviewers may also receive inadequate training, compensation, or information to complete their tasks effectively (Materu, 2007). As a result of these constraints, external QA agencies are often encouraged to limit the number of program reviews they undertake, which necessarily limits their effectiveness in regulating the entire tertiary education system.

One method that has been proposed to circumvent the human capacity constraints to accreditations, audits, and program reviews, is to empower professional associations in the process (Tamrat,

2018). In Nigeria, for example, there are at least 10 professional bodies with a federal mandate to accredit professional education and set standards for members of their professions, including: engineering, accounting, law, dentistry, medicine, ICT, nursing, and midwifery (Hayward, 2006). The key challenge with involving the professional associations is the need to separate their advocacy or trade union functions from QA functions. Some countries have achieved this separation by legislation that created separate statutory bodies independent from the professional associations specifically for the purpose of QA (Materu, 2007).[8] In most cases, the potential to engage professionals in QA processes will depend on the quality of the working relationship between entities—in countries where confrontational relationships are common, involving professional associations in QA is unlikely to produce desirable results. In many countries, it is difficult to determine the true extent of professional association participation in QA processes, as much of it takes place on an *ad hoc* basis (Hayward, 2006). Formalizing some of these existing relationships could present opportunities to improve external QA in the region.

Ultimately, all of the challenges associated with external QA could be avoided if higher education institutions took internal QA more seriously. In the past, public universities were able to maintain quality standards through informal mechanisms like only recruiting elite students, rigorous student evaluations and assessments, and periodic curriculum reviews (Tamrat, 2019). With the advent of massification and marketization in the higher education sector, however, these informal mechanisms have become largely insufficient. National governments can mandate the use of internal assessment for institutions, but without internal commitment and leadership QA structures become more concerned with form than function (Machumu & Kisanga, 2014; Matovu, 2017). Institutions are closer to the learning process, and thus have a

[8] The Health Professions Council of South Africa (HPCSA); The Council for the Regulation of Engineering Education in Nigeria (COREN) and the Council for Legal Education in Nigeria; and the Institute of Chartered Accountants in Ghana are good examples.

much greater ability to evaluate what actually matters in the search for quality education (Machumu & Kisanga, 2014). Establishing and empowering effective internal QA mechanisms, however, relies on the combination of politicalwill in leadership and available resources; in many Eastern African tertiary institutions, at least one of the two is missing (Matovu, 2017).

Unrest in the Higher Education System

Student unrest has a long history in Eastern African universities, and has been a persistent point of vexation for governments in the region (Kiboiy, 2013; K'okul, 2010; Mjema, 2013; Nakayiwa & Kaganzi, 2015; Okeyo, 2017; Omari & Mihyo, 1991). Unrest often leads to the destruction of property, the stoppage of academic programs, and the loss of a peaceful learning environment (Mjema, 2013). All of these, in turn, damage educational quality, and ultimately undermine the credibility of institutions to provide a satisfactory educational experience (Mjema, 2013).Over the years, governments in the region have formed a number of commission committees to look into the causes of unrest and recommend possible solutions (Omari & Mihyo, 1991). Despite numerous efforts, the problem persists.

The causes of student unrest are, unsurprisingly, complex. Everything from the decline of academic authority, to the weakening of state power, to the radicalization of intellectuals has been pinned as the heart of the matter (Omari & Mihyo, 1991). Sociological explanations have pointed to alienation, rejection of parental authority, or simple immaturity on the part of students (Omari & Mihyo, 1991). Some have attributed the growth in frequency and intensity of student protests to the "child rights movement" coupled with a primary and secondary education system that produces "deculturized" students disconnected from their cultural roots (Nakayiwa & Kaganzi, 2015, p. 17). The end result, proponents say, are undisciplined individuals that prefer to operate in anonymous groups that can erupt into riot at the slightest provocation (Nakayiwa & Kaganzi, 2015). In many cases, students may simply be responding

to legitimate societal grievances through the only avenue available to them.

Whatever the specific causes of student unrest, studies have found that inadequate communication between university administrations and the student body plays an important role in exacerbating conflict (Nakayiwa & Kaganzi, 2015). Institutions have maintained traditional forms of communication such as circulars on notice boards, amidst a student population that has shifted to primarily digital means of communication and has a poor reading culture (Nakayiwa & Kaganzi, 2015). A study of student perceptions of unrest at four universities in Kenya (two public and two private) found that 58.8% of respondents believed the cause of unrest was misunderstanding between administration and students, as opposed to power blackouts and water shortages (6.7%), accommodation crisis (17%), or tribalism and ethnicity (4.4%) (K'okul, 2010). Universities, in general, have been slow to enter student communication spaces such as social media(Nakayiwa & Kaganzi, 2015). The resultant gap has been used by certain actors to spread biased information and foment unrest.

Additionally, institutions generally tend to have non-responsive governance frameworks to address student concerns before they escalate to the level of strikes and unrest. The breakdown of these governance systems contributes to the poor flow of information, and undermines official communication between the point of notification and the time when a strike breaks out (Nakayiwa & Kaganzi, 2015). Non-responsive governance frameworks further contribute to unrest because they limit the ability of universities to be transparent about the financial situation of the institution and to clearly articulate the rationale for things like fee increases (Nakayiwa & Kaganzi, 2015).In the presence of non-responsive governance frameworks, communication tends to occur in an informal manner, and relies to a greater degree on personal relationships between students and administration (Nakayiwa & Kaganzi, 2015). At the same time, both staff and student governance structures have high rates of turnover, undermining the formation of close personal relationships and exacerbating confrontational tendencies (Nakayiwa &

Kaganzi, 2015). As evidence for the importance of these personal relationships, faith-inspired institutions have tended to experience less unrest, as the church acts as a common platform outside of the academic environment (Nakayiwa & Kaganzi, 2015). This platform can be used as a communication avenue, and also contributes to a sense of mutual respect and understanding of shared concerns.

There also tends to be a divide between public and private institutions in the manner that they learn from unrest. In public institutions, there are very poor or non-existent mechanisms for institutional learning (Nakayiwa & Kaganzi, 2015). Any structured process of self-evaluation and reflection is extremely rare after an episode of unrest. As evidence of this point, there has been scant documentation or reports produced on student strikes in public institutions (Nakayiwa & Kaganzi, 2015). As a result, there is no record of how disputes were resolved or decisions were made, and no opportunities to learn from past mistakes and improve unrest resolution processes. There seems to be reticence about the issue of unrest at public institutions, perhaps out of fear that any discussion will reflect poorly on current leadership (Nakayiwa & Kaganzi, 2015). However, this silence does no favours for any of the stakeholders involved, and only contributes to cycles of recurring unrest. In contrast to the public universities, private institutions have demonstrated a higher capacity for engaging in transparent evaluations of how unrest was dealt with, and have taken actions to mitigate future occurrences of unrest based on these evaluations (Nakayiwa & Kaganzi, 2015). Unrest is a persistent and corrosive reality in higher institutions across the region, and only by engaging with the issue in a straightforward and transparent manner will any solutions be achieved.

Conclusions and Recommendations

Based on the evidence discussed above, the Expert Committee issues the following conclusions and recommendations for the way forward:

1. Quality assurance mechanisms are best implemented internally, but this requires strong leadership and resources.

Therefore:
a) To limit administrative burdens, national regulatory agencies should offer oversight exceptions to institutions that adequately prove they have the leadership and resources to implement strong internal QA mechanisms. The criteria for oversight exceptions should be enforced universally on all institutions, and transparently communicated to all institutions through outreach programs.

2. Regulatory agencies in the region unevenly enforce policies and rules between private and public institutions because of unclear roles and responsibilities.

Therefore:
a) Instead of enforcing policies by institution type, regulatory agencies should take a risk-based approach and focus their efforts primarily on those institutions that have been shown to repeatedly violate established quality standards.

3. Unrest within higher education systems produces major disruptions and has negative impacts on student learning outcomes. Public institutions and governments are not doing enough to learn from unrest and take mitigating actions.

Therefore:
a) Higher education institutions, and in particular public universities, should implement transparent structures for institutional learning and adaptation following periods of student unrest.

Concluding Remarks from the Expert Committee

As indicated by multiple international and regional evaluations, the quality of education in the Eastern African region is well below the level required to meet our developmental goals. There are likely many contributing factors to this persistent unsatisfactory quality, but a major one is the massification of the education system at all levels. Expanding education access is a noble and necessary goal, and one that should be pursued vigorously. Nevertheless, substantial evidence exists that this expansion inevitably results in declining quality. As a result, significant funding, coupled with strong governance mechanisms—including appropriate sanctions and incentives—are necessary to maintain a satisfactory level of quality within a massifying education system.

International and regional evaluations provide us with valuable data, but they do not tell the whole story. Policymakers, regulators, and educators all receive valuable information from assessments that benchmark student reading or mathematics ability across certain age groups or grades between countries. However, such narrow assessments of what "quality learning" actually means do a disservice to the scope of the problem, and to the many innovative solutions that exist.

According to employers in Eastern Africa, the primary deficiency of our graduates lies in their "trainability." Employers should be willing to invest in capacity building for potential long-term employees—if those employees are actually capable of becoming valuable assets. Students that have been taught their whole lives to simply memorize and restate answers for an examination are unlikely to be particularly "trainable," or to have developed a passion and curiosity for life-long learning. Eastern African economies require confident graduates with critical thinking skills

who are able to analyse complex problems into their constituent parts, understand the information or skills required to help solve those problems, and apply resourcefulness and hard work to secure the necessary information or skills. Our graduates also need well-developed reading, writing, and communication skills to navigate this process—regardless of the industry or sector they eventually enter. As a general observation, the education sector at all levels does not do a very good job of instilling this capacity for life-long learning in our students.

Despite current shortfalls in the education sector, innovative and experimental solutions do exist. For one, there are multiple strategies to improve STEM education at earlier levels of the education system. Current approaches that emphasize memorization and rote learning unnecessarily turn students away from the subject, and make it a very dull experience. With the right creative interventions, science, technology, engineering, and math courses can be an exciting undertaking for all students. In particular, curricula that integrate the arts into STEM teaching show promise to improve learning.

In higher education, programs and courses that emphasize liberal arts or general education courses have shown promise in reinforcing critical thinking abilities in students. Courses of this nature were a common feature of post-independence higher education across the region, but have largely been discontinued. In a similar vein, interest in interdisciplinary research collaboration is growing internationally, and many opportunities exist for Eastern African universities to engage in this movement. When grounded in methodological rigour, interdisciplinary work is particularly valuable for its ability to stimulate critical thinking and complex analysis skills, and also to address the pressing practical concerns of implementation that face all of our countries.

All countries in Eastern Africa have experienced exponential growth in private-sector tertiary institutions in their countries. Private institutions are sometimes for-profit, but also include a range of other institutional arrangements, such as faith-inspired and non-profit. These institutions have played an important role in expanding tertiary education access to more people than ever

before. The marketization of the higher education system, however, extends further than just the entry of new private players. Even public universities are now required to source large portions of their revenue from the market. This shift has produced some benefits, including the greater independence of public institutions, and more responsiveness to labour market needs. This shift has also created major distortions—particularly in the area of quality assurance across programs and institutional types. Additionally, the process of marketization has led to poor differentiation between institutions, as public universities experience vocational drift and vocational polytechnics experience academic drift. As a result of this mission creep, governments have had a challenging time effectively defining intended roles and responsibilities across the tertiary system, and implementing regulations and incentive policies accordingly.

Ultimately, the question of maintaining quality comes down to political will in institutional leadership coupled with available resources. Governments can do a better job implementing policies and enforcing sanctions on offending institutions. They can also do a much better job making sure that the right resources and financial incentives are in place. But without strong internal leadership, institutions will continue to prioritize the form of quality assurance systems over their actual function. Producing the type of graduates that our countries want and need will require a mindset shift at all levels of the system to value the process of learning over its appearance—and in most cases, that shift needs to start from the top.

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EXPERT COMMITTEE ON EDUCATION SYSTEMS IN EASTERN AFRICA

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